Healthy aging

Age Control!

Arnaud van der Veere

Content

Note: a reference list of all books, articles, movies and other references can be found on the University website of the ZUST / Hangzhou / China

Preface

The purpose of this book is to inform the professional about the aging process. Aging starts at birth and will finally end at death. It is an ongoing process that important to understand. People like to have some control or ability to influence lifespan. Eternal life is no option, that is a myth. Understanding the process gives the opportunity to assist and extend life to make it a long lasting healthy process.

It is important to place scientific development in the right perspective. Evolution has been “cheated” by the fast increase of lifespan. In less than 100 years the human age has improved with 20-30 years. This is an incredible achievement.

With this achievement, the most important goal should be the expand of healthy years. Currently, people suffer from 10-20 years of bad health which is around 15 – 30% of the lifespan. The focus of this book is to create awareness and knowledge to help and improve the general amount of healthy years and decrease the cost of healthcare. By providing and assisting the plus 35 group with the proper information and tools it could save large amounts of money but most of all the suffering that goes with every disease. The working goal is prevention only after that the focus can turn to people with the disease.

All knowledge is based on interpretation, personal view, research and in the vision and critical eye of others. Science is considered undoubted facts but there is always room for interpretation. This book contains a collected vision but still one should work with experience and some trial and error. Science is a developing process and not a race already won. Many scientists contributed directly, indirectly or from a historical perspective to the content but much more research is needed.

It is strongly recommended to take notes, use registration sheets and all other forms of available evidence recording. All recording is made for personal learning, evidence in case of error, search back function (“what did I do in this situation back then”) and future exchange with others. Filing is a need.

One of the most important virtues of aging is the move from talking to listening. Every person is aging in a unique way. Listening combines knowledge facts, the story told and experience into a personal helping formula. This book gives the tools. Organized seminars and lectures hand the instruments and the professional groups are ears and eyes. Join one of the groups to improve personal professionality.

Arnaud van der Veere

Introduction

To understand aging it is important first to study life itself. The foundation of life is (bio) chemistry. All that surrounds and the universe is based on chemistry. Every process is chemical or mechanical (physical) or a combination of both. In this book, the focus is on the principles of biology and chemistry to understand the processes of life and aging.

As a writer(s) it is not easy to keep it short, clear and factual. Aging is surrounded by a “mystical” portion of assumptions, myths, believes and traditions/culture. Altogether it is not easy to enter this topic with an open mind. Every person and living being gets older, has connections with older people and are related to them. Emotions play a high ball.

To refrain from emotions it is important to analyze the topic part by part. There are many theories on aging. All pretend to be the “one and only” but aging is a multi-dimensional process and there is no one layer solution. This book addresses most of the different sides of the problem and asks everyone to participate in this ongoing research by sending remarks and commands. All effort taken is in the benefit of mankind and not individuals. To contact use the information in the backside of this book.

Coma

The coma, induced or natural occurring, is a physical state when the body is functioning but the mind is at “rest”. Currently, it is not possible to monitor any mental activity in a coma patient but there is sufficient evidence that a coma patient still has a form of awareness. This implies the body is still alive and not just vegetation without a mental condition. It is considered a full human being.

Why make this statement as clear as possible? The following is the core of this book. Everybody ages with or without conscious grow, develops and grows older without moving, activity or mental instructions. This makes most theories of aging useless. When the body is not used for any activity it should not age but it does. Activity or not, everybody grows older. Slowly but steadily until the battery is finished and the death arrives, for most coma patients as a reliever, but to most people too early.

When a baby is born which has little chances to survive it is often kept in an induced coma. The state of coma gives doctors the chance to study the case in a steady and controlled situation. During the coma, the baby is fed and nourished. Every day it continues developing, growing and changing. These changes are physical. Muscles develop, blood is moving and slowly the digestion starts to work. It is a wonder that life is able to start and continue. But the fact that even in a state of the coma the baby is developing shows that the body is working “under pressure”. It is resisting something of the outer world that put forces on it which stimulate to respond, otherwise, it would not react.

Sometimes hospitals are confronted with sad cases of child accidents. Children with a brain damage or serious injury arrive in the hospital and go to the coma rooms for treatment. All precautions are taken and the child is monitored 24 hours per day. Some children stay in a state of coma due to the accident and others are kept in it until further action is possible. During the state of the coma, the body continues to be physically active. Due to the machines, the body is fed with food and oxygen. The metabolism keeps moving. When the state of coma takes a long time the body is growing at a normal rate of development.

Sometimes the state of coma takes years. The child enters puberty and all physical aspects of puberty develop. Physically everything is changing. Organs change, the sex organs mature and all muscles grow. Hormones and enzymes change in amount and function and hair start growing. There is a relatively normal development of growth, even without consciousness. This gives parents hope of spontaneous waking up. But the body follows the laws of nature, no matter it is conscious or not.

When adults arrive in a hospital and a state of coma is needed or happening, the same procedures are followed. The person is taken to a specially prepared emergency room and connected with the machines for monitoring, food, and oxygen. A new state of life starts. This state should be complete without activity but while monitoring movement and muscles it is proven that there is a lot of activity.

All instruments measure muscle tension, blood moving, heart pumping and other activities. Every second of the day. They also register a change. When the coma takes years the same machines detect physical differences. A changing body, the person is growing older. Muscle tension changes, blood pressure, heart pump and all other activities slow down, change in a specific rate that shows the growing older process.

In every sample, it is clear that the person in a coma is not consciously busy. It is proven that there is no real physical activity, although it is possible to measure muscle activity at all time. This shows there are powers working in and on the body that keeps it active.

Activity stimulates change and growth even in a coma situation. A situation where everything is controlled by instruments, there is no physical activity but still, the individual is growing older. This proves clearly that nature is destined to let everything grow over time. All human beings have a limited time span. Even in the most controlled environment.

There are a number of important and significant facts that have to be registered which all come back in this book:

- From the start of life, the body produces electrical impulses that can be measured
- Muscles show activity from the first moment of birth till the last moment we die
- Blood keeps on moving as long as the heart keeps pumping it around
- Consciousness is not a condition for living a life, sub-conscious is!
- There are powers working on the body which keep it responding all the time. These powers work 24/7 around with an equal force at all time.
- Growth in time depended and connected. By the passing of time, the body responds, always.

Wake up to reality. Life is not depended on theories. This book gives a realistic, practical situation which every individual is confronted with every day and all day long. Face reality, follow the path of Age Control.

1 – Our food content

Life, a precious gift to all but lasting such a short time. A time to spend considering how to live it. The most scientists did focus on one or a few aspects of the aging process. But there are powers that influence all. Powers that affect every living being on earth. These powers are everywhere, seemingly almighty and unavoidable. This book is a search for these powers and a revelation of what to do to make the given years of living healthy, happy and prosperous.

A healthy life is the best option for a happy one. To be happy it is important to understand the parts that influence life itself and health in particular. It is the science of the parts that make the whole complete, but science should have open (holistic) eyes to combine the parts into the "cycle of life". Understanding this is the most important part of acceptance and further discoveries. Life is a constant seeking of balance between

The conscious/subconscious mind and the physical world

Every physical product has a psychological effect on an individual, and always different. The first part of the research is the content of food. A most important part of everyday life with a huge psychological effect on the modern human being. Food has become a culture in itself. Today food comes from every corner of the world. The kitchen is global but the mentality not yet. Understanding, acceptation and reasoning food content and origin is an important step to social development and it is a very important tool in the aging process.

There is a simple saying; "we are what we eat"!

This truth is inevasible, a fact of life, a philosophy in itself and something to account for, every day again.

Understanding food starts with analyzing the ingredients. All food is built of certain ingredients (building blocks) which combined gives what needed. All these building blocks are presented in a unique order which represent life itself. The composition of ingredients makes the unique specification of a product, animal, herb and even human.

To understand the importance of these building blocks analyzation is needed.
(COMPONENT) macro components do we recognize as food components:

- Proteins and amino acids
- Carbohydrates
- Fats
- Vitamins and minerals
- Fibers
- Liquids

Nature has chosen the way of completely "uniqueness". Every plant, tree, animal or human has individual features, chemically and consciously. Food from a natural source is always different. The composition of the same products varies by piece, harvest, and place. The composition is unique for all living organisms. This is important while study health processes. A change of harvest or source can make a large difference in the physical reaction of the consumer.

Understanding this draws the logical conclusion that all stats, records and measuring results are guidelines and not fixed numbers. In biological processes all registered data is not fixed data, it is considered directional data to give an impression of what is going on. Consider DNA, there is no 2 DNA alike.

When setting up a data collection for age research it is important to add extra information fields to record data which normally is not taken into account. **(SOURCE)**

- Source and origin of the food product. (spice, quality, quantity)
- Local climate or climate of origin which did influence the growth and nature of the product (place/time)
- Local pollution has become a third determination factor of importance (soil constitution)

Food production is time and places dependent. This accounts for manufacturing (growing) and for consumption of food. Eating in the night is not good for the health. Time seems to be an important factor. Hereby referring to a disputed part of science which is called the “biological clock”. Eating is an important part of the metabolic processes and the time of eating influences the effect. The digestive system shows time depending patterns which are trained and ruled by external influences. When food is taken at the “wrong “ time, digestion is not complete and leaves more waste to be expelled. This inefficiency creates unwanted waste of source product.

This waste and the effect on the cellular system is an important part on basic cell levels where it has an impact on the functioning of a cell.

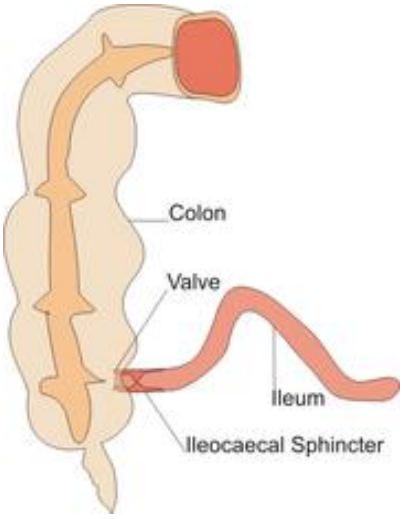
(FUNCTION) It is important to know why do food is needed. What is the purpose of food?

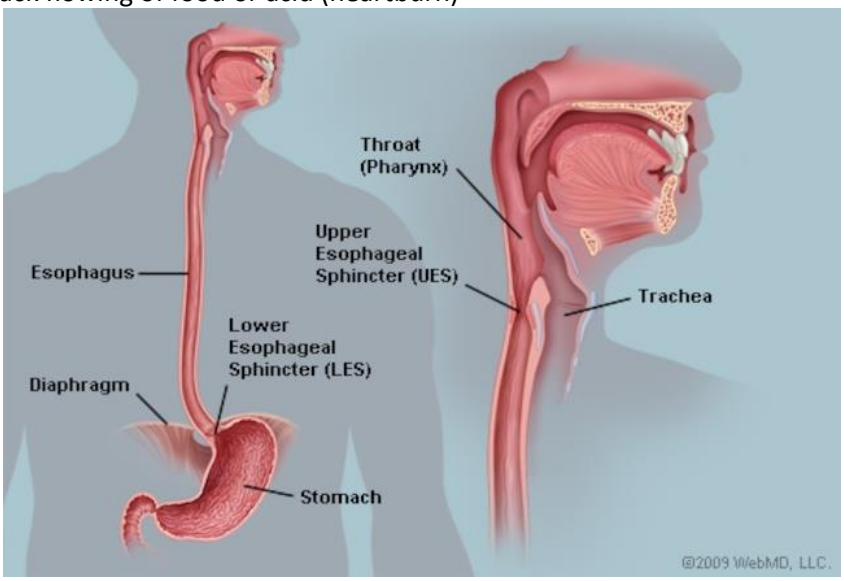
- Energy. Food provides energy to keep warm or cold, fuel all biological processes.
- Building. The body needs building blocks for growth and recovery
- Protection. Organs need to be sustained in functionality

While studying the components of food it should be kept in mind; does this component have one function or can it have other different functions also? If yes what are the consequences of this?

How does aging affect the digestive system? The first observation is that the digestive process becomes less efficient, over the years recordings of functionality changes in different parts such as:

- In the mouth, food is not properly broken down due to missing teeth or gum problems as well as lowered saliva production
- The lower sphincter (*A sphincter is a circular muscle that normally maintains constriction of a natural body passage or orifice and which relaxes as required by normal physiological functioning*) that regulates the flow of food from the esophagus (*The esophagus is a muscular tube connecting the throat (pharynx) with the stomach. The esophagus is around 8 inches long and is lined by moist pink tissue called mucosa. The esophagus runs behind the windpipe (trachea) and heart, and in front of the spine*) into the stomach, weakens resulting in reflux, a back flowing of food or acid (heartburn)





- Loss of muscle tone causes food to move more slowly along the digestive tract
- The stomach becomes less elastic and cannot hold as much food
- The production of acids and enzymes declines. A decline in the production of lactase, an enzyme that digests dairy products can lead to lactose intolerance, a condition that causes bloating and gas when milk products are consumed. This condition is only important if the person lives in a milk oriented society and is often confronted with amounts of over 200 ml of milk products per meal serving.

The process of digestion starts in the mouth, where food is chewed and broken into smaller pieces. Saliva is mixed with the food during chewing, which makes it easier to move around in the mouth. An enzyme called salivary amylase starts to digest carbohydrates like sugar and starches.

Once the food has been chewed, it is pushed by the tongue to the back of the mouth. From here, muscles move it further down the esophagus and continue past a one-way valve, which is called the oesophageal sphincter. The muscles of the esophagus are strong and gravity-defying – one can swallow even if standing upside down or lying down.

The stomach, under normal conditions, performs three main functions.

- Firstly, storage, 2 or 3 meals a day can provide all energy needs. Without this, easting would be a continuous process all day long.
- Secondly, aids the digestive process, food is turned into a semi-liquid substance so that the nutrients can be absorbed from it.
- Destruction of contaminants that the food may contain – bacteria and other micro-organisms. Very little nutrients are absorbed into the bloodstream through the stomach walls – aspirin and alcohol being exceptions to this rule.

The cephalic phase is the stage in which the stomach responds to the senses observation such as smell, taste, or even the thought of food. About 30% of total acid secretion occurs before food enters the stomach. These sensory and mental inputs converge on the hypothalamus, which relays signals to the medulla oblongata. Vagus nerve fibers from the medulla stimulate the parasympathetic nervous system of the stomach which, in turn, stimulates gastric secretion. Sensory stimuli from food activate dorsal motor nucleus of the vagus nerve in the medulla (activating the parasympathetic nervous system). Insulin-induced hypoglycemia also stimulates the vagus nerve. This results in four distinct physiological events.

1.) In the body of the stomach, the vagal postganglionic muscarinic nerves release acetylcholine(ACh) which stimulates H+ secretion.

2.) In the lamina propria of the body of the stomach, the ACh released from the vagal endings triggers histamine secretion from ECL cells. Histamine also stimulates H+ secretion from parietal cells.

3.) In the antrum, peptidergic postganglionic parasympathetic vagal neurons and other enteric nervous system neurons release GRP which stimulates antral G cells to produce and release gastrin. Gastrin stimulates acid secretion by directly stimulating parietal cells as well as by promoting histamine secretion by ECL cells.

4.)In both the antrum and corpus, the vagus nerve inhibits D cells, thus reducing their release of somatostatin and reducing background inhibition of gastrin release.

- Mucous cells secrete the alkaline mucous for shielding the epithelium from hydrochloric acid. These are found in the fundic, cardiac, and pyloric region.
- Parietal cells, located in the fundic, cardiac, and pyloric region, secrete hydrochloric acid; the acid activates the release of pepsin for protein digestion. The acid also kills micro-organisms swallowed with the food.
- Chief cells secrete pepsin. These cells are located in the fundic region.
- G cells are found in the fundic, pyloric, and gastric region. These secrete gastrin which stimulates the secretion of hydrochloric acid.

The glands at different locations of the stomach wall may secrete different substances. These glands are therefore termed according to its location – cardia glands (in the cardia of the stomach), fundic glands (in the fundus of the stomach) and pyloric glands (in the pylorus of the stomach).

The secretions from these glands are as follows:

Cardia glands – mainly mucus.
Fundic glands (oxyntic glands) – pepsinogen, intrinsic factor and gastric acid.
Pyloric glands – gastrin.

The two enzyme-producing cells in the stomach are the chief cells and parietal cells. Chief cells secrete pepsin while parietal cells secrete gastric acid and intrinsic factor.

Although gastric acid is secreted by the stomach wall, it is not considered to be an enzyme. Acid indiscriminately breaks down substances, which are not resistant to it. Mucus is also secreted by the stomach wall and one of the main functions of this mucus is to protect the lining of the stomach wall. Gastrin, a hormone, is secreted by cells of the pyloric glands. These other substances are important for digestion despite not being enzymes.

Enzymes speed up and/or facilitate chemical reactions and are usually specific for certain substances. The two main types of stomach enzymes include:

- Pepsin (active form) secreted in the inactive form, pepsinogen.
- Intrinsic factor (IF)

Pepsin

Pepsin is the active form of pepsinogen which is secreted by the chief cells in the stomach wall. Pepsinogen is converted to pepsin by the action of stomach acid. Pepsin digest protein. It breaks down large protein chains (polypeptides) into smaller proteins (dipeptides and peptides).

Pepsin is most active when it is in an acidic (pH 1.5 to 3.5) environment. Coupled with the fact that it is secreted in an inactive form means that it does not damage or digest the tissue of wall. The mucus barrier that separates the stomach contents from the stomach wall also prevents auto-digestion.

Although the stomach acid is effective in destroying bacteria that may be consumed with food or beverages, pepsin may assist in this regard to some extent.

Intrinsic Factor

Intrinsic factor is a glycoprotein that is secreted by the parietal cells in the stomach wall. It is an ***enzyme-like*** substance which is responsible for vitamin B12 absorption. However, an intrinsic factor only acts within the small intestine despite being secreted by the stomach wall.

Vitamin B12 that is released from food in the stomach is bound by specific binding proteins, and not an intrinsic factor. When this bound vitamin B12 enters the small intestine, enzymes from the pancreas releases the vitamin B12 from the binding proteins.

Activation of Gastric Chief Cells

Gastric chief cells are primarily activated by Ach (Acetylcholine). However, the decrease in pH caused by activation of parietal cells further activates gastric chief cells. Alternatively, the acid in the duodenum can stimulate S cells to secrete secretin which acts on an endocrine path to activate gastric chief cells.

Gastric Phase, 50-60% of total gastric acid secretion occurs during this phase. The gastric phase is a period in which swallowed food and semi-digested protein (peptides and amino acids) activate gastric activity. Ingested food stimulates gastric activity in two ways: by stretching the stomach and by gastric contents stimulating receptors in the stomach. Stretch activates two reflexes: a short reflex mediated through the myenteric nerve plexus, and a long reflex mediated through the vagus nerves and brainstem.

Distention (Stretching) Path

1.) Vagovagal Reflex Distention activates an afferent pathway which in turn stimulates an efferent response from the dorsal nucleus of the vagus nerve. Stimulation of acid secretion occurs as it does in the cephalic phase.

2.) Local ENS Pathway Activated ENS releases ACh stimulating parietal cells to secrete acid.

From the stomach food and chime move through the porter into the other parts of the digestive system. Slow waves of smooth muscle contraction known as peristalsis flow down the length of the gastrointestinal tract to push chyme through the duodenum. Each wave begins at the stomach and pushes chyme a short distance toward the jejunum. It takes many peristaltic contractions over the course of an hour for chyme to travel through the entire length of the duodenum. Small regional contractions of the intestinal wall, known as segmentation, help to mix chyme with the digestive secretions in the duodenum and increase the rate of digestion. Segmentation also increases the contact of chyme with the mucosal cells to increase the absorption of nutrients through the intestinal wall.

The small intestine consists of the duodenum, the jejunum, and the ileum, which share the same wall structure formed by, from inside to outside,

- mucosa,
- submucosa,
- muscularis interna,
- muscularis externa,
- serosa.

The mucosa of the small intestine, comprising simple columnar epithelium and a lamina propria, forms wave-like projections, villi, which protrude into the lumen. The most important cell in the epithelium is the absorptive enterocyte with microvilli on its apical membrane.

The jejunum and ileum are histologically identical, except for their villi and the presence of Paneth cells. The villi of the jejunum are tall and cylindrical, while they are short and cylindrical in the ileum.

The duodenum continues the process of digestion of food that begins in the stomach. Its main function is to receive the chyme which is a combination of partially digested food and stomach acids. The chyme is released into the duodenum through pylorus (porter), which is a small valve located between the stomach and the duodenum. The duodenum accepts the chyme from the stomach and continues the digestion. This is done with the help of digestive enzymes and intestinal juices secreted by the crypts in the intestinal wall. Also, the duodenum receives bile drained from the liver and gallbladder and pancreatic juice secreted by the pancreas. These secretions aid in the digestion of food.

Apart from digesting foods, the duodenum regulates the rate of gastric emptying. Gastric emptying represents stomach emptying which is the process of food going from the stomach to the duodenum. The duodenum also triggers the hunger signals. Both of these functions are performed with the help of hormones that are produced and released by the duodenal epithelium. The epithelium includes cells that secrete two hormones known as secretin and cholecystokinin. When excess acid is present in the small intestine or duodenum, the hormone secretin is released. On the other hand, cholecystokinin is released in the presence of fatty acids and amino acids. Both secretin and cholecystokinin encourage secretion of bile and pancreatic juice.

The duodenum absorbs the nutrients and it does it even more than the stomach. Because of that, in obese people, the duodenum is frequently bypassed in gastric bypass surgery to decrease the absorption of nutrients.

About *20,000 protein-coding genes are expressed in human cells and 70 % of these genes are expressed in the normal duodenum*. Some 300 of these genes are more specifically expressed in the duodenum with very few genes expressed only in the duodenum. The corresponding specific proteins are expressed in the duodenal mucosa and many of these are also expressed in the small intestine, such as ANPEP, a digestive enzyme, ACE an enzyme involved in the control of blood pressure, and RBP2 a protein involved in the uptake of vitamin A. From here the foods moves into the Jejunum.

The lining of the jejunum is specialized for the absorption, by enterocytes, of small nutrient particles which have been previously digested by enzymes in the duodenum. Once absorbed, nutrients (with the exception of fat, which goes to the lymph) pass from the enterocytes into the enterohepatic circulation and enter the liver via the hepatic portal vein, where the blood is processed. The jejunum is involved in magnesium absorption. The pH in the jejunum is usually between 7 and 9 (neutral or slightly alkaline). The jejunum has less fat inside its mesentery than the ileum. The jejunum is typical of larger diameter than the ileum.

The ileum is the third and final part of the small intestine. It follows the jejunum and ends at the ileocecal junction, where the terminal ileum communicates with the cecum of the large intestine through the ileocecal valve. The ileum has more fat inside the mesentery than the jejunum. The diameter of its lumen is smaller and has thinner walls than the jejunum.
Its circular folds are smaller and absent in the terminal part of the ileum. While the length of the intestinal tract contains lymphoid tissue, only the ileum has abundant *Peyer's patches, unencapsulated lymphoid nodules that contain large numbers of lymphocytes and other cells of the immune system*.

The function of the ileum is mainly to absorb vitamin B12 and bile salts and whatever products of digestion were not absorbed by the jejunum. The wall itself is made up of folds, each of which has many tiny finger-like projections known as villi on its surface. In turn, the epithelial cells that line these villi possess even larger numbers of microvilli. Therefore, the ileum has an extremely large surface area both for the adsorption (attachment) of enzyme molecules and for the absorption of products of digestion. The DNES (diffuse neuroendocrine system) cells of the ileum secrete various hormones (gastrin, secretin, cholecystokinin) into the blood. Cells in the lining of the ileum secrete the protease and carbohydrase enzymes responsible for the final stages of protein and carbohydrate digestion into the lumen of the intestine. These enzymes are present in the cytoplasm of the epithelial cells.

The villi contain large numbers of capillaries that take the amino acids and glucose produced by digestion to the hepatic portal vein and the liver. Lacteals are small lymph vessels and are present in villi. They absorb fatty acid and glycerol, the products of fat digestion. Layers of circular and longitudinal smooth muscle enable the chyme (partly digested food and water) to be pushed along the ileum by waves of muscle contractions called peristalsis. The remaining chyme is passed to the colon.

In general, it is possible to say that the first problems with our health start with food digestion. Babies have problems with an empty stomach but also when food is not digested the right way. Our digestion can be considered one of the important parts of the aging process. It is extensively used and suffers from many attacks. The production of saliva, enzymes and other products varies during a lifetime. But surely and steadily there is decline. This decline cannot be stopped but delayed.

To see what can go wrong here are a few simple samples. The umbrella term for stomach disease is gastropathy. Some common stomach disorders include:

- Dyspepsia: This is a condition characterized by a feeling of fullness; indigestion; and pain in the upper abdomen or lower chest. Other symptoms include nausea and vomiting. Dyspepsia can be a precursor to GERD and may also indicate angina.
- GERD: Gastroesophageal reflux disease is a condition in which the stomach acids rise up the esophageal passage. Heartburn is a common symptom of the condition.
- Peptic Ulcers – These can occur when the protective mucous lining of the stomach walls is damaged by the stomach acids. The bacterium, Helicobacter pylori is thought to be an important factor in the development of gastric and duodenal ulcers.

THE pH REGULATORY SYSTEM OF THE BODY

The pH balance of the human bloodstream is recognized by all medical physiology texts as one of the most important biochemical balances in all of human body chemistry.

pH is the acronym for "Potential Hydrogen". In definition, it is the degree of concentration of hydrogen ions in a substance or solution. It is measured on a logarithmic scale, basically from 0 to 14. Higher numbers mean a substance is more alkaline in nature and there is a greater potential for absorbing more hydrogen ions. Lower numbers indicate more acidity with less potential for absorbing hydrogen ions.

Our body pH at various levels of our body's fluid organization is very important because pH controls the speed of our body's biochemical reactions. It does this by controlling the speed of enzyme activity as well as the speed that electricity moves through our body.

The higher (more alkaline) the pH of a substance or solution, the more electrical resistance that substance or solution holds. Therefore, electricity sees more resistance to travel with higher pH.

All biochemical reactions and electrical (life) energy are under pH control.
If something has an acid pH, it is considered a sense of hot and fast. As an example, the battery of a car. It's an acid battery.

Alkaline pH on the other hand, biochemically speaking, might be likened to slow and cool. Compare it to an alkaline battery in a flashlight.

There is no direct relation between pH and conductivity.
1. pH measures the concentration H+ ion only
2. Conductivity measures the concentrations of all active ions present in the solution
Therefore, pH by itself does not specify the conductivity of the solution, because it does not tell anything about the presence of other ions that affect the solution conductivity.

pH = - log [H+] and conductivity measures the solution aptitude to conduct the electric current. H+ is a "small part" of the conductivity. Acidic pH and alkaline pH have their effects on the solution behavior towards dissolved organics, microorganisms and colloids.

On the other hand, there is another way to look at this relation between the pH and the electrical current flow [the conductivity] of a solution, but there are other factors that affect the conductivity. When an electrical current passes through a wire, what actually moves and carries the current is ELECTRONS. But in solutions, the current is carried by IONS: positively charged CATIONS [+]such as H+, Na+, Mg+, etc. and negative ANIONS [-]such as OH-, Cl-, Acetate-, etc. The conductivity of a solution depends on the concentration of ALL the ions present, the greater their concentrations, the greater the conductivity. These ions all have the electrical unit charges shown by their symbols, but they move at different velocities [mobilities] through the solution, they contribute differently to the conductivity.

Of the common ions, the most mobile CATION is the Hydrogen ion [H+] with a value of 350 units, and the most mobile ANION is the Hydroxyl ion [OH-], 199 units. The other common ions have values ranging between 40 and 80 units.

Strongly acidic [or strongly basic] solution have high conductivity. Since the pH is a measure of the concentration of the Hydrogen [and the Hydroxyl] ions, for an acidic solution, the lower the pH [i.e. the higher the H+ concentration,] the greater the conductivity. Conductivity is the sum of the contribution of ALL ions present in the solution.

Stomach pH Problems

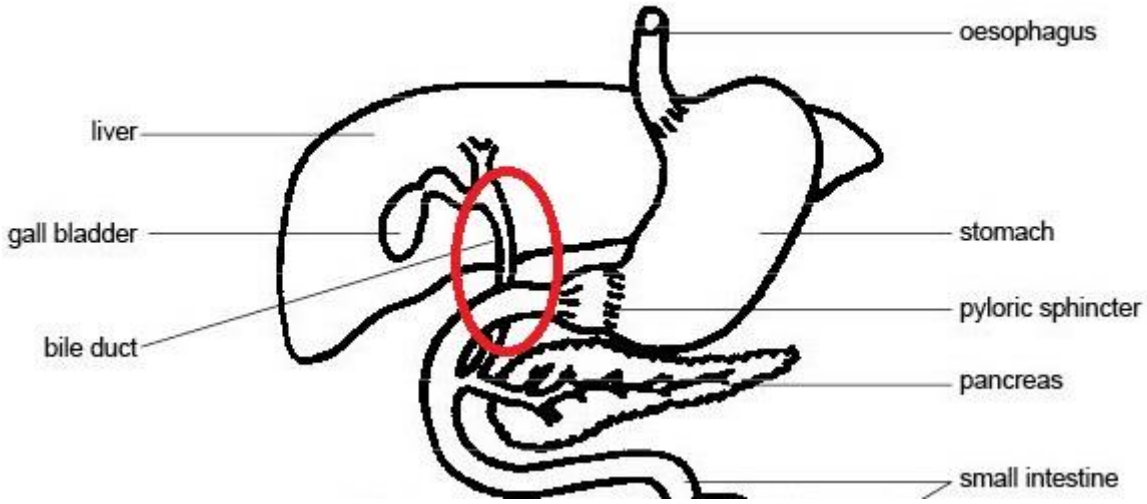
The stomach juices are acidic (low pH) due to the presence of gastric acid. There are various ways in which the stomach pH can be disrupted, mainly due to the loss of acid-producing cells, disturbances in the secretory function of the acid-producing cells or the use of medication that hampers acid production. As mentioned, this acidity is necessary for the activation of pepsin. Therefore pepsin levels are low since pepsinogen is not activated.

In chronic H.pylori infection, the chemicals responsible for promoting inflammation can impair the secretory function of the acid-producing cells, although it may not be damaged or destroyed. Acid-suppressing drugs like proton pump inhibitors (PPIs), which are commonly used to treat conditions like gastritis and peptic ulcers, can also affect stomach pH due to the lower than normal levels of stomach acid.

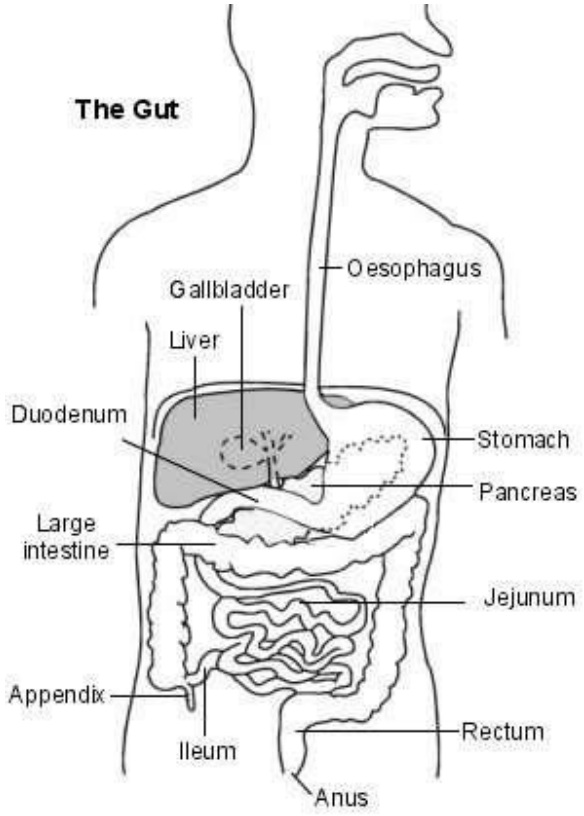
While aging, chewing can become more difficult, and less efficient.
Chewing is important because it breaks down food and adds enzymes and liquid so that stomach acid and intestinal enzymes can better break it down. When swallowing larger pieces of food without chewing properly, it takes about 50 to 100 percent longer for it reaches to the stomach because of the esophagus, contract less forcefully while aging. A serious problem can be hypertrophic gastritis (reduced production of stomach acid) or atrophic gastritis (the absence of stomach acid).

Too little stomach acid results in decreased vitamin B12 absorption. A deficiency of vitamin B12 in the bloodstream and tissues may lead to pernicious anemia and irreversible nervous-system impairment and may contribute to high levels of homocysteine in the blood. High homocysteine is one of the risk factors for heart disease.

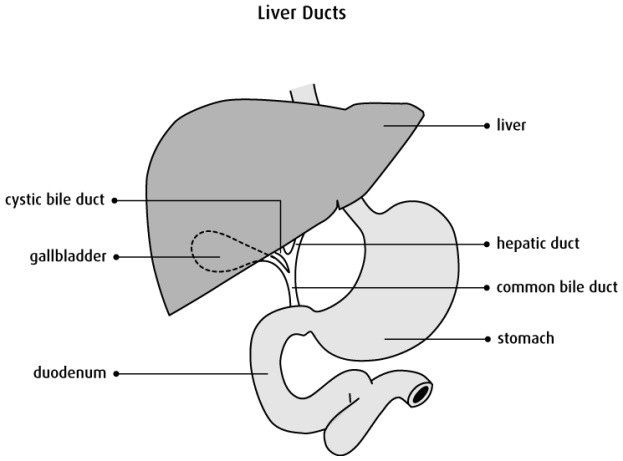
People over age 60 have a greater risk of developing gallstones, the narrowing of the bile duct at the opening of the intestine is a risk factor. A high (animal) fat diet brings a greater risk. Upon digestion of fat bile is needed, a substance made by the liver and stored in the gallbladder. Gallstones form when liquid stored in the gallbladder hardens into the rock-hard material. The stones form when the amount of cholesterol or bilirubin in the bile is high.



With aging the gut -- particularly the colon -- becomes sluggish and less toned. One in three people age 60 or older have diverticula *(Diverticulosis is the condition of having multiple pouches and colon (diverticula) in the colon that are not inflamed. These are out pockets of the colonic mucosa and submucosa through weaknesses of muscle layers in the colon wall.*) which are outpouchings in the lining of the large intestine. These pouches are the result of increased pressure within the intestine caused by decreased muscle tone. In addition, when the gut gets sluggish, the individual becomes more vulnerable to constipation. Lifestyle is one of the major causes of this problem.



The liver is the largest internal organ, weighing in at about 1.44–1.66 kg. But it gets smaller with time, beginning around age 50. The liver's shrinkage begins at the same time that body weight and muscle mass start their decline. However, in the very old, the liver becomes disproportionately small. Having less liver tissue and decreased blood flow to this organ means that the body may handle certain medications differently.



THE COLON

The large intestine or colon is shorter than the small intestine but has a larger diameter. The length of the colon is approximately 1,4 – 1,8 meter. Its largest diameter is at the cecum (7.5 cm) and narrowest in the sigmoid (2.5 cm). The colon has the function of absorption of water and electrolytes and storing waste until it can be expelled. It is responsible for maintaining water balance and absorption of vitamins. The mixture of remaining food and intestinal juices is called chyme. It is devoid of almost all nutrients and water; it consists of primarily the undigested food with some amount of water and electrolytes.

The lining of the colon is different from the small intestine in that there exists a large number of mucous cells that do not secrete enzymes but mucus. The mucus helps to protect the wall from the bacterial *fermentation* inside. About 1.5 L of liquid digestive contents, chyme, pass into the colon. The colon is responsible for absorbing and recycling the great majority of this liquid.

Absorbing water

Completing the process of digestion that largely takes place in the small intestine. It takes nearly 24 to 30 hours to complete the digestive process. Further digestion or breaking down of nutrients does not take place there but it helps by absorbing water and making the stools solid.

Absorption of vitamins

The large intestine helps in absorption of vitamins made by bacteria that normally live in the large intestine. There are over 700 – 1000 species of bacteria that perform a variety of functions. These commensal bacteria break down the undigested polysaccharides or fibers in diet into short-chain fatty acids. These can be absorbed by the large intestine by passive diffusion. The bacteria also produce gas (flatus), which is a mixture of nitrogen and carbon dioxide, with small amounts of the gases hydrogen, methane, and hydrogen sulfide. These result from the bacterial fermentation of undigested polysaccharides.

These bacteria also produce vitamins. The most important of these is Vitamin K and Biotin (a B vitamin). When the vitamin intake in the diet is low, this can be a source of these vitamins. A person who depends on absorption of vitamins formed by bacteria in the large intestine may become vitamin deficient if treated with drugs like antibiotics that kill the commensal bacteria. While chyme moves through the large intestine, bacteria digest substances in the chyme that is not digestible by the human digestive system. Bacterial fermentation converts the chyme into feces and releases vitamins including vitamins K, B1, B2, B6, B12, and biotin. Vitamin K is almost exclusively produced by the gut bacteria and is essential in the proper clotting of blood.

Intestinal gas

The movement of gas through the intestines produces the gurgling sounds known as borborygmi. In the resting state, there are usually about 200 ml of gas in the gastrointestinal tract. Its composition varies: between 20 and 90 percent nitrogen, up to 10 percent oxygen, up to 50 percent hydrogen, up to 10 percent methane, and between 10 and 30 percent carbon dioxide. Most of the air that people swallow, while talking and eating in particular, is either regurgitated (as in belching) or absorbed in the stomach.

High levels of carbon dioxide in rectal flatus reflect bacterial activity in the colon. Methane cannot be produced by any cell and is entirely the result of bacteria's acting on fermentable dietary residues in the colon, although there appears to be a familial factor involved in this, as not everyone can generate methane.

In the colon, bacterial production of hydrogen is markedly elevated when the diet contains an excess of vegetable saccharides. This is particularly noticeable after consuming beans, for example. Gas is more often responsible for the buoyancy of stools than is excessive residual fat in malabsorption states. The gradient between the partial pressures (or the pressure exerted by each gas in a mixture of gases) of particular gases in the intestinal lumen and the partial pressures of gases in the circulating blood determines the direction of movement of gases.

Thus, because oxygen tends to be under a low pressure in the colon, it diffuses out from the blood into the intestine. The diffusion of nitrogen from the blood into the intestine occurs because a gradient is established by the carbon dioxide, methane, and hydrogen that result from metabolic activities of the commensal bacteria; the partial pressure contributed by nitrogen in the colon is lowered, stimulating nitrogen to enter the intestine from the blood.

In areas where lactase, the enzyme that breaks down lactose (milk sugar), is missing from the group of disaccharidases of the small intestine, lactose passes into the colon undigested. In a lactase-deficient person, the unhydrolyzed lactose enters the colon, where the amount of lactose normally present in a glass of milk is capable of liberating, after bacterial fermentation, the equivalent of two to four cups (500–1,000 ml) of gas (hydrogen). About 15 percent of the gas diffuses back into the blood, with the rest passing as flatus.

Hydrogen generated in the colon is partly absorbed, passes in the circulating blood to the lungs, and diffuses into the respiratory passages, where its presence can be easily determined. The time taken for hydrogen to appear in the breath after ingestion of a standard load of glucose or lactose is used to determine whether the upper area of the gastrointestinal tract is colonized by bacteria. Hydrogen that appears within 30 minutes of the ingestion of the sugar load suggests heavy colonization of the small intestine.

The rectum enlarges as people age, and increased storage of stool in the rectum means that older people often need to have larger volumes of stool in their rectum in order to feel the urge to defecate. The increased rectal volume also allows hard stool to become impacted.

Other common factors in older people that lead to constipation include increased use of constipating drugs, a low-fiber diet, coexisting medical conditions (such as diabetes), and reduced physical activity.

BASIC ANATOMY OF THE COLON

The colon is divided into four sections - the ascending colon, the transverse colon, the descending colon, and the sigmoid colon. The colon lies in the abdominal cavity and behind it. The left side of the colon is involved in absorption while the right side is involved with storing feces.

- Ascending colon – It is around 25 cm in length and lies on the right side of the abdomen.
- Transverse colon – This is attached to the colon by the greater omentum and is covered in the peritoneum.
- Descending colon – This part of the colon extends from the splenic flexure to the point where the sigmoid colon begins.
- Sigmoid Colon – This part of the colon is S-shaped, it is located after the descending colon and before the rectum.

The rectum is 10 cm in length in the adult. It starts at the peritoneal reflexion and follows the curve of the sacrum ending at the anal canal. The anal canal is 5 cm in length in the adult, has discrete upper and lower demarcations.

Over the surface of the large intestine are longitudinal muscle fibers called taeniae coli, each about 5 mm wide. There are three bands and they start at the base of the appendix and extend from the cecum to the rectum. There are sacculations called haustra that are characteristic features of the large intestine, and distinguish it from the rest of the intestines. There is a large amount of lymphoid tissue that helps in maintaining an immune barrier. Macrophages or immune cells lie at the subepithelial layer.

Producing antibodies

The large intestine, particularly the appendix, is a confluence of several lymphoid tissues. These play an important role in immunity. The lymphoid tissues of the large intestine also help in the production of antibodies and cross-reactive antibodies. These antibodies are produced by the immune system against the normal commensal bacteria but may also be active against related harmful bacteria and thus prevent infections.

BACTERIA IN THE COLON

The bacteria in the colon are capable of digesting small amounts of cellulose. Substances formed as a result of bacteria activity include vitamin K, vitamin B12, thiamin, and riboflavin.

During its passage through the large intestine, digested material by-products are converted to feces upon fermentation and reaction with the gut flora. This waste material is received by the ascending colon which reabsorbs excess water and eventually pushes the semi-solid matter to the descending colon. Here, the gut flora breaks down fiber for sustaining itself and releases acetate, propionate, and butyrate. These are absorbed by the cell lining for nourishment. From the colon, the stool passes to the rectum to be discharged from the body.

Diseases and conditions that affect the colon and the digestive system and which are often age related (this is a short list):olon Cancer:
Appendicitis
Gallstones
Inflammatory Bowel Disease
Lactose Intolerance
Tapeworms
Acid Reflux (GERD)
Diarrhea
Hemorrhoids
Irritable Bowel Syndrome
Stomach Ulcers
Ulcerative Colitis

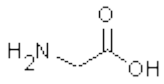
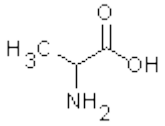
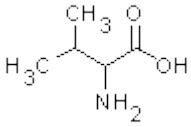
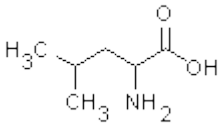
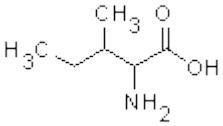
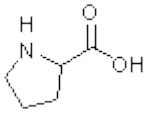
Colon cleanses

Many people use colon cleanses as a means to keep the colon healthy. This process includes taking laxatives, teas, powders or supplements, using enemas, or getting colonic irrigation (colon hydrotherapy) to flush out the colon. There can be side effects of cleansing, and some practices can even be dangerous. Doctors have varied opinions on cleansing. The colon's very function is to remove toxins.

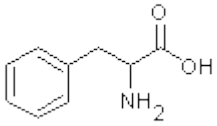
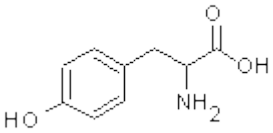
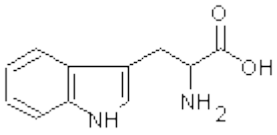
Proteins and amino acids.

Aminoacids are the building blocks of proteins. There are 20(+) amino acids.

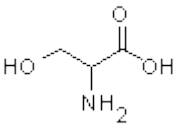
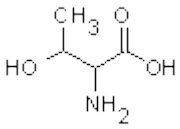
non-polar, aliphatic residues

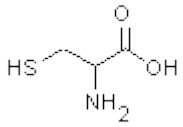
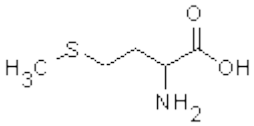
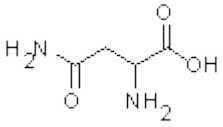
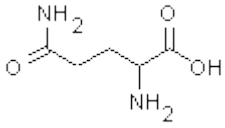
Glycine	**Gly**	**G-2**		**GGU GGC GGA GGG**
Alanine	**Ala**	**A-3**		**GCU GCC GCA GCG**
Valine	**Val**	**V-1**		**GUU GUC GUA GUG**
Leucine	**Leu**	**L-1**		**UUA UUG CUU CUC CUA CUG**
Isoleucine	**Ile**	**I-1**		**AUU AUC AUA**
Proline	**Pro**	**P-2**		**CCU CCC CCA CCG**

aromatic residues

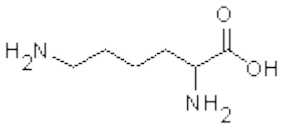
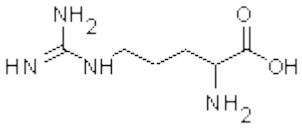
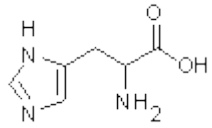
Phenylalanine	**Phe**	**F-1**		**UUU UUC**
Tyrosine	**Tyr**	**Y-2**		**UAU UAC**
Tryptophan	**Trp**	**W-1**		**UGG**

polar, non-charged residues

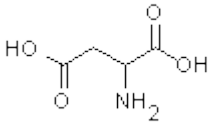
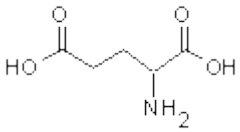
Serine	**Ser**	**S-3**		**UCU UCC UCA UCG AGU AGC**
Threonine	**Thr**	**T-1**		**ACU ACC ACA ACG**

Cysteine	**Cys**	**C-2**		**UGU UGC**
Methionine	**Met**	**M-1**		**AUG**
Asparagine	**Asn**	**N-3**		**AAU AAC**
Glutamine	**Gln**	**Q-2**		**CAA CAG**

positively charged residues

Lysine	**Lys**	**K-1**		**AAA AAG**
Arginine	**Arg**	**R-2**		**CGU CGC CGA CGG AGA AGG**
Histidine	**His**	**H-1**		**CAU CAC**

negatively charged residues

Aspartate	**Asp**	**D-3**		**GAU GAC**
Glutamate	**Glu**	**E-3**		**GAA GAG**

1 = essential amino acid
2 = conditional essential amino acid
3 = non-essential amino acid

Like the Periodic table of elements, there is decided to give the foundation of biology a specific list of basic components. These building blocks have a common feature that sets them apart from other biological chemicals. Most important are the amino and carboxyl groups, amino acids have a side chain or R group attached to the α-carbon. A way to separate them is to look at their level and way of activity. Building Blocks Of Proteins
The most simple amino acid is called glycine (glyco, “sugar”). In the mid-1950s scientists agreed that 20 amino acids (called standard or common amino acids) were the essential building blocks of proteins.

Over 140 amino acids are known to occur naturally in proteins and thousands more occur in nature or are synthesized in the laboratory. Many non-proteinogenic amino acids are active as;

- intermediates in biosynthesis,
- post-translationally formed in proteins,
- possess a physiological role (e.g. components of bacterial cell walls, neurotransmitters, and toxins),
- natural or man-made pharmacological compounds,
- present in meteorites and in prebiotic experiments (e.g. Miller–Urey experiment).

Technically, any organic compound with an amine (-NH2) and a carboxylic acid (-COOH) functional group is an amino acid. The proteinogenic amino acids (Proteinogenic amino acids are amino acids that are incorporated biosynthetically into proteins during translation. The word "proteinogenic" means "protein creating".) are small subset of this group that possess central carbon atom (α- or 2-) bearing an amino group, a carboxyl group, a side chain and an α-hydrogen Levo conformation, with the exception of glycine, which is achiral, and proline, whose amine group is a secondary amine.

Electrons are….

Electrons are confined to specific orbits, a bit like the planets of our solar system is. They can't exist anywhere between orbits and have to make a "quantum leap" from one orbit to another. As quantum particles, electrons exist as a collection of probabilities rather than at specific locations. The best way to understand is to show the electrons as a set of fuzzy shells, shields, around the nucleus. Electrons are the foundation of “electric flow” or current.

There are two types of electron flow, Direct Current, or DC, and Alternating Current, or AC. Direct Current is the kind of electrical flow like in batteries and solar cells when electrons travel in one direction. On the other hand, AC is the electrical flow from a typical electrical outlet in a home. AC is when the electrons flow in two directions, from the positive to the negative terminal and from the negative to the positive terminal, 'alternating' between the two directions.

In 1924, the French physicist Louis de Broglie suggested that, like light, electrons act as both particles and waves. De Broglie's hypothesis was confirmed in experiments that showed electron beams could be diffracted or bent as they passed through a slit much like light could. The waves produced by an electron confined in its orbit about the nucleus sets up a standing wave of a specific wavelength, energy, and frequency (i.e., Bohr's energy levels).

The next problem occurred was to locate an electron. This problem was solved by the German physicist, Werner Heisenberg, and it was called the uncertainty principle: To view an electron in its orbit, a wavelength of light had to be shined on it that is smaller than the electron's wavelength.
This small wavelength of light has a high energy. The electron will absorb that energy. The absorbed energy changes the electron's position. It is not possible to know both the momentum and position of an electron in an atom. Therefore, Heisenberg suggested that it is not possible to view electrons as moving in well-defined orbits about the nucleus!

With de Broglie's hypothesis and Heisenberg's uncertainty principle in mind, the Austrian physicist named Erwin Schrodinger came up with a set of equations or wave functions in 1926 for electrons. According to Schrodinger, electrons confined in their orbits would set up standing waves and that could be described only the probability of where an electron could be. The distributions of these probabilities formed regions of space about the nucleus were called orbitals. Orbitals could be described as electron density clouds. The densest area of the cloud is where the greatest probability of finding the electron is and the least dense area is where the lowest probability of finding the electron.

Nonpolar Side Chains

There are six / eight (there is a dispute about this number) amino acids with nonpolar side chains. Glycine, alanine, and proline have small, nonpolar side chains and are all weakly hydrophobic. *Phenylalanine**, valine, leucine, isoleucine, and *methionine** have larger side chains and are more hydrophobic. * there is a discussion about their place in this part.

This needs clarification: hydrophobic describes the fact that nonpolar substances don't combine with water molecules. Water is a polar molecule, which implies that it carries a partial charge between its atoms. Oxygen, as an electronegative atom, draws the electrons of each bond closer to its core, thus creating a more negative charge. Therefore, any materials with a charge, negative or positive are able to interact with water molecules to dissolve.

Hydrophobic molecules are molecules that do not have a charge, they are non-polar. By lacking a charge, these molecules do not have charge-to-charge interactions that allow them to interact with water. Hydrophobic materials often do not dissolve in water or in any solution that contains a largely aqueous (watery) environment. This characteristic of being hydrophobic - or non-polar - is important for many of the molecules found in nature, in other organisms, and even within our own bodies.

Aromatic amino acids

Aromatic amino acids are relatively nonpolar. characterized by increased chemical stability resulting from the delocalization of electrons in a ring system (such as benzene) containing usually multiple conjugated double bonds. To different degrees, aromatic amino acids absorb ultraviolet light. Tyrosine and tryptophan absorb more than do phenylalanine; tryptophan is responsible for most of the absorbance of ultraviolet light (ca. 280 nm) by proteins. Tyrosine is the only one of the aromatic amino acids with an ionizable side chain.

Polar, Uncharged Side Chains

There are six amino acids with polar (A molecule in which the bond dipoles present do not cancel each other out and thus results in a molecular dipole), uncharged side chains. Serine and threonine have hydroxyl groups. Asparagine and glutamine have amide groups. Cysteine has a sulfhydryl group.

Charged Side Chains

There are three amino acids with charged side chains. The charge comes in two varieties: positive and negative: positive charge (+q) is a property of protons; negative charge (-q) is a property of electrons. The charge on the proton is identical in size to that on the electron but differs in sign. Arginine and lysine have side chains with amino groups. Their side chains are fully protonated at pH 7.4. Histidine has as a positively charged imidazole functional group.

Negatively charged residues

Aspartate under physiological conditions (pH 7.4) usually occurs as the negatively charged aspartate form, −COO−. Glutamic acid in highly alkaline solutions the doubly negative anion −OOC-CH(NH2)-(CH2)2-COO− prevails.

An amino acid consists of a basic amino group (−NH2), an acidic carboxyl group (−COOH), and an organic R group (or side chain) that is unique to each amino acid. The term amino acid comes from α-amino [alpha-amino] carboxylic acid. Each molecule contains a central carbon (C) atom, called the α-carbon, to which both an amino and a carboxyl group are attached. The remaining two bonds of the α-carbon atom are attached to a hydrogen (H) atom and the R group.

Chirality

Chirality is a geometric property of some molecules and ions. A chiral molecule/ion is non-superimposable, this means that the molecules cannot be placed on top of one another and give the same molecule. Chiral molecules with one or more stereocenters can be enantiomers / each of a pair of molecules that are mirror images of each other. All the amino acids are chiral molecules (except glycine). They show two optically active asymmetric forms (enantiomers) considered mirror images. One enantiomer is named shape D and the other L. Amino acids found in proteins almost always possess the L-configuration. This reflects the fact that the enzymes responsible for protein synthesis have evolved to utilize only the L-enantiomers.

Acid-Base Properties

Another important feature of amino acids is the existence of both a basic and an acidic group at the α-carbon. Compounds such as amino acids that can act as either an acid or a base are called amphoteric. The basic amino group typically has a pKa between 9 and 10, while the acidic α-carboxyl group has a pKa that is usually close to 2 (a very low value for carboxyls). The pKa of a group is the pH value at which the concentration of the protonated group equals that of the unprotonated group.

pKa Definition pKa is the negative base-10 logarithm of the acid dissociation constant (Ka) of a solution. pKa = -log10Ka A lower pKa value shows a stronger acid. Example, the pKa of acetic acid is 4.8, while the pKa of lactic acid is 3.8. Using the pKa values, lactic acid is a stronger acid than acetic acid. The reason pKa is used is because it describes acid dissociation using small decimal numbers.

Meaning, at physiological pH (about 7–7.4), the free amino acids exist largely as dipolar ions or "zwitterions" (German for "hybrid ions"; a zwitterion carries an equal number of positively and negatively charged groups). *Any free amino acid and likewise any protein will, at some specific pH, exist in the form of a zwitterion.*

All amino acids and all proteins, when subjected to changes in pH, pass through a state at which there is an equal number of positive and negative charges on the molecule. The pH at which this occurs is known as the isoelectric point (or isoelectric pH) and is denoted as (pI, pH(I), IEP).

When dissolved in water, all amino acids and all proteins are present predominantly in their isoelectric form. Stated another way, there is a pH (the isoelectric point) at which the molecule has a net zero charge (equal number of positive and negative charges), but there is no pH at which the molecule has an absolute zero charge (complete absence of positive and negative charges). Amino acids and proteins are always in the form of ions; they always carry charged groups. This fact is vitally important in considering further the biochemistry of amino acids and proteins.

Peptide bond

Amino acids can be linked by a condensation reaction in which a −OH is lost from the carboxyl group of one amino acid along with a hydrogen from the amino group of a second, forming a molecule of water and leaving the two amino acids linked via an amide—called, in this case, a peptide bond. When individual amino acids are combined to form proteins, their carboxyl and amino groups are no longer able to act as acids or bases, since they have reacted to form the peptide bond. The acid-base properties of proteins are dependent upon the overall ionization characteristics of the individual R groups of the component amino acids.
Amino acids joined by a series of peptide bonds constitute a peptide. Small polymers of amino acids (fewer than 50) are called oligopeptides, larger ones (more than 50) are referred to as polypeptides.

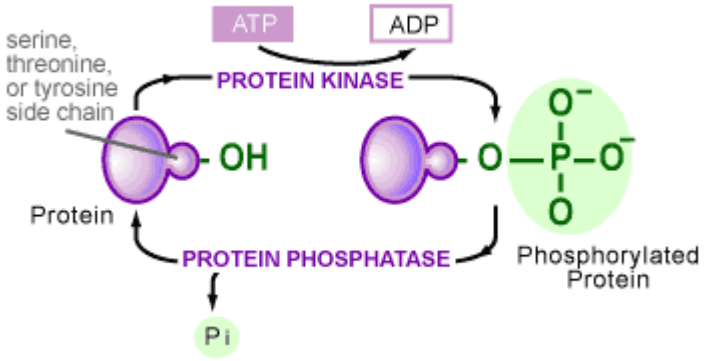
In summary, it is the sequence of amino acids that determines the shape and biological function of a protein as well as its physical and chemical properties. The functional diversity of proteins arises because proteins are polymers of 20 different kinds of amino acids. The hormone insulin, which has 51 amino acids. With 20 different amino acids to choose from at each of these 51 positions, a total of 2051, or about 1066, different proteins could theoretically be made.

Other Functions

Amino acids are precursors of a variety of complex nitrogen-containing molecules. Prominent among these are the nitrogenous base components of nucleotides and the nucleic acids (DNA and RNA). Furthermore, there are complex amino-acid derived cofactors such as heme and chlorophyll. Heme is the iron-containing organic group required for the biological activity of vitally important proteins such as the oxygen-carrying hemoglobin and the electron-transporting cytochrome c.

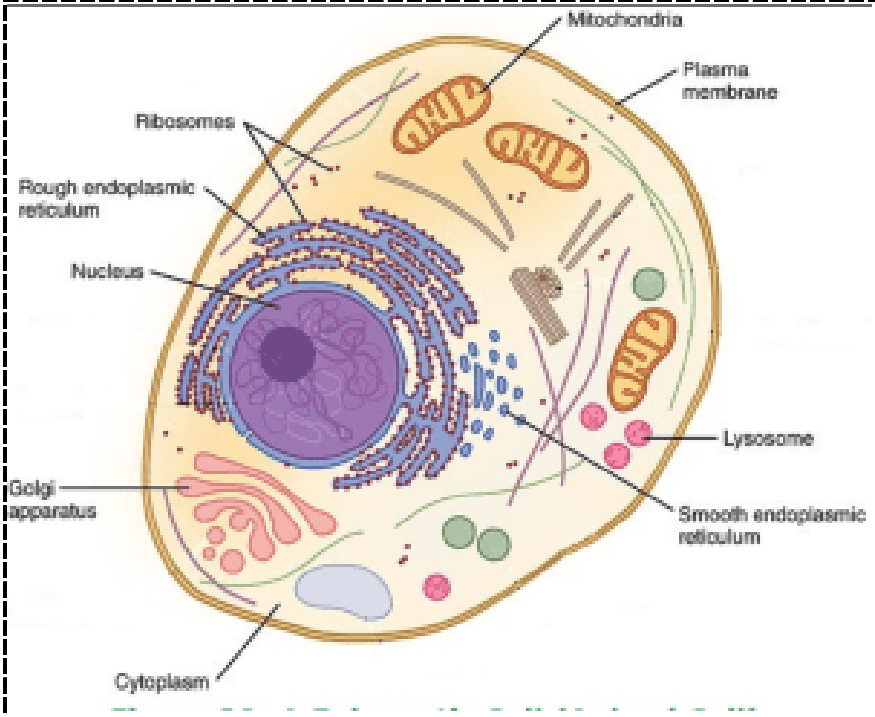
Several α-amino acids (or their derivatives) act as chemical messengers. For example, γ-aminobutyric acid (gamma-aminobutyric acid, or GABA; a derivative of glutamic acid), serotonin and melatonin (derivatives of tryptophan), and histamine (synthesized from histidine) are neurotransmitters. Thyroxine (a tyrosine derivative produced in the thyroid gland of animals) and indole acetic acid (a tryptophan derivative found in plants) are examples of hormones.

The most important posttranslational modification of amino acids in eukaryotic organisms (including humans) is the reversible addition of a phosphate molecule to the hydroxyl portion of the R groups of serine, threonine, and tyrosine. This event is known as phosphorylation and is used to regulate the activity of proteins in their minute-to-minute functioning in the cell. Serine is the most commonly phosphorylated residue in proteins, threonine is second, and tyrosine is third.



Amino acids are used therapeutically for nutritional and pharmaceutical purposes. For example, patients are often infused with amino acids to supply these nutrients before and after surgical procedures. Treatments with single amino acids are part of the medical approach to control certain disease states. Examples include L-dihydroxyphenylalanine (L-dopa) for Parkinson disease; glutamine and histidine to treat peptic ulcers; and arginine, citrulline, and ornithine to treat liver diseases.

Certain derivations of amino acids, especially of glutamate, are used as surfactants in mild soaps and shampoos. D-Phenylglycine and D-hydroxyphenylglycine are intermediates used for the chemical synthesis of β-lactam antibiotics (e.g., synthetic versions of penicillin). Aspartame is a sweetener prepared from the individual component amino acids aspartic acid and phenylalanine.



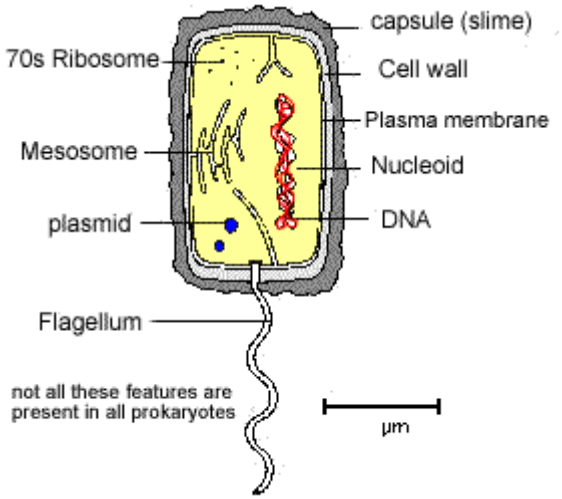
Eukaryotic cells contain membrane-bound organelles, such as the nucleus, while prokaryotic cells do not. Differences in the cellular structure of prokaryotes and eukaryotes include the presence of mitochondria and chloroplasts, the cell wall, and the structure of chromosomal DNA.

Prokaryotes were the only form of life on Earth for millions of years until more complicated eukaryotic cells came into being through the process of evolution. The difference between the structure of prokaryotes and eukaryotes is so great that it is considered to be the most important distinction among groups of organisms.

The most fundamental difference is that eukaryotes do have "true" nuclei containing their DNA, whereas the genetic material in prokaryotes is not membrane-bound. In eukaryotes, the mitochondria and chloroplasts perform various metabolic processes and are believed to have been derived from endosymbiotic bacteria. In prokaryotes similar processes occur across the cell membrane; endosymbionts are extremely rare.

The cell walls of ***prokaryotes*** are generally formed of a different molecule (peptidoglycan) to those of eukaryotes (many eukaryotes do not have a cell wall at all). Prokaryotes are usually much smaller than eukaryotic cells. Prokaryotes also differ from eukaryotes in that they contain only a single loop of stable chromosomal DNA stored in an area named the nucleoid, while eukaryote DNA is found on tightly bound and organized chromosomes.

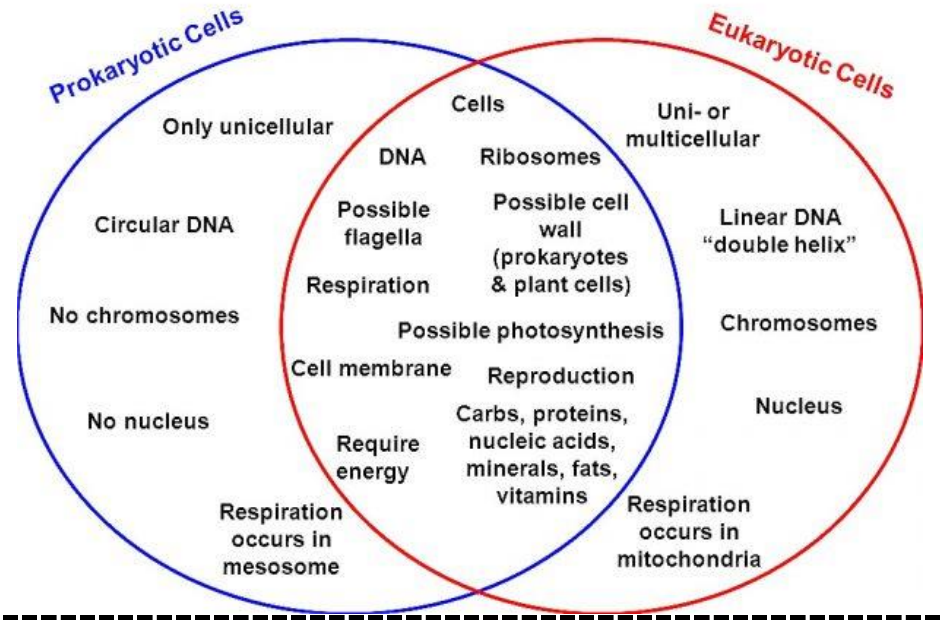
Although some eukaryotes have satellite DNA structures called plasmids, these are generally regarded as a prokaryote feature and many important genes in prokaryotes are stored on plasmids. Prokaryotes have a larger surface area to volume ratio giving them a higher metabolic rate, a higher growth rate and consequently a shorter generation time compared to Eukaryotes.



Prokaryotes also differ from eukaryotes in the structure, packing, density, and arrangement of their genes on the chromosome. Prokaryotes have incredibly compact genomes compared to eukaryotes, mostly because prokaryote genes lack introns and large non-coding regions between each gene. Whereas nearly 95% of the human genome does not code for proteins or RNA or includes a gene promoter, nearly all of the prokaryote genome codes control something.

Prokaryote genes are expressed in groups, known as operons, instead of individually, as in eukaryotes.
In a prokaryote cell, all genes in an operon are transcribed on the same piece of RNA and then made into separate proteins, whereas if these genes were native to eukaryotes, each would have their own promoter and be transcribed on their own strand of mRNA. This lesser degree of control over gene expression contributes to the simplicity of the prokaryotes as compared to the eukaryotes.

Venn diagram: comparison of prokaryotic and eukaryotic cells



Amino Acids And The Origin Of Life On Earth

The question of why organisms on Earth consist of L-amino acids instead of D-amino acids is still an unresolved riddle. Some scientists have long suggested that a substantial fraction of the organic compounds that were the precursors to amino acids—and perhaps some amino acids themselves—on early Earth may have been derived from comet and meteorite impacts. One such organic-rich meteorite impact occurred on September 28, 1969, over Murchison, Victoria, Australia. This meteorite is suspected to be of cometary origin because of its high water content of 12 percent. Dozens of different amino acids have been identified within the Murchison meteorite, some of which are found on Earth. Some compounds identified in the meteorite, however, have no apparent terrestrial source. Most intriguing are the reports that amino acids in the Murchison meteorite exhibit an excess of L-amino acids. An extraterrestrial source for an L-amino acid excess in the solar system could predate the origin of life on Earth and thus explain the presence of a similar excess of L-amino acids on the prelife Earth.

This vision supports the continuous life theory. Live did not start, it has been transferred.

DNA structure and amino acids

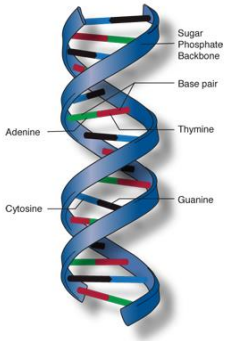
All aging theories are based on the chemistry of life. Most of these theories focus on details of the total. To understand the process, knowledge of details is needed to get a vision of the total.

The backbone of DNA is based on a repeated pattern of a sugar- and a phosphate group. The full name of DNA, deoxyribonucleic acid, shows the name of the sugar - deoxyribose. Deoxyribose is a modified form of ribose. Ribose is the sugar in the backbone of RNA, ribonucleic acid.

DNA is made of nucleotides. These are made of three parts: a phosphate group, a sugar group and one of four types of nitrogen bases. To form a strand of DNA, nucleotides are linked into chains, with the phosphate and sugar groups alternating.

The four types of nitrogen bases found in nucleotides are adenine (A), thymine (T), guanine (G) and cytosine (C). The order, or sequence, of these bases, determines what biological instructions are contained in a strand of DNA. For example, the sequence ATCGTT might instruct for blue eyes, while ATCGCT might instruct for brown.

The complete DNA instruction book, or genome, for a human, contains about 3 billion bases and about 20,000 genes on 23 pairs of chromosomes.



Proteins

It is not easy to make a list of proteins. To create a list there is a need to define the use of these proteins. In nature, the amount of different proteins is sheer endless. While focusing on human aging it is important to focus only on proteins which fulfill a role in this. The enclosed list does not pretend to be complete but can be used as a guideline for further work ;

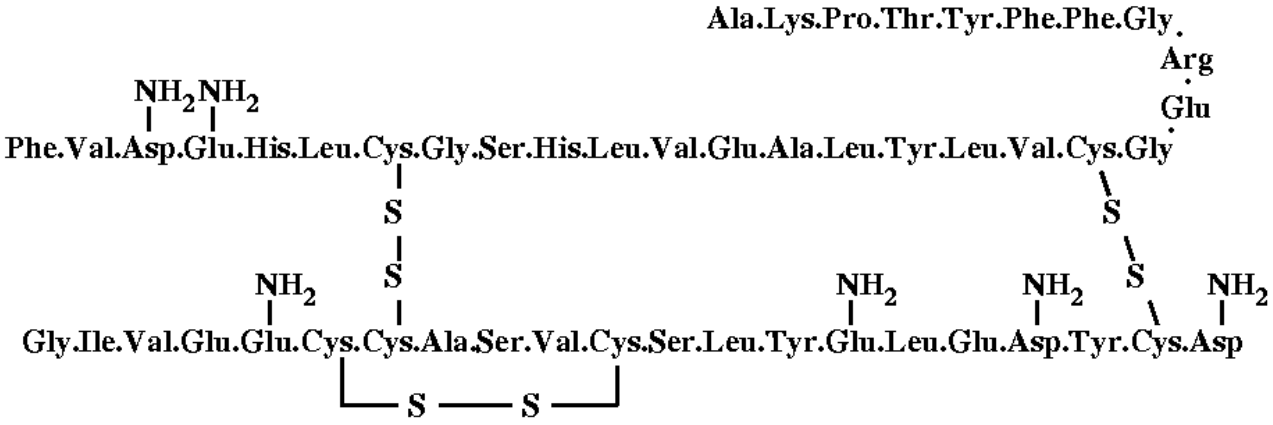
Globular proteins	Plasma proteins / Serum Amyloid P Component Serum albumin / Coagulation factors Complement proteins / C1-inhibitor C3-convertase / Factor VIII / Factor XIII Protein C / Protein S / Protein Z / Protein Z-related protease inhibitor Thrombin / Von Willebrand Factor Acute phase proteins C-reactive protein / Hemoproteins Hemoglobin (oxyhemoglobin and deoxyhemoglobin) Cadherin / Ependymin / Integrin NCAM / Selectin
Transmembrane transport proteins	CFTR / Glycophorin D Scramblase / Ion channels Ligand-gated ion channels Nicotinic acetylcholine receptor GABAa receptors / Voltage-gated ion channels Potassium channels / Calcium channels Sodium channels Synport / Antiport proteins / Glucose transporter
Hormones and growth factors	Colony-stimulating factors (CSFs) Epidermal growth factor (EGF) Fibroblast growth factor (FGF) Platelet-derived growth factor (PDGF) Transforming growth factors (TGFs) Vascular endothelial growth factor (VEGF) Peptide hormones / Insulin Insulin-like growth factor (IGF) / Oxytocin
Extracellular matrix proteins	Collagen / Elastin / F-spondin / Pikachurin Fibronectin

Protein structure

The best way to separate proteins is based on structure. It is possible to distinguish 4 different structures which are leading at all time.

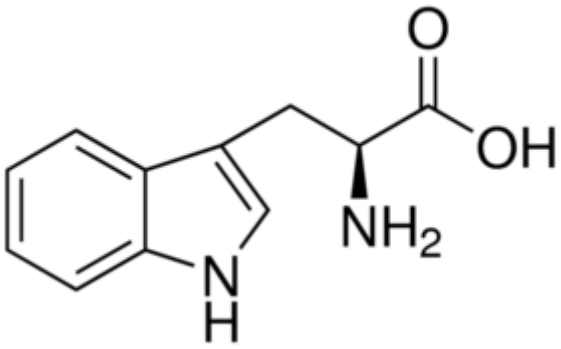
Primary structure

The first level of structure in amino acids is a polypeptide chain. The primary structure is held together by peptide bonds in which the two ends of the polypeptide chain are referred to as the carboxyl terminus (C-terminus) and the amino terminus (N-terminus) based on the nature of the free group on each extremity. When a peptide bond is formed, a water molecule is lost. For example, insulin is composed of 51 amino acids in 2 chains. One chain has 31 amino acids, and the other has 20 amino acids. Post-translational modification such as disulfide bond formation, phosphorylations, and glycosylations are usually also considered a part of the primary structure.



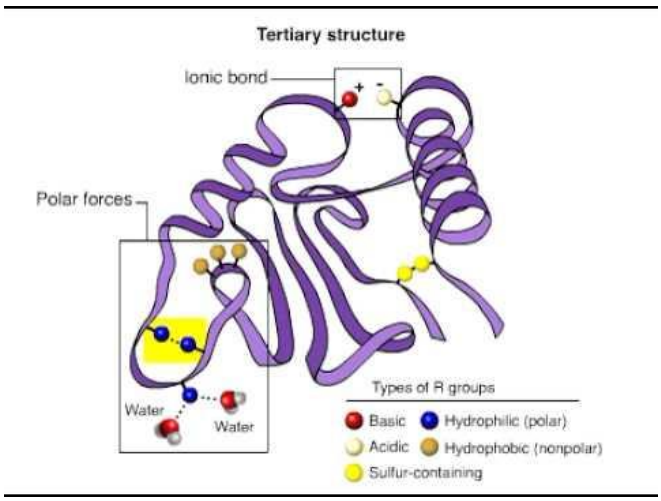
Secondary structure

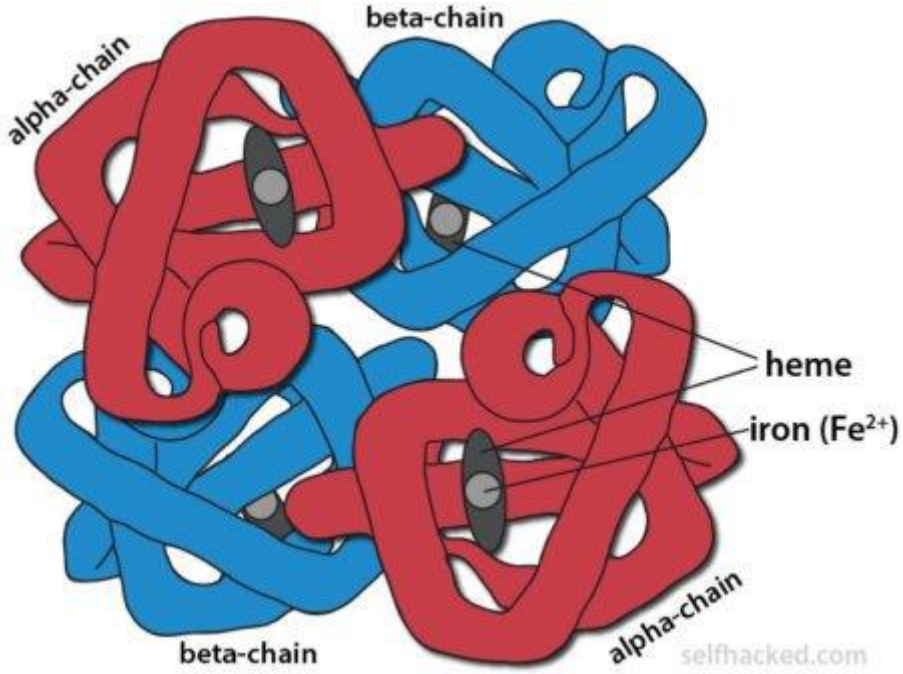
There are two main types of secondary structure, the α-helix, and the β-strand or β-sheets. These secondary structures are defined by patterns of hydrogen bonds between the main-chain peptide groups. They have a regular geometry due to interactions between atoms of the backbone constrained to specific values of the dihedral angles ψ and ϕ on the Ramachandran plot. Several sequential secondary structures may form a "supersecondary unit". Some parts of the protein may look in disorder. Many proteins contain both α helices and β pleated sheets. Proline is found in unstructured regions between secondary structures. The amino acids tryptophan, tyrosine, and phenylalanine have large ring structures in their R groups and found in β pleated sheets, probably the β pleated sheet structure provides enough of space for side chains.



Tertiary structure

Tertiary structure refers to the three-dimensional structure of monomeric and multimeric protein molecules. α-helixes and β-pleated-sheets are folded into a compact globular structure A tertiary structure is primarily due to interactions between the R groups of the amino acids. Folding is driven by the non-specific hydrophobic interactions. The structure is stable only when parts of a protein domain are locked into place by specific tertiary interactions, such as salt bridges, hydrogen bonds, and the tight packing of side chains and disulfide bonds. The disulfide bonds are extremely rare in cytosolic proteins since the cytosol (intracellular fluid) is generally a reducing environment.

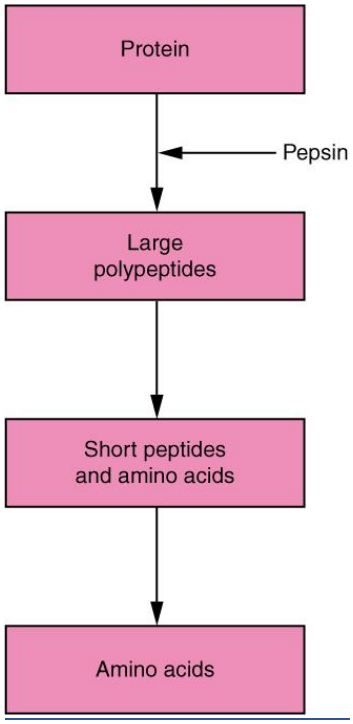




Hemoglobin

Quaternary structure

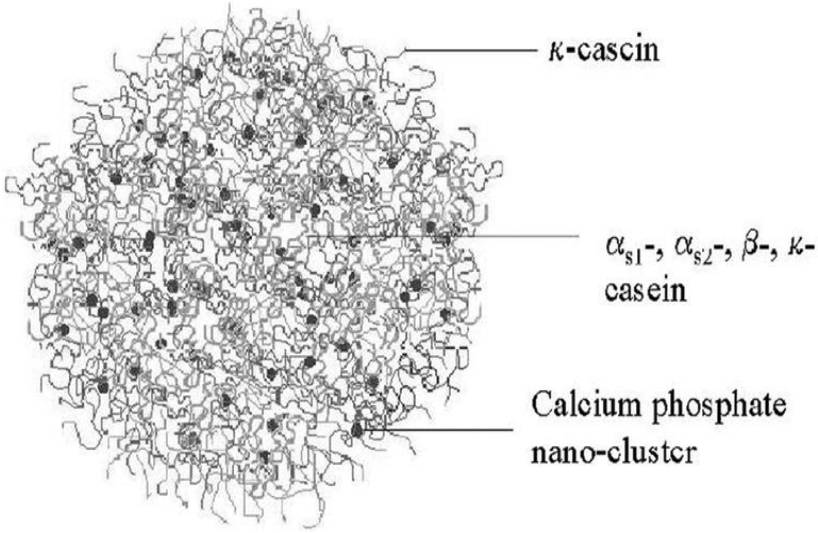
This is the three-dimensional structure consisting of the aggregation of two or more individual polypeptide chains (subunits) that operate as a single functional unit. Complexes of two or more polypeptides (i.e. multiple subunits) are called *multimers*. It would be called a dimer if it contains two subunits, a trimer if it contains three subunits, a tetramer if it contains four subunits, and a pentamer if it contains five subunits. The subunits are frequently related to one another by symmetry operations, such as a 2-fold axis in a dimer. Multimers made up of identical subunits are referred to with a prefix of "homo-" (e.g. a homotetramer) and those made up of different subunits are referred to with a prefix of "hetero-", for example, a heterotetramer, such as the two alpha and two beta chains of hemoglobin.



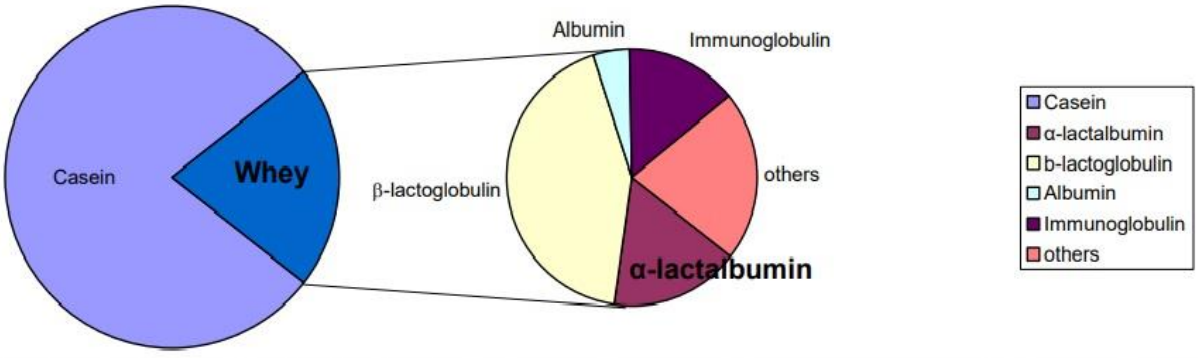
Now the main target names are clarified, content, structure and chemical formulas of the following products it is easier to understand the value and use of it in the digestive and metabolic system. The daily food contains all needed amino acids/proteins in specific quantities and should not need to have lack of anything. But during aging, it seems to create insufficient availability of needed nutrients. The first step is to identify some important forms of proteins in dairy foods. This gives inside information and understanding of digestion.

- **Milk (related) proteins**. When protein comes from a cow, and most other mammals, it is called casein. Beside getting milk from the cow we also do get it from goat, sheep, horse, camel and some other animals. These quaternary structure proteins are not easy to digest because of their shape. Caseins are combined with lactose which is a "milk" sugar and for about 60 – 80% of the world population difficult to digest. In a standard natural way, the enzyme lactase disappears from the digestive system after the age of 4 years. That is why, in the Western schools, and increasingly all over the world, milk is supplied to primary school children from the first day of entering. It takes around 4 hours to digest casein and less than 2 for neutralizing the lactose if enough lactase is available. The digestive time of around 4 hours. Hereby it is important to raise the following questions;
    - Since the introduction of milk as an important part of our diet, it seems to have a lot of benefits. But how many of these benefits are really proven scientifically?
    - Milk is introduced in many societies where it has never been a part of the diet before. Is this a danger to the digestive system? Research is needed.

Essential nutrient content per 100 g of selected dairy foods Dairy food (food code)



- **Whey-proteins.**



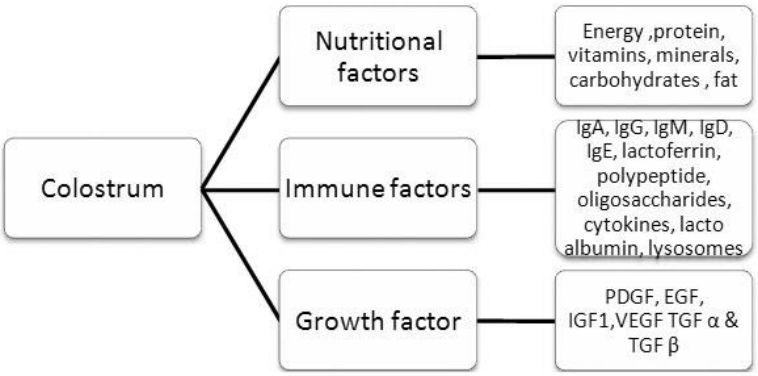
It is a visible more open structure with a lower molecular weight. Due to this, it is easier to digest. The molecular weight of whey is lower than casein. Whey is ingested faster into the bloodstream with the benefit of being available to the muscle and cells when needed. The importance of whey also can be found in the support of the immune system. Whey could be used during the aging process as additional recuperation food item to support faster recovery after injury, during disease, and with muscle weakness. The supply of whey should be administered over the day in small, easy to digest amounts for maximum effect. The best

way to administer whey as the supportive medication is as a liquid in the diluted form of around 12 – 14 gram per serving. The digestive time is around 30 minutes.

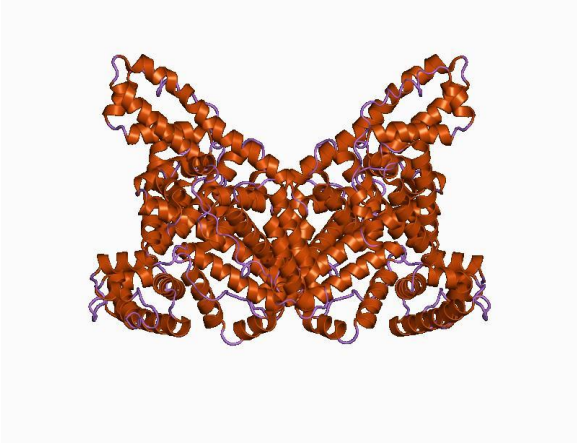
Colostrum

Colostrum is a form of milk produced by the mammary glands in late pregnancy and in the few days after giving birth. It has high concentrations of nutrients and antibodies. Colostrum is high in carbohydrates, high in protein, high in antibodies, and low in fat. Colostrum contains fat-soluble vitamins, minerals, and immunoglobulins. Immunoglobulins are basically antibodies that provide the passive immunity to the birthling, which is responsible for prevention of the viral and bacterial infection. Colostrum brings eight growth factor that promotes normal cell growth, DNA synthesis, fat utilization and increases mental activity.

Figure 1: Composition of Colostrum



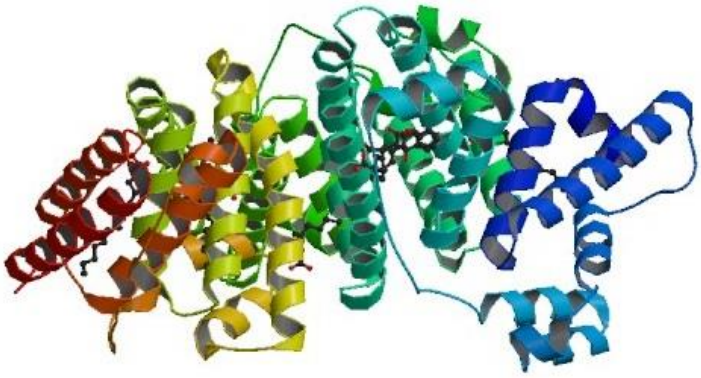
An assumption still to be proven is that colostrum would be an important immune booster for the elderly and supportive to their digestive track and general health.



Albumine / egg protein

- **<u>Egg-proteins.</u>**
  - There is a difference between bovine and egg albumin. The difference is based on the chemical structure. Both are animal-based proteins with a Quaternary structure which are close to the human forms and easy to recognize but not automatically easy to digest.
  - The molecular structure of egg protein is denser than whey but lighter than casein. The more open structure gives the digestive system more opening to break it down.
  - Digestion of egg protein takes around 4 x longer than with whey.

- **<u>Bovine proteins</u>** made from animal meat has a structure closely related to the mentioned egg-protein. It is a mammal animal protein. Animal proteins in a production system of purification and concentration and especially bovine are more sensitive for pollutions, virus or bacteria than other proteins. Controlled production is very important to avoid danger. Expertise is necessary.



Human Serum Bovine

- **<u>Soja and plant origin proteins</u>**.
  There are many discussions about the maximum availability of proteins to the human body when supplementing plant or animal origin proteins. Part of the scientist has strong evidence that plant origin proteins are better and more healthy for the human system. Other scientists have evenly strong evidence that animal proteins are better. The best way is to look at the digestive system before making a judgment. Many "scientist" use personal preferences to push one or the other options. It is possible both, plant and animal proteins, are useful but all depend on the individual digestive track which cannot be controlled nor tested from a distance but only by trial and error. This is one of the reasons why diets have a different effect on every individual and personal care is a must, not an option.

  There is 3 general type of digestive systems:
  1. Herbivore. The plant only consumer. This digestive tract can only consume limited animal protein before it reacts by the first removal and on the next level getting sick.
  2. Carnivore. The animal meat eater is only able to use herbs as part of the menu for digestive purpose but not as active nutrition part. The ability to use herbs as part of the menu is not available.
  3. An omnivore can eat "everything". This digestive tract is able to consume food of animal and plant origin. Its digestive tract is filled with multipurpose enzymes which enables it to live in omni-environmental situations. This is the human situation.

The human being is Omnivore and able to digest multiple source protein. It is unknown yet if a vegetarian diet is healthy enough for a person to have a long life. Currently, the research among centurions shows no sign of that. In an overall study of the current human being, it is clear that a meat-oriented diet is no longer considered healthy. New research points to a diet dividing of;

- 70/30 in meal/plant is extreme cold climates where the meat part is mainly fish oriented.
- 60/40 for intermediate climates where the winter time is 50+ % of the year
- 50/50 for sea climates where the summer is warm and winter cold
- And a 40/60 for warmer climates

These combinations are suggestions only and more research still has to take place. Fact is that in a current activity level of 80/20 (80% of the day less or not active / 20% of the day active) a plant diet shows to be more digestible and safe than a meat-oriented diet. At a lower activity level meat creates more digestive obstructions and problems than plants.

- **<u>Fish and other animal sources of proteins</u>**. Biochemical there are no shocking differences between the different animal proteins other than the source of the product. The size of the protein may differ but not the availability for the digestive/metabolic system.
  New sources of proteins in the future would be bugs which are protein rich and easy to grow.

REMARK; protein supplementation is overall easily available but must be critically approached. Supplies are often of questionable sources. Protein supplementation has a large filling property, meaning that digesting a "meal" of

protein-rich food stops most people from eating their normal food. This is not a positive development as the digestive tract is based on solid foods and will decay if the foods are liquid. The use of protein as a supplement is a matter of professional judgment and not one of simple trial and error if concerning a weak health person. The following information is important to check and supply to people in the care.

Proteins for human consumption must undergo a number of treatments before it is ready to use.

- Hydrolyzation takes care of the size of the protein and makes it solvable and digestible. Most supplements must undergo an enzymatic treatment for better digestion.
- There are proteins available for the industrial purpose. These proteins are relatively cheap and to be used in chemical processes. The proteins of this segment are not for a consumer market. These proteins are dangerous for individual use. But these proteins are widely commercially used on the internet and budget supplement market which sells inferior products for the low price.
- As mentioned before some proteins must be checked on health contaminations such as bacteria, virus or others. Especially bovine and egg are under constant suspicion.

Proteins are the building blocks of the body and the cornerstones of life. One of the major important protein-based structures in the body are the enzymes. Enclosed the list of category, name, and function as a reference. Enzymes go before hormones (this seems to be a highly disputed statement but all hormones only come to activity after they undergo a change by enzymes) and the observer should pay attention to the function and health benefits.

Enzymes are of vital importance to our health and also highly vulnerable to toxins and health (=environmental) changes.

Table of enzymes is found in chapter 3.

During aging, most of these enzymes decrease in strength and activity. One of the main goals is to support the activity and strength of these enzymes to ensure a maximum lifetime.

Protein-based Hormones

TISSUE (ORGAN)	HORMONE
Hypothalamus	Thyrotropin releasing hormone (TRH)
Hypothalamus	Growth hormone Releasing hormone (GHRH)
Anterior pituitary	Thyrotropin stimulating hormone
Anterior pituitary	Corticotropin (ACTH)
Anterior pituitary	Growth hormone (GH)
Posterior pituitary	Vasopressin
Pancreas	Insulin

Peptide hormones can't pass through the cell membrane because cell membranes consist of fatty compounds called phospholipids, and protein-based hormones are water-soluble, not fat-soluble. Peptide hormones bind to receptors on the outside of cells, this triggers a response inside the cell. Examples of short chain hormones are vasopressin and

oxytocin. These two hormones possess a chain of nine amino acids. The sequence of these amino acids differs allowing them to be completely different proteins.

Peptide and protein hormones are, of course, products of translation. They vary considerably in size and post-translational modifications, ranging from peptides as short as three amino acids to large, multi-subunit glycoproteins.

Many protein hormones are synthesized as prohormones, then proteolytically clipped to generate their mature form. In other cases, the hormone is originally embedded within the sequence of a larger precursor, then released by multiple proteolytic cleavages.

Peptide hormones are synthesized in the endoplasmic reticulum, transferred to the Golgi and packaged into secretory vesicles for export. They can be secreted by one of two pathways:

- Regulated secretion: The cell stores hormone in secretory granules and releases them in "bursts" when stimulated. This is the most commonly used pathway and allows cells to secrete a large amount of hormone over a short period of time.
- Constitutive secretion: The cell does not store hormone, but secretes it from secretory vesicles as it is synthesized.

Most peptide hormones circulate unbound to other proteins, but exceptions exist; for example, insulin-like growth factor-1 binds to one of several binding proteins. In general, the half-life of circulating peptide hormones is only a few minutes.

Peptide/protein hormones have different functions which all are equally important.

Hormonal

Hormones are protein-based chemicals secreted by the cells of the endocrine glands. Transported through the blood, hormones act as chemical messengers that transmit signals from one cell to another. Each hormone affects certain cells in the body, known as target cells. Such cells have receptors on which the hormone attaches itself to transmit the signals. An example of a hormonal protein is insulin, which is secreted by the pancreas to regulate the levels of blood sugar in the body.

Enzymatic

Enzymatic proteins accelerate metabolic processes in cells, including liver functions, stomach digestion, blood clotting and converting glycogen to glucose.

Structural

Also known as fibrous proteins, structural proteins are necessary components of the body. They include collagen, keratin, and elastin. Collagen forms the connective framework of the muscles, bones, tendons, skin, and cartilage. Keratin is the main structural component in hair, nails, teeth, and skin.

Defensive

Antibodies, or immunoglobulin, are a core part of the immune system, keeping diseases under control. Antibodies are formed in the white blood cells and attack bacteria, viruses and other harmful microorganisms, rendering them inactive.

Storage

Storage proteins mainly store mineral ions such as potassium in the body. Iron, for example, is an ion required for the formation of hemoglobin, the main structural component of red blood cells. Ferritin -- a storage protein -- regulates and guards against the adverse effects of excess iron in the body. Ovalbumin and casein are storage proteins found in breast milk and egg whites, that play a huge role in embryonic development.

Transport

Transport proteins carry vital materials to the cells. Hemoglobin, for example, carries oxygen to body tissues from the lungs. Serum albumin carries fats in the bloodstream, while myoglobin absorbs oxygen from hemoglobin and then releases it to the muscles. Calbindin is another transport protein that facilitates the absorption of calcium from the intestinal walls.

Receptor

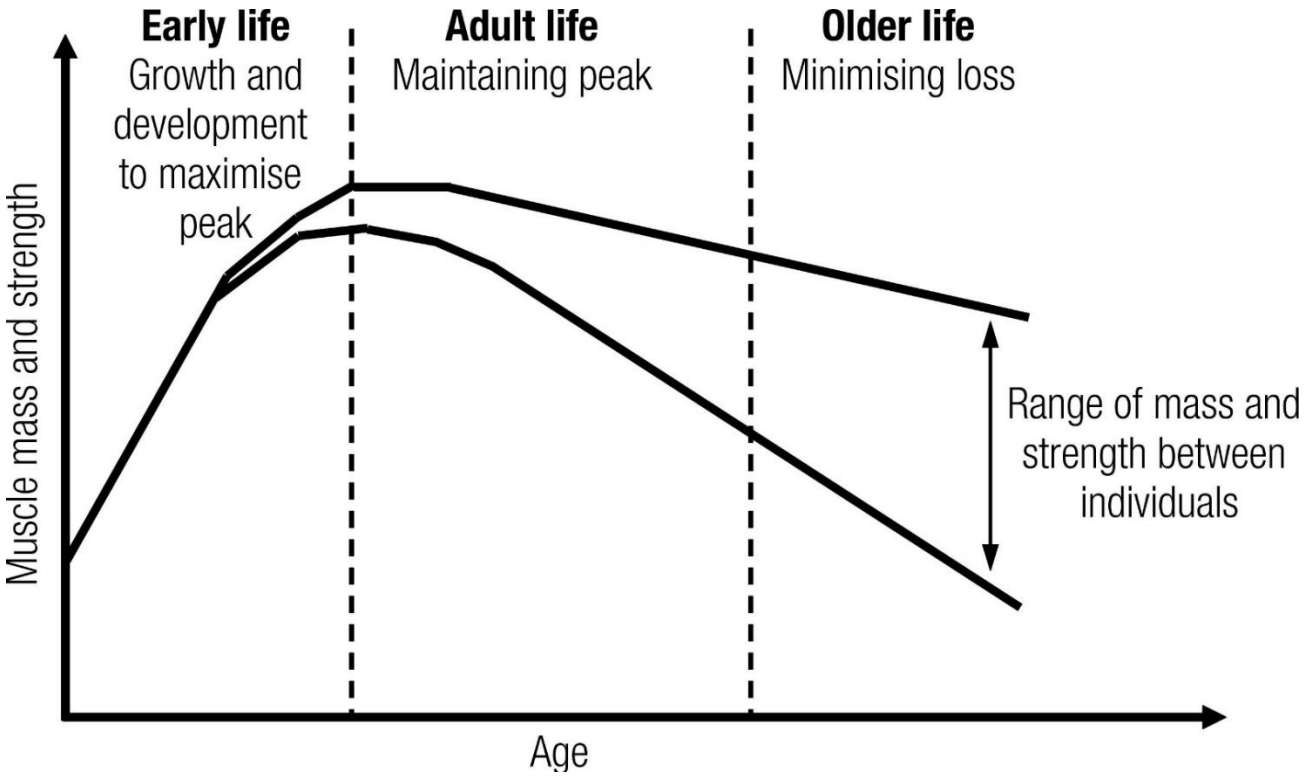
Located on the outer part of the cells, receptor proteins control the substances that enter and leave the cells, including water and nutrients. Some receptors activate enzymes, while others stimulate endocrine glands to secrete epinephrine and insulin to regulate blood sugar levels.

Contractile

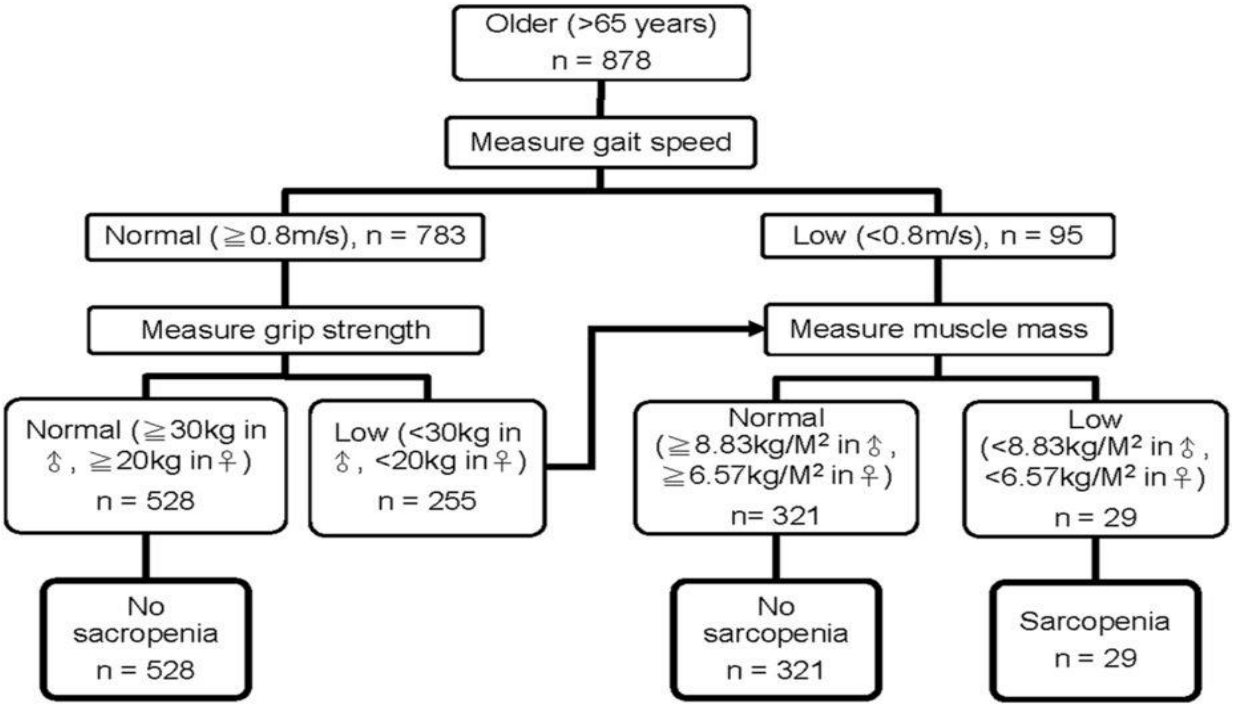
Also known as motor proteins, contractile proteins regulate the strength and speed of heart and muscle contractions. These proteins are actin and myosin. Contractile proteins can cause heart complications if they produce severe contractions.

Proteins/peptides in the aging process:

One of the major problems at aging is the loss of muscles. When muscles decrease in size/strength it is likely that the physical and mental defense systems weaken and health danger is ahead for the individual. Statistics give us some inside:

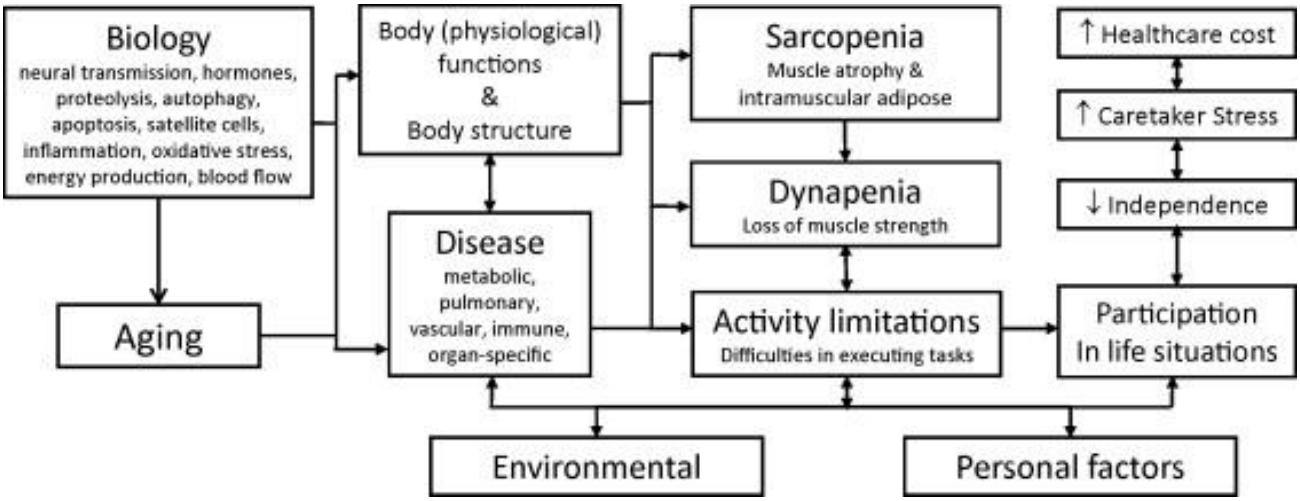


It is clear that, depending on the degree of activity, people lose mass on an individual basis.



It is possible to measure muscle loss. One of the reasons is the change in digestive activity and ability.
An important part of the muscle loss is the ability to keep muscle protein chains in a good condition.
The factors that contribute to reduced muscle mass with age are many. They include reduced physical activity (i.e., a sedentary lifestyle), reduced anabolic signaling (which could be due to reduced hormones such as growth hormone, insulin-like growth factor 1 [IGF1] and testosterone), increased adiposity and prevalence of metabolic diseases (such as insulin resistance). Exercise improves the sensitivity of muscle to insulin and also stimulate the production of anabolic hormones like GH/IGF1 and testosterone, which can positively impact muscle growth (or prevent its breakdown). For this, exercises that activate a large muscle masses (such as the legs) result in the best anabolic response.

During aging, the anabolic/catabolic balance slowly changes. Inactive lifestyles increase the catabolic reaction as the body reduces all possible factors of obstruction (like unused parts). The first to go in the aging process seems to be protein structures. Fat and carbohydrates continue to be stored. Why? Proteins are the building blocks and fat/carbs are the energy. The body stores energy but breaks down the building. Most elderly have enough energy storage for years to go at moment of their passing.



Risks of high protein diets.

The use of proteins as an energy source is doubtful. There are a number of reasons for it but there are also reasons enough to say that protein is not a bad source of energy. To make a judgment it is important to review the process:

Proteins contain Hydrogen and Carbon like all Carbohydrates. The difference is the Amino (NH+) group which is considerably different and cannot be used in an energetic process. To use proteins the following steps must be taken;

- Deamination = the NH2 group must be removed. This removal takes place by an enzymatic reaction. This will be transported to the liver and turned in NH3 (ammonia) and removed through transfer into Urea. It is possible to measure the amount of urea by the BUN (Blood Urea Nitrogen) check. The kidneys remove the ammonia.
- Keto acids or ketone bodies are formed which are formed into acetyl sugar
- Acetyl sugar enters the Citric cycle for energy production. Beside AcetylCoA there are other reaction paths such as oxaloacetate and other parts entering the citric acid cycle.

This process is called Gluconeogenesis which refers to the production of sugar from non-sugar sources such as amino acids. But there is a catch in this. The production also delivers side products such as:

- Acetone
- Acetoacetic acid
- Beta-hydroxybutyric acid

It is very likely to smell a person who is in gluconeogenesis as acetone has a very strong and specific smell that leaving the body through breathing and skin. The smell can be strong.

The body first turns to carbs and fat for an energy source. Only as a “last” resort, the body turns to proteins. The reason is found in the fact that the muscles and vital organs are made of proteins. Bringing the body in a state of Gluconeogenesis can have the effect of self-destruction and let the body turn on itself. Proteins are easily available but also vital to most of the life support systems. Destruction/use of proteins as energy resource might result in dangerous situations of “self-harm”. This process is known as “ketonemia” or “ketosis”.

Ketonemia brings a high demand for water (liquids) as the secretion of the keto-acids takes a lot of water. This is one reason why people suffering from diabetes are frequent drinkers in need of liquid (thirsty).

The following amino acids can “easily” be turned into glucose by removing the N2 group: alanine, serine, glycine, and valine. Other amino acids cannot be transformed by ketogenetics but follow other pathways.

Using amino acids as an energy source has only disadvantages. The process to retrieve energy is inefficient and waste creating. Due to the dangers of self-destruction and possible autoimmune disturbances, it is not advised to consume large amounts of proteins neither uses excessive amino acid supplements.

It is important to work with different amino acids and proteins to combat the age-related problems but to do so it is needed to calculate individually. Blood analysis, urine and other tests are often useful but not always needed to set specific personal programs.

REMARK; meat eaters store protein as fat. Is this true? People who frequently eat a large amount of meat (like in the USA , Brazil or Argentina) are often overweight or even obese. The problem with meat is the fact all proteins are surrounded (encapsulated) by fats. These fats get into the same digestive system and will be taken in at the same speed as the proteins. The combination of fat/protein is what makes it dangerous. Fat slows down every digestive process and follows a longer route with more enzyme activity. By encapsulating the proteins they are released at a state of non-broken down, which sets them aside for further distribution in the body.
Conclusion: amino acids and proteins are very important in all functions of the body. A decrease in uptake has a direct effect on efficiency, recovery, and building of different parts of the body. This decrease shows as aging, a decay of functions.

Carbohydrates

The first level energy source is carbohydrates. It is possible to distinguish different levels of use, digestion, and availability. Not all carbohydrates give energy. Ab important and interesting fact is that the source of carbohydrates is mainly from plant origin. The ancestors got their energy often from fats but when turning to farm the digestive system changed. The current carbohydrate source is mainly of plant origin.

Carbohydrates are divided in different ways.

- Fast energy delivery. Primary carbs
- Medium speed energy delivery.
- Slow delivery system carbs

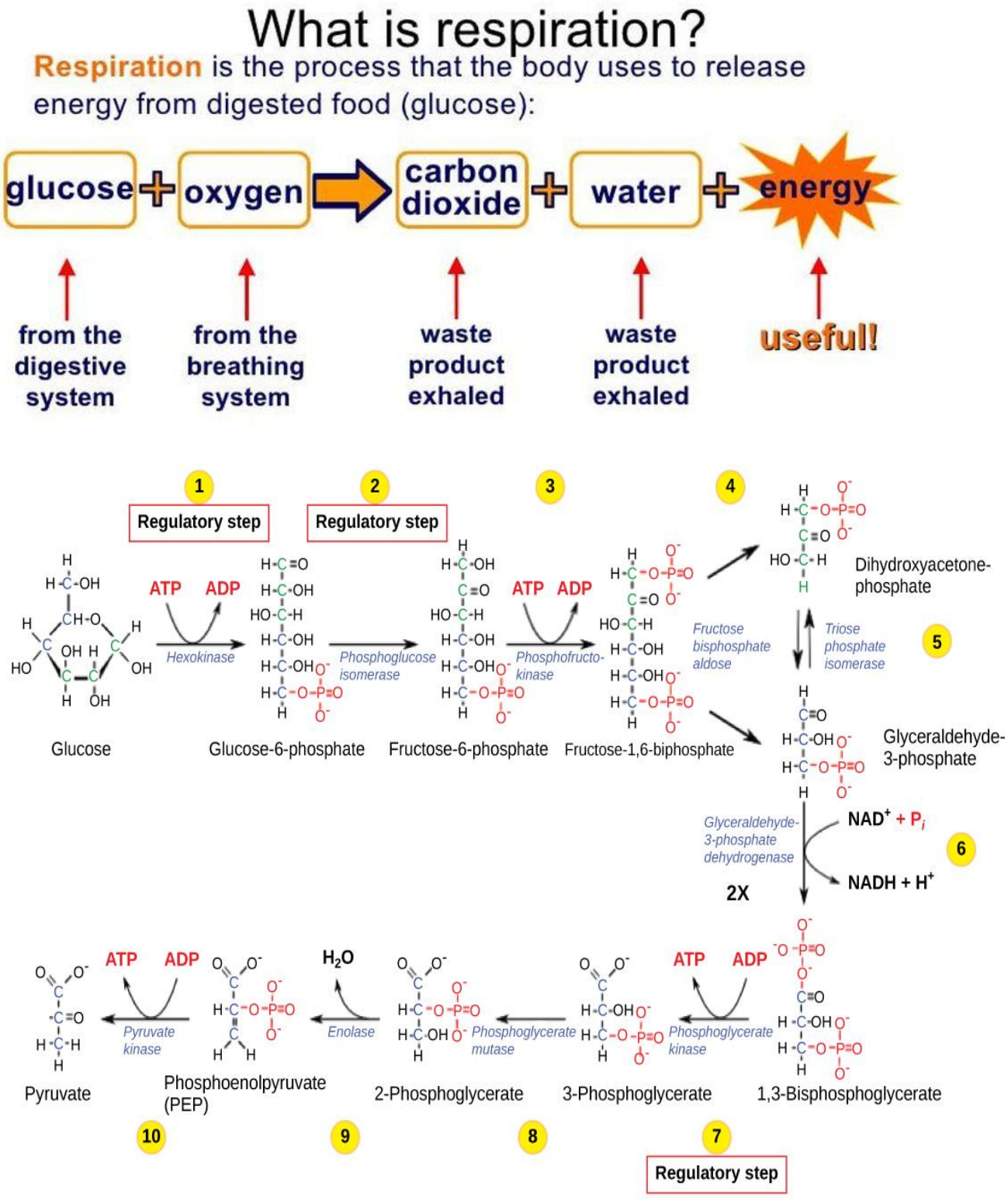
This dividing is easier to understand when using the GI (Glycemic) index scale. Hereby we set Glucose at 100 as it is the fastest available carbohydrate for the human body;

FOOD	Glycemic index (glucose = 100)
White wheat bread*	75 ± 2
Chapatti	52 ± 4
White rice, boiled*	73 ± 4
Brown rice, boiled	68 ± 4
Sweet corn	52 ± 5
Rice noodles†	53 ± 7
Udon noodles	55 ± 7
Couscous†	65 ± 4
Rice porridge/congee	78 ± 9
Apple, raw†	36 ± 2
Orange, raw†	43 ± 3
Dates, raw	42 ± 4
Potato, boiled	78 ± 4
Taro, boiled	53 ± 2
Milk, full fat	39 ± 3
Ice cream	51 ± 3
Soy milk	34 ± 4
Rice milk	86 ± 7
Kidney beans	24 ± 4
Soya beans	16 ± 1
Chocolate	40 ± 3
Soft drink/soda	59 ± 3
Fructose	15 ± 4
Sucrose	65 ± 4
Glucose	103 ± 3
Honey	61 ± 3
Data are means ± SEM. * Low-GI varieties were also identified. † Average of all available data.	

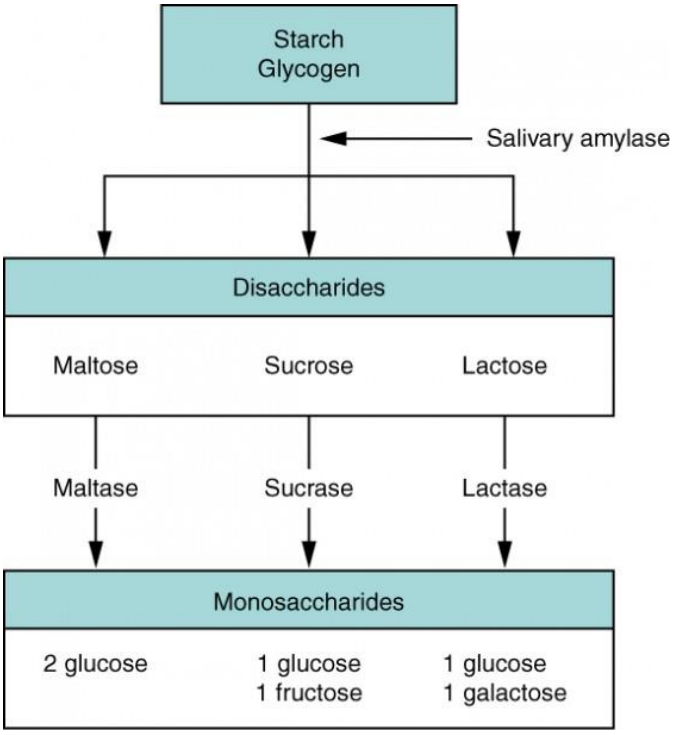
The glycemic index is a value assigned to foods based on how slowly or how quickly those foods cause increases in blood glucose levels. Also known as "blood sugar," blood glucose levels above normal are toxic.

Target Levels by Type	Upon waking	Before meals (preprandial)	At least 90 minutes after meals (postprandial)
Non-diabetic*		4.0 to 5.9 mmol/L	under 7.8 mmol/L
Type 2 diabetes		4 to 7 mmol/L	under 8.5 mmol/L
Type 1 diabetes	5 to 7 mmol/L	4 to 7 mmol/L	5 to 9 mmol/L

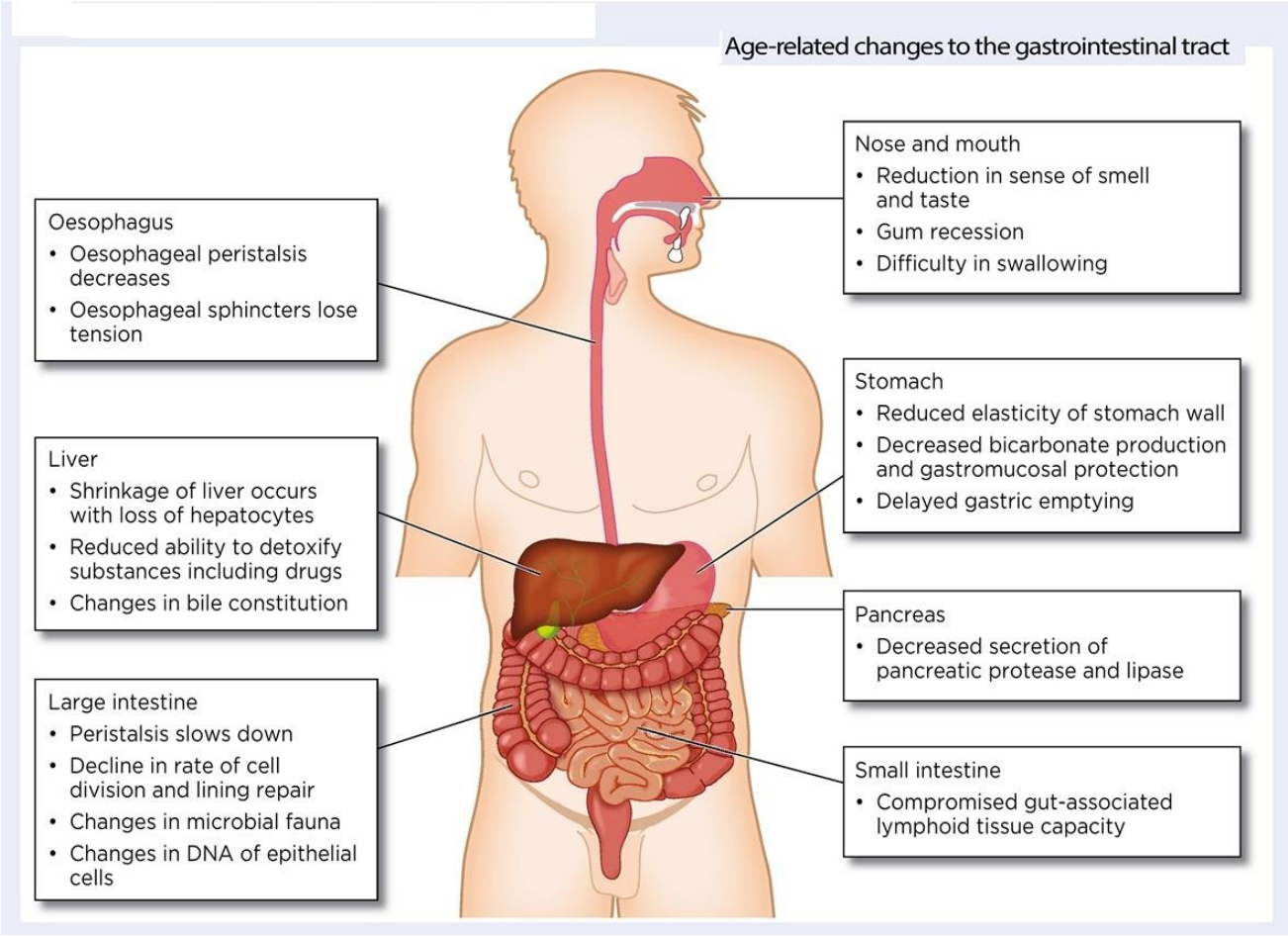
The primary carb in the human system is glucose. It is the fastest and most needed carb. But how does it turn into energy? The enclosed picture makes this an easy inside process.



All larger carbohydrates must go through the breakdown process in the digestive system :



The digestive energy track of the carb cycle has few serious fowls during the aging process.



Within the gastrointestinal tract, there is a lot of functional loss during the aging process. Each loss does not seem to have a direct relationship with the energy and other systems. But the main problem is the loss of source material (food) which passes through the system without being properly digested. This problem with added to this a function and activity loss of the enzymatic system do promote aging.

Once glucose is inside the liver, glucose is phosphorylated into glucose-6-phosphate or G6P. G6P is further metabolized into triglycerides, fatty acids, glycogen or energy. Glycogen is the form in which the body stores glucose. The liver can only store about 100 g of glucose in the form of glycogen. The muscles store glycogen. Muscles can store approximately 500 g of glycogen. Because of the limited storage areas, any carbohydrate that is consumed beyond the storage capacity is converted to and stored as fat. There is practically no limit on how many calories the body can store as fat.

The glucose stored in the liver serves as a buffer for blood glucose levels. Therefore, if the blood glucose levels start to get low because due to not consuming food for a period of time, the liver is able to release glucose into the bloodstream to maintain healthy levels. Blood glucose levels are tightly regulated because glucose is the primary energy source for the central nervous system. Blood glucose is important for sustaining brain functioning. If the body reserves of glucose deplete, a process called gluconeogenesis will take place. During gluconeogenesis, glucose is synthesized from molecules that are not carbohydrates. Often, this means the body breaks down muscle fibers to obtain the molecules to produce glucose. Glycogenolysis occurs primarily in the liver and is stimulated by the hormones glucagon and epinephrine (adrenaline).

Muscle glycogen reserves are stored energy for the muscles. The glycogen is able to be broken back down into glucose when the muscle contracts and requires energy. The body is able to store 500 g of glycogen, roughly equivalent to 2,000 calories, in the muscles. Therefore, if not eaten for a day, the stores become depleted.

Carbohydrates are an absolute need for the survival as it is the source of energy. On the other hand, the current time offers and excess use of carbohydrates and it is hard to nearly impossible to escape this. The use of the glycemic index is not important in the food industry. Taste and addiction to carbohydrates are. Carbohydrate creates an addiction by promoting a constant craving for dopamine release. Hereby it is clear that the mind is not always working in favor of the body and health. One of the most serious problems is an addiction to something. Addiction to carbohydrates is leading to gigantic health problems worldwide (Obesities).

The body receives carbohydrate addiction source training from a very young age. The milk sugar lactose is most favorable for the baby. The body cuts of the production at around age 4 of the enzyme needed to digest lactose. This enzyme, lactase, stops its activity, generally, during the third year of life. Gradually the mother milk stops coming and there should be no use of it anymore. But the Western world invented a scheme in the 60's that all people should drink milk. What started as a commercial marketing to sell milk product got the backup of science. Milk became a health tool. When looking back at history it is possible to discover that the introduction of milk started in the 50's-60 's. People just past a world war and there was a need for good and cheap sources of nutrients.

A little school milk history from Europe

After the passing of the 1906 Education Act, Local Education Authorities were empowered to provide free school meals. In 1921 this had been extended to free milk. However, an investigation by John Boyd Orr(published as Food, Health, and Income in 1937) revealed that there was a link between low-income, malnutrition, and under-achievement in schools. Following the 1945 General Election, the new Prime Minister, Clement Attlee, appointed Ellen Wilkinson as Minister of Education, the first woman in British history to hold the post. Wilkinson had long been a campaigner against poverty and in 1946 managed to persuade Parliament to pass the School Milk Act. This act ordered the issue of one-third of a pint of milk free to all pupils under eighteen.

In 1946, the School Milk Act provided free milk to all school children. A third of a pint of milk was provided to all children under the age of 18 years until 1968 when Harold Wilson's Government withdrew free milk from secondary schools. This policy was extended in 1971 when Margaret Thatcher (then secretary of state for education) withdrew free school milk from children over seven.

This was an economic decision, not one based on a nutritional assessment of the value of milk, and for this, she earned the nickname 'Thatcher, Thatcher, milk snatcher' – although many children were delighted at not having to drink the warm sickly odorous milk at school anymore! The school milk scheme was introduced in 1977 by the

European Union (EU) to encourage the consumption of milk in schools. The scheme required member states to make subsidized milk available to primary and nursery schools wishing to take part, but participation was entirely a matter for the school or LEA.

The European Commission had originally indicated that it wished to abolish the subsidy because the scheme was not providing value for money. The UK did not accept these conclusions and fought hard to retain the scheme. A compromise was secured whereby in 2001 the subsidy rate was reduced from 95 to 75 percent. The UK Government topped up the subsidy to its original level in England, up to a maximum total expenditure of £1.5 million each year. In the academic year 2003 to 2004, around one million school children in England drank 34.9 million liters of subsidized milk at a cost of around £7 million.

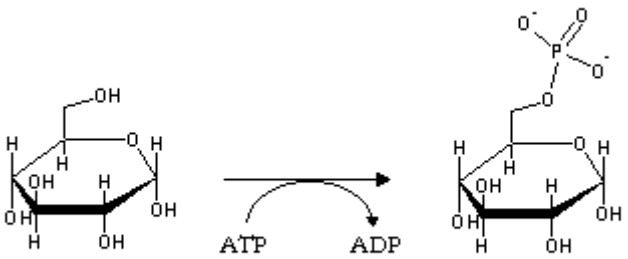
The white liquid, which was neither liked or used much before, milk became a solution. A strong lobby of the dairy industry discovered the combination of cheap, healthy and multiple uses in milk and did put all their effort into it. It was clearly successful as milk became easy to sell and widely available. Soon it was discovered that lactase production created a critical problem. People got diarrhea, gas and digestive problems, which were inconvenient and gave a setback to milk consuming. The solutions were the start to train the body at a very young age to get used to milk and milk products. Children are brought up with milk in the classroom from primary school up. By training the body to produce lactase it soon became possible to sell milk and milk products to every age group. In the current market, it is very difficult to avoid milk as it is used in nearly every product. Lactose intolerance became a disease not the standard within less than 50 years.

Carbohydrates cravings are build up since very young. In nearly all the food we eat is some form of carbohydrate "hidden". The reasons are:

- Easy available
- Cheap
- Tasty

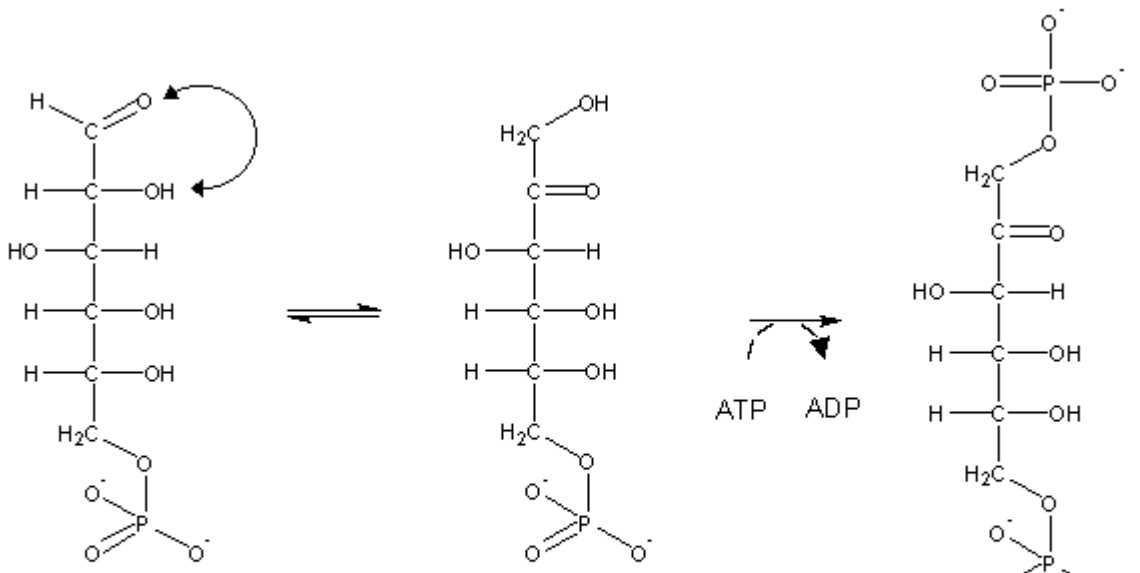
Carbohydrates are best known as fructose which is nearly 10x more sweet than glucose but also less useful for the body. The following explains how the chemical reaction is set up.

Blood glucose levels are kept at approximately constant levels around 4-5 mM. Glucose enters cells by facilitated diffusion. This process does not allow the cell to contain glucose at a higher concentration than the one present in the bloodstream, the cell (through the enzyme hexokinase) chemically modifies glucose by phosphorylation:



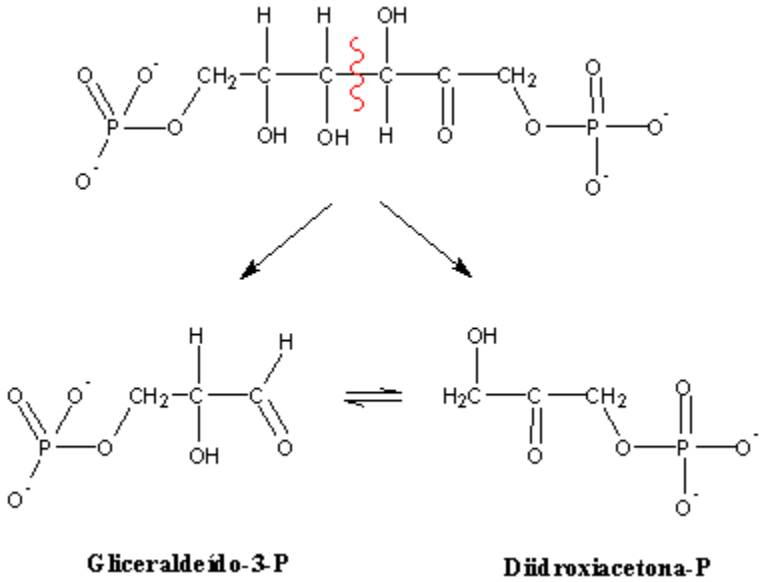
Glucose Glucose-6-P

The cell membrane is impermeable to glucose-6-phosphate, this process effectively "traps" glucose inside the cell, allowing the recovery of more glucose from the bloodstream. Glucose-6-phosphate is used in glycogen synthesis (a storage form of glucose), production of other carbon compounds by the pentose-phosphate pathway, or degraded in order to produce energy- **glycolysis**.
To be used for energy production, glucose-6-phosphate must be isomerized in fructose-6-phosphate. Fructose-6-phosphate is again phosphorylated to fructose-1,6-bisphosphate, in a reaction catalyzed by **phosphofructokinase**. This is the **committed step** of this metabolic pathway: from the moment glucose is transformed into fructose-1,6-bisphosphate it must proceed through glycolysis.



Glucose-6-P **Frutose-6-P** **Frutose-1,6-BP**

Cells contain 2 phosphofructokinase forms: PFK 1 (which produces fructose-1,6-bisphosphate) and PFK 2. PFK 2 produces fructose-2,6-bisphosphate (F-2,6-BP), which is an activator of PFK 1 and an inhibitor of the gluconeogenic enzyme fructose-1,6-bisphosphatase. F-2,6-BP, therefore, prevents gluconeogenesis from occurring at the same time as glycolysis. When blood glucose levels are low, the pancreas releases glucagon. Glucagon activates the hydrolysis of fructose-2,6-bisphosphate, which relieves the inhibition of gluconeogenesis, and depresses glycolysis.
After this conversion, an inverse aldolic addition cleaves fructose-1,6-bisphosphate in two three-carbon molecules :

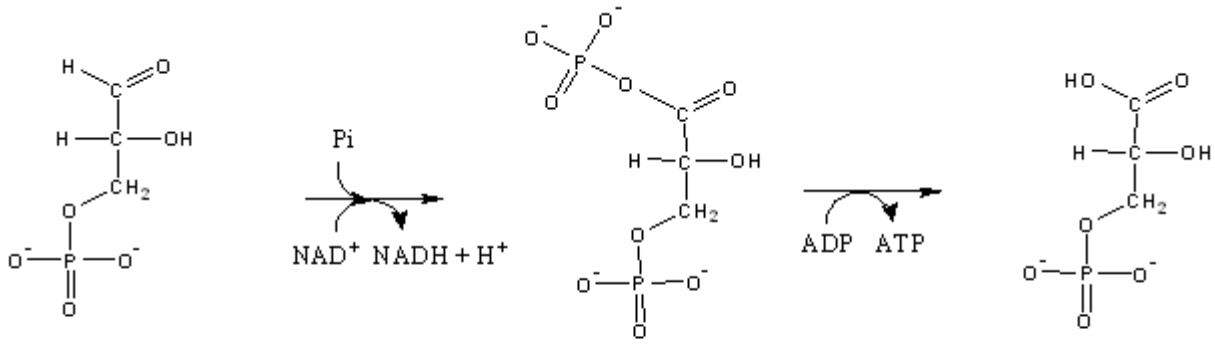


Gliceraldeído-3-P **Diidroxiacetona-P**

Both molecules (dihydroxyacetone phosphate and glyceraldehyde-3-phosphate) can easily be interconverted by isomerization. A single metabolic pathway is enough to degrade both. This is why glucose-6-P was first isomerized to fructose-6-P: glucose-6-P breakdown through an inverse aldol addition would yield two different molecules (of two and four carbons, respectively), which have to be degraded through two different pathways.

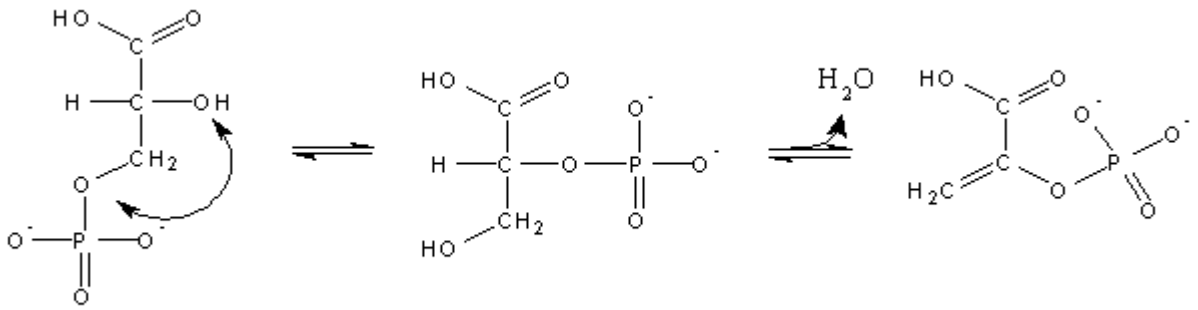
Aldehydes have very low redox potentials (around -600 to -500 mV). Oxidation of glyceraldehyde-3-phosphate by NAD^+ (E^0=-320 mV) is spontaneous. It is exergonic in a way that it can be used to produce ATP (ATP production

from ADP and Pi can be performed if coupled to a two-electron redox reaction with a potential difference of at least 160 mV). ATP production happens through two consecutive steps: in the first step, gliceraldehyde-3-phosphate oxidation to a carboxylic acid is coupled to the phosphorylation of the produced carboxylic acid.

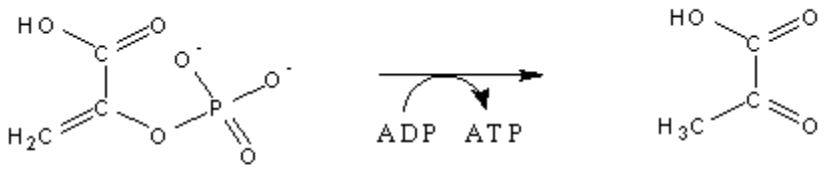


gliceraldeído-3-P **1,3-bisfosfoglicerato** **3-fosfoglicerato**

Phosphorylated acids (including phosphoenol and phosphoguanidines) contain very energetic phosphate groups: hydrolysis of these phosphate groups yields with significant resonance stabilization. The phosphate group attached to carbon 1 in 1,3-bisphosphoglycerate can be transferred to ADP, in order to produce ATP. 3-Phosphoglycerate is isomerized to 2-phosphoglycerate, which after dehydration (i.e. losing H_2O) yields a phosphoenol:



Due to its high phosphate transfer potential phosphoenolpyruvate can transfer a phosphate group to ADP:



Fosfoenolpiruvato **Piruvato**

Two ATP molecules are used in glycolysis, and four ATP are produced. NAD^+ must be continuously regenerated, otherwise, glycolysis will stop since NAD^+ is a substrate in one of the reactions. Under aerobic conditions, NADH transfers its two electrons to the electron transport chain. In animal cells, in the absence of O_2 NADH transfers its electrons to the end-product of glycolysis (pyruvate), yielding lactate. This is called **fermentation**: an internally balanced degradation, i.e., a process that uses one of its products as the final acceptor of the electrons it releases.

A few negative effects of carbohydrates in the body due to the use of it are:

Relative Sweetness Scale - Sucrose = 100	
Compound	**Rating**
Sucrose	100

Fructose	140
High Fructose Corn Syrup	120-160
Glucose	70-80
Galactose	35
Maltose	30-50
Lactose	20

In addition mono- and disaccharides are craved because of their sweetness. All carbohydrate sweeteners (sugar, evaporated cane juice, turbinado sugar, honey, high fructose corn syrup, maple syrup, juice concentrates) contain primarily sugars and do not provide significant amounts of vitamins and minerals. The value of sugar and other natural sweeteners is measured because they enhance the taste and enjoyment of a wide variety of nutritious foods.

Saccharides have varying degrees of sweetness on a relative scale as illustrated in the table. Fructose is the sweetest, while lactose is only slightly sweet by comparison.

Originally the needs of diabetics and more recently the soft drink industry has provided the stimulus in the search of other sweeteners.

Relative Sweetness Scale - Sucrose = 1	
Compound	Rating
Saccharin	300 X
Cyclamate	30 X
Aspartame	180 X
Acesulfame	200 X
Sucralose	600 X

Non-Carbohydrate Sweeteners:

Saccharin was discovered in 1879 by Constantine Fahlberg, while working in the laboratory of Ira Remsen, quite by accident as were most other sweeteners. While working in the lab, he spilled a chemical on his hand. Later while eating dinner, Fahlberg noticed a more sweetness in the bread he was eating. He traced the sweetness back to the chemical, later named saccharin, by tasting various residues on his hands and clothes (unsanitary conditions) and finally chemicals in the lab (not a safe lab practice).

By 1907, saccharin was used as a replacement for sugar in foods for diabetics. Since it is not metabolized in the body for energy, saccharin is classified as a noncaloric sweetener. By the 1960s it was used on a massive scale in the "diet" soft drink industry.

Aspartame: In 1965, Jim Schlatter, a chemist at G.D. Searle was working on an on a project to discover new treatments for gastric ulcers. One of the steps in the research process was to make a dipeptide intermediate, aspartyl-phenylalanine methyl ester. He accidentally and unknowingly spilled some on his hand. Later he licked his finger as he reached for a piece of paper, and noticed the sweet taste. He and a friend decided to test some in coffee and confirmed the identity of the chemical with the sweet taste. The result was the sweetener, aspartame.

Cyclamate: Michael Sveda, while a graduate student at the University of Illinois, discovered cyclamate by smoking a cigarette. While working on the synthesis of antipyretic (anti-fever) drugs in the laboratory in 1937, he put his cigarette down on the lab bench. When he put it back in his mouth, he discovered the sweet taste of cyclamate.

Acesulfame was discovered by another chemist, Karl Clauss, in 1967. He noticed a sweet taste when he licked his finger to pick up a piece of paper.

Sucralose may have the strangest "accidental discovery" story. Tate & Lyle, a British sugar company, was looking for ways to use sucrose as a chemical intermediate. Halogenated sugars were being synthesized and tested. A foreign graduate student, Shashikant Phadnis, misunderstood a request for "testing" of a chlorinated sugar as a request for "tasting," leading to the discovery that many chlorinated sugars are sweet with potencies some hundreds or thousands of times as great as sucrose. Substituting three chlorine ions for hydroxyl groups on an ordinary sucrose molecule makes Sucralose.

Hypoglycemia

Sugar addiction is a buildup imbalance of blood sugar. When a person eats excess carbs over a long period of time, their body has difficulty balancing blood sugar levels. Many different cells stop being responsive to insulin. This condition is called insulin resistance. As a direct result of this the body produces more insulin to try to balance the blood sugar levels which in turn fuels the vicious cycle of frequent hunger and intense cravings for more carbs to 'feed' the excess insulin. It is possible that hypoglycemia turns into diabetes when more favorable conditions are met (such as genetic or diseases). The essence of this problem is the slow but steady dependence training (road to addiction) and craving development.

Adrenals and Thyroid
Underactive thyroid which causes extreme fatigue can lead a person to reach for a quick energy source like carbs or sugar. Similarly, stressed and overworked adrenals (due to chronic stress or disease) can lead to carb cravings. When the body is in a constant fight or flight mode (high-stress level) carbohydrates are used for fast energy. Cortisol, the stress hormone that is released, tries to rebalance the body by demanding more fast energy resources (craving for carbohydrates)

Low serotonin and melatonin levels
Lack of sleep surges the cravings for carbs tremendously, research has proven this. A study at the University of Chicago discovered that leptin levels decreased and ghrelin levels increased among sleep-deprived men. The hormone ghrelin tells the brain that the body needs food and seems not to have many limitations. The hormone leptin, which is decreased by inadequate sleep, tells the brain that there is no need for food (not hungry). Similar studies found that people who slept for less than 6 hours tended to eat more food and preferred calorie dense food. People who slept 8 hours a night did eat less food in general.

PMS/Menopause and Hormone Imbalance
Insulin resistance can occur in women during certain times in their cycle or at certain points in their life as their progesterone and estrogen drops. As insulin production increases they might suddenly find themselves experiencing intense cravings for sweets and carbs. Addressing hormone imbalances is key.

About carbohydrates, there are many stories. One of them is Calorie restriction as an important factor in prologue life. Calorie restriction prolongs lifespan in numerous mammalian species and delays the development of aging-associated diseases such as diabetes and atherosclerosis. The mechanism is unknown. From an efficiency perspective, one might expect calorie restriction to reduce DNL (known as de novo lipogenesis = DNL), which is a wasteful energetic process. However, the opposite is observed. Calorie-restricted mice demonstrate a four-fold increase in adipose tissue DNL. It is not known whether this mediates the therapeutic effects of calorie restriction. But it is highly plausible that it mediates favorable metabolic effects because enhanced DNL in adipose tissue confers improved glucose homeostasis.

Calorie restriction is a process which should be applied for a prologue period of time in life. Restriction sounds harsh but one should take the following in consideration as the best way of restriction;

- Eat when needed and never eat to full. Keep to the 80% rule. Meaning eats 80% of what that actually want cause it is only 80% of that what is needed.
- If possible divide meals in 6 x small per day

- Use high calorie with high activity and low calorie at low activity
- Combine foods and use as much as possible the 30/30/40 rule (P/F/C)
- When hungry eat fats not sweets
- Eat what the season offers (in summertime food is lower in calorie than in winter)

Calorie efficiency would be a better way to improve life and prologue lifespan. What is calorie efficiency?

- During the lifespan, there are different energetic periods. At some periods there is a need for more carbohydrates than others.
- It is important to keep the use of carbohydrates within calculated borders which are related to age, occupation, and rate of activity. There are some good results of carbohydrate limitation and specific choice of the kind of carbohydrates in ADHD patients such as high and low on the glycemic table.
- Periodical change of low and high glycemic index level foods. Referring to the energy needs of specific periods in life it is important to consider which foods are useful for each period in life. Sample; pasta can be until age 30/35 but after that must be limited.
- Gradually decrease of the use of simple carbohydrates in exchange for more complex with low glycemic index.

Fasting, does it "work"?

A most interesting and always returning phenomena is; Fasting. Periods of not or little eating and drinking. People use this method for different reasons. Most of them are religious in nature. But after mentioning the terms calorie restriction and limitation it should be clear that all are related. Consider fasting as one of the more extreme forms of restriction. It is important to know what is happening in the body.

- Fasting is always set for a specific period in time (days/weeks/months)
- It is only allowed for people with a healthy body and mind. People with a disease or some more or less chronic problem are not advised to take part.
- The first goal is the detoxification of the body by a mild form of starvation. When the body is deprived of food it starts using its storage. By using stored products it releases toxic rest materials from these storages. By doing so it enables the body to clean itself.
- Fasting improves mental resistance to addiction. Carbohydrate cravings must be controlled. By the right application of fasting it is possible to control food addictions.

The major problem of fasting actions that they are not applied in the right way. Some examples:

- Most fasting actions have got a religious background and a more or less duty related function. People follow the rules but take sharp corners to relieve the burden.
- Religious fasting start and end with a party where the use of alcohol or excess food is common.
- During these "fasting periods" there is a timeframe of not eating and drinking but when this is finished people eat and drink too much at a wrong time. The body gets shocked by the disturbance of the biological food pattern. The result is counterproductive.
- Fasting has time to prepare and a time to cure/stop. It is unhealthy to start and stop suddenly.

Is fasting positive for the health and does it have a life-prolonging effect?

- If fasting is applied the right way and right time it has some very strong effects
- 1 / detoxification
- 2 / calorie restrictive periods
- 3 / addiction decreasing
- 4 / mentally improvement

Fasting should become a part of regular society as a common preparation for healthy aging as it undoubtedly improves the physical and mental state of every healthy person. Good fasting has a scientific background and is not religious bounded it is important to disconnect these two in the studies.

This is the time of diabetes. To understand the importance of the disease and the impact of it to state some facts.

Key facts

- The number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014 (1 in 11 adults).
- The global prevalence of diabetes* among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014.
- Diabetes prevalence has been rising more rapidly in middle- and low-income countries.
- Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation.
- In 2015, an estimated 1.6 million deaths were directly caused by diabetes. Another 2.2 million deaths were attributable to high blood glucose in 2012.
- Almost half of all deaths attributable to high blood glucose occur before the age of 70 years. WHO projects that diabetes will be the seventh leading cause of death in 2030.
- A healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use are ways to prevent or delay the onset of type 2 diabetes. Professional guidance is advised.
- Diabetes can be treated and its consequences avoided or delayed with diet, physical activity, medication and regular screening and treatment for complications.
- By 2040, 642 million adults (1 in 10 adults) are expected to have diabetes
- 1 in 7 births is affected by gestational diabetes
- 542,000 children have type 1 diabetes
- 12% of global health expenditure is spent on diabetes ($673 billion)
- Approximately 11.6% of Chinese adults have diabetes, a total of 114 million people.

Type 1 diabetes

Type 1 diabetes (previously known as insulin-dependent, juvenile or childhood-onset) is characterized by deficient insulin production and requires daily administration of insulin. The cause of type 1 diabetes is not known and it is not preventable with current knowledge.

Symptoms include excessive excretion of urine (polyuria), thirst (polydipsia), constant hunger, weight loss, vision changes, and fatigue. These symptoms may occur suddenly.

Type 2 diabetes

Type 2 diabetes (formerly called non-insulin-dependent, or adult-onset) results from the body's ineffective use of insulin. Type 2 diabetes comprises the majority of people with diabetes around the world and is largely the result of excess body weight and physical inactivity.

Symptoms may be similar to those of type 1 diabetes but are often less marked. As a result, the disease may be diagnosed several years after onset, once complications have already arisen. Until recently, this type of diabetes was seen only in adults but it is now also occurring increasingly frequently in children.

Gestational diabetes

Gestational diabetes is hyperglycemia with blood glucose values above normal but below those diagnostic of diabetes, occurring during pregnancy. Women with gestational diabetes are at an increased risk of complications during pregnancy and at delivery. They and their children are also at increased risk of type 2 diabetes in the future. Gestational diabetes is diagnosed through prenatal screening, rather than through reported symptoms.

Impaired glucose tolerance and impaired fasting glycemia

Impaired glucose tolerance (IGT) and impaired fasting glycemia (IFG) are intermediate conditions in the transition between normality and diabetes. People with IGT or IFG are at high risk of progressing to type 2 diabetes, although this is not inevitable.

Food combinations

All over the world, people pay a lot of attention to cooking. If interested it is easily possible to spend 24/7 on cooking programs on TV and the internet. The sheer endless possibilities of food combinations are a continuous source of

interests and happiness. When studying the nearly endless stream of advice on how to eat with diabetes it is clear that the advice having not been adjusted for the last few years. Still, most organizations mention the food dividing of
25% Proteins
25 % Fats
50 % Carbohydrates
Based on the facts already mentioned, the advice should be changed into;
30 % Proteins
30 % Fats
40 % Carbohydrates

Most of the food recipes did undergo changes. All are rooted in the regular kitchen with minor carbohydrate corrections. This does not help. Only "*food congruence*" (ref. Arnaud van der Veere) offers the solution to the real problem.

Food congruence is the method of matching foods with specific interactive properties in a meal. Many good cooks do already apply the method but often are not aware of the facts/reasons why the combinations work.

- There are carbohydrate food combinations at which one of the ingredients is a "binder" of the other. The "binder" protects the ingredient of fast reaction in the digestive system. It will slow down the digestion or even prevent it from doing so.
- Fat binders. Some vegetables are cooked with fat products as to prevent the fat to change form or create a more complicated digestion. These products make the fats less "digestible".
- Digestive promotors. These elements are added to the food to make it easier to digest (herbs).
- Taste improvers. Added herbs which improve the taste of a product to make consumption easier.
- Easier passage. Some vegetables ease the transportation of food through the digestive system.

The use of specific herbs or other ingredients is important for the digestive system for different reasons:

- Herbs improve the production of saliva (okra)
- Start of digestive activities in the food (fermentation)
- Complete change of chemical composition of ingredients by interaction with them (production of alcohol)

The application of food congruence science depends on different factors such as:

- Basic food pattern (since birth)
- Climate
- Environmental food production (neighborhood growing)
- Education on food (eat what is offered or produced)
- Food tradition and culture

Carbohydrates play an important role in all these issues as they are the major contributor of energy and life.

Glycoproteins
Proteins which have carbohydrate groups attached to the polypeptide chain. Secreted extracellular proteins are glycosylated. Glycoproteins are often integral membrane proteins, they play a role in cell to cell interactions. The way White blood cells attach to the blood vessel lining is through glycoproteins called lectins.
Blood type refers to the type of glycoprotein on the red blood cells. The type A blood, refers to the A antigens, or A glycoproteins, on the red blood cells. Glycoproteins help to stimulate the process of coagulation of platelets to clot blood when activated.

Glycoproteins are involved in keeping the skin healthy. Glycoproteins are on the surface of skin cells, called epithelial cells. These help to attach the skin cells to each other, forming a tough barrier to protect the body. Cadherins, also a glycoprotein, help the skin hold together. Other samples are:

Function	Glycoproteins

Structural molecule	Collagens
Lubricant and protective agent	Mucins
Transport molecule	Transferrin, ceruloplasmin
Immunologic molecule	Immunoglobulins, histocompatibility antigens
Hormone	Human chorionic gonadotropin (HCG), thyroid-stimulating hormone (TSH)
Enzyme	Various, e.g., alkaline phosphatase, patatin
Cell attachment-recognition site	Various proteins involved in cell-cell (e.g., sperm-oocyte), virus-cell, a bacterium–cell, and hormone–cell interactions
Antifreeze protein	Certain plasma proteins of cold-water fish
Interact with specific carbohydrates	Lectins, selectins (cell adhesion lectins), antibodies
Receptor	Various proteins involved in hormone and drug action
Affect folding of certain proteins	Calnexin, calreticulin
Regulation of development	Notch and its analogs, key proteins in development
Hemostasis (and thrombosis)	Specific glycoproteins on the surface membranes of platelets

A number of naturally occurring substances have already been identified as having high glycoprotein content a clear example are the medicinal mushrooms. Reishi, maitake, cordyceps, shiitake and oyster mushrooms all have beta-glucan polysaccharide. There are a number of documented studies on these medicinal mushrooms, which boost the immune system, aid communication between immune cells and rogue cells. This is also a reason why mushrooms take an important place in the Chinese Traditional Medicines (TCM).

Carbohydrate calculation suggestions

Most people wish to have a guideline to calculate the daily needs of carbohydrate. For those interested in self-help or advise it is recommended to use these formulae. The best way is to use the different methods together and

choose the best option by experience. Most methods are based on American systems which are often not completely 100% suitable for other nationalities. In the most practical way, it should be possible to create a more sophisticated detailed calculation method which includes race and food pattern.

Mifflin St. Jeor Calculation
Men
10 x weight (kg) + 6.25 x height (cm) – 5 x age (y) + 5
Women
10 x weight (kg) + 6.25 x height (cm) – 5 x age (y) – 161.

Owen method:
MEN: BMR = 879 + 10.2 (weight in kg)
WOMEN: BMR = 795 + 7.2 (weight in kg)

Katch-McArdle:
BMR = 370 + (21.6 x LBM) *LBM = (total weight in kg) x (100 – bodyfat %) /100

Most Basic Formula Possible:
MEN: BMR = (Body Weight in lbs x 8-10)
WOMEN: BMR = (Body Weight in lbs x 7-9)

Activity Factor Multiplier
The activity factor takes into account everything done in a day and not just training. After the BMR is calculated to use one of these multipliers to find the number of calories needed to stay at the same weight (maintenance calories).

BMR x 1.2: Sedentary
BMR x 1.3-1.4: Lightly Active
BMR x 1.5-1.6: Moderately Active
BMR x 1.7-1.8: Very Active
BMR x 1.9-2.2: Extremely Active

Gender	*Age (years)*	*Sedentary*	*Moderately Active*	*Active*
Child	2-3	1,000	1,000-1,400	1,000-1,400
Female	4-8	1,200	1,400-1,600	1,400-1,800
	9-13	1,600	1,600-2,000	1,800-2,200
	14-18	1,800	2,000	2,400
	19-30	2,000	2,000-2,200	2,400
	31-50	1,800	2,000	2,200
	51+	1,600	1,800	2,000-2,200
Male	4-8	1,400	1,400-1,600	1,600-2,000
	9-13	1,800	1,800-2,200	2,000-2,600
	14-18	2,200	2,400-2,800	2,800-3,200
	19-30	2,400	2,600-2,800	3,000
	31-50	2,200	2,400-2,600	2,800-3,000
	51+	2,000	2,200-2,400	2,400-2,800

Conclusion; carbohydrates are a major part of all forms of life. As a human, we face the fact of overeating, wrong diets and not selective consumption. Professional advice and education are needed to combat diseases related to the use of carbohydrates. But carbohydrates are neither dangerous nor suspicious. The common sense of using it in the right proportions is a matter of training and guidance. Most people need professional advice.

Fats

There are many misconceptions about Fats. One of the most important misfits is the suggestion that fats would be unhealthy. People do not get fat from fat. The persons who get fat / obese have many different causes to become overweighed, it does not have a direct link with (healthy or unhealthy) fat but could be with the amount and form of consumed fats.

Fats have several useful applications in the body and therefore needed at all time.

- Energy. Fats deliver a strong part of our energy and are the main source after carbohydrates.
- Protection. Fats assist most of our internal organs with protection against different forms of impact and internal forces
- Transportation. Some products like vitamins need fats as a transporter in the body.

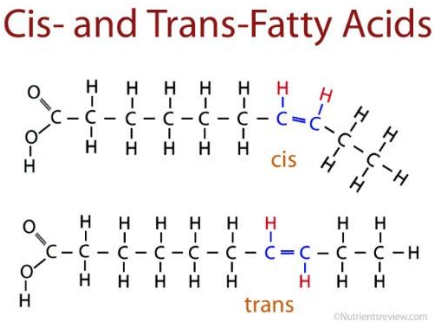
Fats have a separation in;

- Plant origin
- Animal origin

Also, these can be divided into;

- Saturated
- Unsaturated
- Polyunsaturated

Currently, due to manufacturing and other industrial/environmental processing, more and more different fat structures which are harmful to the human body enter the commercial markets. These are called empty fats which have no function in the metabolic system.



Most of these fats enter our body due to the production of food and not as a natural content. This is one reason why food production process should be watched over closely and develop more portable devices to test food on these and contents. Fat is an important energy source. The energy delivered of fats are (compared to other nutrients);

Food	**component**	**Energy density**
	kJ/g	**kcal/g**
Fat	37	9
Protein	17	4
Carbohydrates	17	4
Fibers	8	2

<u>Animal fats:</u>

Animal fats are mostly saturated fat, which implies they stand up better to high heat and last longer than vegetable fats. Reduced oxidation in animal fats means they are less susceptible to the toxins and carcinogens generated by using vegetable oil alone. Animal Fats are rendered from the flesh of animals or, in the case of butter and ghee, separated from the milk fat of said animals.

- Relatively rich in saturated fatty acids
- Due to their saturation, tend to stay solid at room temperature, hence commonly known as ‘fats’

- Iodine number of animal lipids is relatively less (Iodine numbers are used to determine the amount of unsaturation in fatty acids. This unsaturation is in the form of double bonds, which react with iodine compounds. The higher the iodine number, the more C=C bonds are present in the fat)
- Animal fats have a relatively higher value of Reichert-Meissl number (Reichert-Meissl number indicate how much volatile fatty acid can be extracted from a fat through saponification) The Reichert value (or more fully, the Reichert-Meissl-Wollny value or Reichert-Meissl-Wollny number) is a value determined when examining fat. Saponification number: a measure of the totally free and combined acids especially in a fat, wax, or resin expressed as the number of milligrams of potassium hydroxide required for the complete saponification of one gram of substance — called also saponification value.
- Oxidative rancidity is observed more frequently. Oxidative rancidity is associated with the degradation by oxygen in the air. Via a free radical process, the double bonds of an unsaturated fatty acid can undergo cleavage, releasing volatile aldehydes and ketones. Oxidation primarily occurs with unsaturated fats.
- Stored in the liver, beneath the skin etc.
- Animals have specialized cells for storing fat reserve called adipocytes. Adipocytes, also known as lipocytes and fat cells, are the cells that primarily compose adipose tissue, specialized in storing energy as fat. Adipocytes are derived from mesenchymal stem cells which give rise to adipocytes, osteoblasts, myocytes and other cell types through adipogenesis. There are types of adipose tissue,
    - white adipose tissue (WAT) and brown adipose tissue (BAT), which are also known as white fat and
    - brown fat, respectively, and comprise two types of fat cells.
    - beige adipocytes with a gene expression pattern distinct from either white or brown adipocytes.

The fatty acids in oils are absorbed in the intestine and esterified (with glycerol) to form triglycerides. Then, they are incorporated in lipoprotein complexes. There are different types of lipoproteins- VLDL (Very Low-Density Lipoprotein), LDL (Low-Density Lipoprotein) and HDL (High-Density Lipoprotein) which have different sizes and compositions. Lipidome—the collection of all lipids within cells—is highly regulated during senescence.

Plant Lipid

Vegetal oils are frequently classified in two main groups, according to their source: pulp oil (palm, olive, avocado) and seed oil (other sources). The amount of lipids in plant parts varies from as low as 0.1% in potatoes to about 70% in pecan nuts. Some vegetal products are fat poor (1% in lentils, 3% in mushrooms), some seeds have a middle range amount (about 10% in wheat germ, 20% in soybeans) while some are very oily (44% in peanuts, 55% in almonds, 65% in walnuts).
Plants store their energy production first as carbohydrates, but during ripening, they transform these oxygen-containing compounds in carbon-rich triglycerides. Thus, a minimum of the volume is required to stock a maximum of energy content. Conversely, the triglyceride stock is reconverted into carbohydrates during germination along with an incorporation of a high amount of water. One gram of oil is converted into 2.7 g of carbohydrates.

1. Main world sources of oils
Palm oil
Rape oil
Soja oil
Sunflower oil

2. Seven important oils
Arachis (groundnut)
Cotton
Coprah
Palmkernel
Maize (corn)
Olive
Sesame

3. Minor vegetal oils
Almond seed
Camelina
Carthame
Grape Seed
Hazelnut
Linseed
Poppy seed
Walnut

4. Oils used in dietetics, cosmetics, and lipochemistry
Avocado pear
Black-currant
Borage
Cacao
Castor bean
Evening primrose
Kukui oil
Wheat germ

5. Vegetal butter and Margarine

- Comparatively rich in unsaturated fatty acids
- Due to their high un-saturation, tend to stay liquid at room temperature, hence commonly known as 'oils'
- Iodine number of plant fats will be more when compared to animal fats
- Relatively lower Reichert-meissl number
- Oxidative rancidity is relatively less in plant fats
- Stored in fruits and seeds
- Plants do not have adipocytes for storing fats, fats are stored as granules (oil droplets) in the cell cells of endosperm of seeds or other cells

Fat is needed to build cell membranes, the vital exterior of each cell, and the sheaths surrounding nerves. It is essential for blood clotting, muscle movement, and inflammation. For long-term health, some fats are better than others. Fats are divided in the degree of saturation.

Monounsaturated fats have a single carbon-to-carbon double bond. The result is that it has two fewer hydrogen atoms than a saturated fat and a bend at the double bond. This structure keeps monounsaturated fats liquid at room temperature.

Polyunsaturated fats are essential fats. That means they're required for normal body functions but the body can't make them. Like essential amino acids, they have to be taken in by food. Polyunsaturated fats build cell membranes and the covering of nerves. They involved in the blood clotting process, muscle movement, and inflammation.

A polyunsaturated fat has two or more double bonds in the carbon chain. It is possible to distinguish the following types of polyunsaturated fats which the human body needs and cannot produce:

Omega-3 fatty acids are good for the heart in several ways. They help:

- Reduce triglycerides, a type of fat in the blood
- Reduce the risk of an irregular heartbeat (arrhythmia)
- Slow the build-up of plaque in the arteries
- Slightly lower the blood pressure

Omega-6 fatty acids may help:

- Control the blood sugar
- Reduce the risk of diabetes
- Lower the blood pressure

The numbers of the Omega fats refer to the distance between the beginning of the carbon chain and the first double bond. Both types offer health benefits.

Lipogenesis is a term used to describe a process of fatty acid and triglyceride synthesis from glucose or other substrates. Although storage of excess energy in the form of lipids is a useful defense against starvation, for modern humans, to whom food is often constantly accessible, this adaptive mechanism has become inimical, with energy surplus and excessive lipid exposure generating the basis for a variety of metabolic disorders. However, more recent research has revealed that in addition to energy storage, lipids have wide-ranging actions as signaling molecules that are relevant to systemic metabolism. This specific biosynthesis takes place predominantly in the liver. The initial step for such fatty acid synthesis is acetyl-CoA carboxylation to malonyl-CoA with the help of the enzyme acetyl-CoA carboxylase, which is mostly taking place in liver cells, but also in skeletal muscle and adipose tissue. The process is activated by insulin and inhibited by hyperglucagonemia (excess glucagon secretion) and by cellular energy deprivation through 5’ AMP-activated protein kinase by glucagon.

Fatty acids are essential macromolecular cellular constituents serving critical structural and energetic roles. Synthesis of fatty acids endogenously (known as de novo lipogenesis = DNL) is originally thought to serve the purpose of converting excess carbohydrates into lipids for storage because lipid is much more energy-dense than carbohydrate and is, therefore, a more efficient storage form. In animals and

humans, fatty acids are predominantly stored in adipose tissue as triglyceride. Most fatty acids in adipose tissue are obtained from dietary fat. Evolutionarily, the ability to store lipid conferred an advantage, because organisms that efficiently stored energy survived when food was scarce. Now, this tendency for storage contributes to the growing obesity epidemic and its associated multiple problems. Interestingly, when surplus food is available, excess carbohydrate generally is oxidized rather than converted to fatty acids by DNL. Not all body fat is created equal. The fat that accumulates beneath the skin, subcutaneous fat, is much less harmful to health — than fat around the midsection — belly fat, abdominal fat = visceral fat. Belly fat promotes aging. Visceral fat refers to body fat that is stored inside the abdominal cavity, around the internal organs (viscera), and it has uniquely harmful effects on health. For example, in older women, the ratio of waist to hip circumference is “strongly and positively associated with mortality in a dose-response manner“, and is a better marker of mortality and health risks than body mass index.

Visceral fat is a significant risk factor for breast cancer in women, and for prostate cancer in men, It is a strong predictor of heart disease in men. The likely source for all of these risks is that visceral fat promotes insulin resistance and ultimately diabetes.

Conclusion; fats are important to all functions in the body and have a major influence on the aging processes. It is, therefore, we should keep the fat level as low as possible in the different parts of our body. During the aging process, it is hard to impossible for most people to keep full control of the fat % due to many reasons. Some are even valid reasons. Individual levels must be checked and recorded over the years and kept within ranges of danger. At any time it is important to know that fat has a reason, a season and can be treason.

- **Vitamins and minerals**

It is important to understand the difference between vitamins and minerals for an overall functional oversight.

	Vitamins	**Minerals**
Chemical composition	Organic substance	Inorganic substance
Source	Plants and animals	Soil and rock
Vulnerability	Easily destroyed by heat, chemical reaction or environment	Not sensitive to external factors
Nutritional requirement	Necessary for proper function of the body	Not all are required and amount often is very little

VITAMIN	BENEFITS	GOOD FOOD SOURCES
RETINOIDS AND CAROTENE (vitamin A; includes retinol, retinal, retinyl esters,	Essential for vision Keeps tissues and skin healthy. Plays an important role in bone growth and in the immune system. Carotenoids act as antioxidants.	**Sources of retinoids:** beef liver, eggs, shrimp, fish, fortified milk, butter, cheddar cheese, Swiss cheese **Sources of beta-carotene:** sweet potatoes, carrots, pumpkins, squash, spinach, mangoes, turnip greens
THIAMIN (vitamin B_1)	Helps convert food into energy. Needed for healthy skin, hair, muscles, and brain and is critical for nerve function.	Pork chops, brown rice, ham, soymilk, watermelons, acorn squash
RIBOFLAVIN(vitamin B_2)	Helps convert food into energy. Needed for healthy skin, hair, blood, and brain	Milk, eggs, yogurt, cheese, meats, green leafy vegetables, whole and enriched grains and cereals.
NIACIN (vitamin B_3, nicotinic acid)	Helps convert food into energy. Essential for healthy skin, blood cells, brain, and nervous system	Meat, poultry, fish, fortified and whole grains, mushrooms, potatoes, peanut butter
PANTOTHENIC ACID (vitamin B_5)	Helps convert food into energy. Helps make lipids (fats),	Wide variety of nutritious foods, including chicken, egg yolk, whole

	neurotransmitters, steroid hormones, and hemoglobin	grains, broccoli, mushrooms, avocados, tomato products
PYRIDOXINE (vitamin B_6, pyridoxal, pyridoxine, pyridoxamine)	Aids in lowering homocysteine levels. Helps convert tryptophan to niacin and serotonin, a neurotransmitter that plays key roles in sleep, appetite, and moods. Helps make red blood cells Influences cognitive abilities and immune function	Meat, fish, poultry, legumes, tofu and other soy products, potatoes, non-citrus fruits such as bananas and watermelons
COBALAMIN (vitamin B_{12})	Aids in lowering homocysteine levels. Assists in making new cells and breaking down some fatty acids and amino acids. Protects nerve cells and encourages their normal growth Helps make red blood cells and DNA	Meat, poultry, fish, milk, cheese, eggs, fortified cereals, fortified soymilk
BIOTIN	Helps convert food into energy and synthesize glucose. Help make and break down some fatty acids. Needed for healthy bones and hair	Many foods, including whole grains, organ meats, egg yolks, soybeans, and fish
ASCORBIC ACID (vitamin C)	Help make collagen and support blood vessel walls. Help make the neurotransmitters serotonin and norepinephrine Acts as an antioxidant, neutralizing unstable molecules that can damage cells. Bolsters the immune system	Fruits and fruit juices (especially citrus), potatoes, broccoli, bell peppers, spinach, strawberries, tomatoes, Brussels sprouts
CHOLINE	Helps make and release the neurotransmitter acetylcholine, which aids in many nerve and brain activities. Plays a role in metabolizing and transporting fats	Many foods, especially milk, eggs, liver, salmon, and peanuts

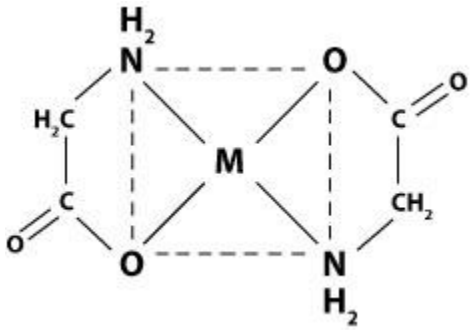
CALCIFEROL (vitamin D)	Helps maintain normal blood levels of calcium and phosphorus, which strengthen bones. Helps form teeth and bones.	Fortified milk or margarine, fortified cereals, fatty fish
ALPHA-TOCOPHEROL (vitamin E)	Acts as antioxidant, neutralizing unstable molecules that can damage cells. Protects vitamin A and certain lipids from damage.	A wide variety of foods, including vegetable oils, salad dressings, and margarine made with vegetable oils, wheat germ, leafy green vegetables, whole grains, nuts
FOLIC ACID(vitamin B_9, folate, folacin)	Vital for new cell creation.	Fortified grains and cereals, asparagus, okra, spinach, turnip greens, broccoli, legumes like black-eyed peas and chickpeas, orange juice, tomato juice
PHYLLOQUINONE, MENADIONE (vitamin K)	Activates proteins and calcium essential to blood clotting.	Cabbage, liver, eggs, milk, spinach, broccoli, sprouts, kale, collards, and other green vegetables

Available minerals

Minerals are important for our body. But only in very small amounts. Besides the amount the shape of delivery is important. Our body is not able to consume minerals when not chelated. The shape of chelation is the point of interest.
CHELATION is a natural process. The word chelate derives from the Greek word “chel”, meaning a crab’s claw, and refers to the pincer-like manner in which the metal is bound. Chemically, a chelate is a compound from complexing of cations with organic compounds resulting in a ring structure.

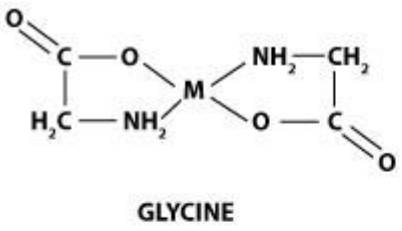
Minerals have the ability and need to chemically interact as soon as possible. To prevent chemical reactions between minerals within an organism nature did create the option of chelation. Encapsulating or inactivating chemical reactions when entering the biological entity. The best chelating partners are Hydroxamate Siderophores, Organic Acids, and Amino Acids.

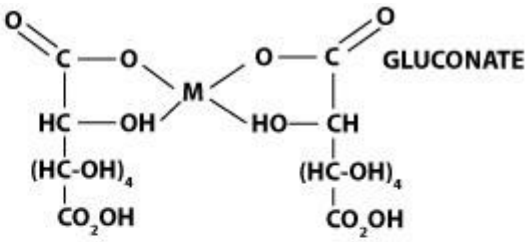
Organic acids and amino acids such as citric acid and glycine are naturally occurring chelating agents. Glycine is the simplest amino acid with a molecular weight of 75. The chelates usually contain 2 moles of ligand (glycine) and one mole of metal as demonstrated in the following figure.

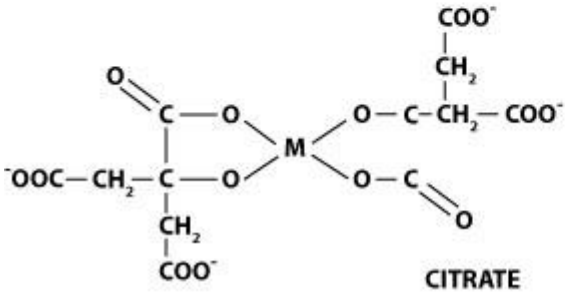


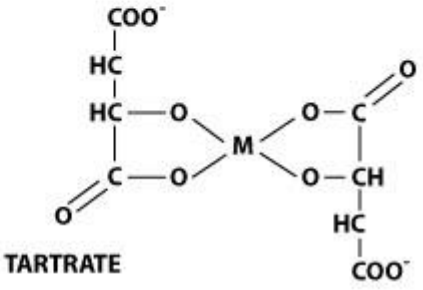
Citric acid is one of the organic acids commonly used as chelating agents. Other naturally occurring organic acids such as malonic acid and gluconic acid also play an important role in plant mineral nutrition.

The typical structure of chelates with known organic acids are shown below for citric acid, tartaric acid, gluconic acid, and glycine.









M=Metal

Why is chelation important for nature and the human being?

1. Increase the availability of nutrients.
2. Prevent mineral nutrients from forming insoluble precipitates.

An example is an iron in high pH soil. In high pH soil, iron reacts with a hydroxyl group (OH^-) to form the insoluble ferric hydroxide ($Fe(OH)_3$) which is not available to plants.

Fe^{+3} + 3 OH- ———> $Fe(OH)_3$
Soluble Insoluble
Chelation prevents this reaction from happening and hence render iron available to plants.

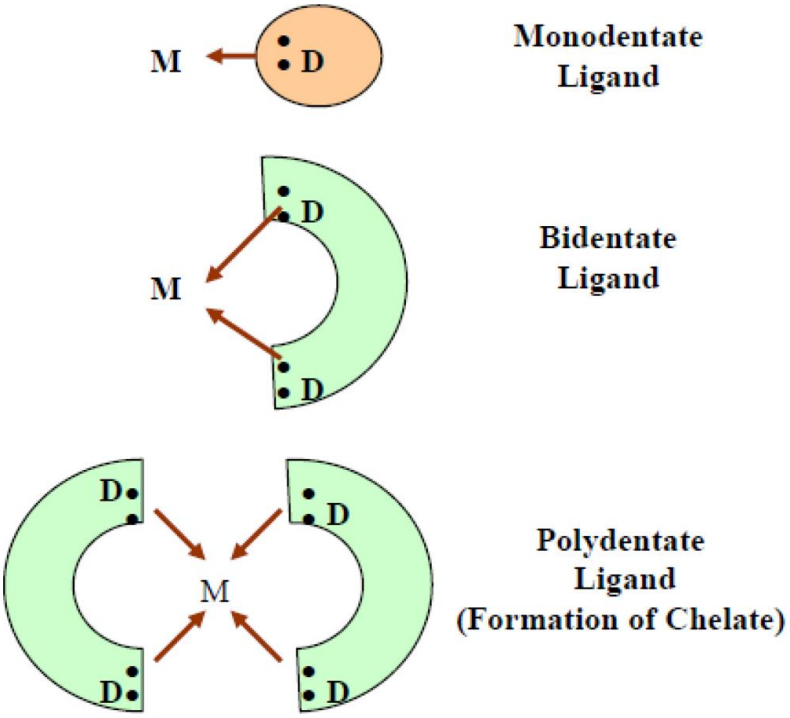
1. Reduce toxicity of some metal ions to plants. Chelation in the soil may reduce the concentration of some metal ions to a non-toxic level.
2. Prevent nutrients from leaching. Metal ions forming chelates are more stable than the free ions. Chelation process reduces the loss of nutrients through leaching.
3. Increase the mobility of plant nutrients. Chelation increases the mobility of nutrients in the soil. This increased mobility enhances the uptake of these nutrients by plants.
4. Suppress the growth of plant pathogens.
5. Some chelating agents may suppress the growth of plant pathogens by depriving iron and hence favor plant growth.

(with gratitude to the company JH Biotech)

MINERAL	BENEFITS	GOOD FOOD SOURCES
CALCIUM	Builds and protects bones and teeth. Helps with muscle contractions and relaxation, blood clotting, and nerve impulse transmission. Plays a role in hormone secretion and enzyme activation. Helps maintain healthy blood pressure	Yogurt, cheese, milk, tofu, sardines, salmon, fortified juices, leafy green vegetables, such as broccoli and kale (but not spinach or Swiss chard, which have binders that lessen absorption)
CHLORIDE	Balances fluids in the body. A component of stomach acid, essential to digestion	Salt (sodium chloride), soy sauce, processed foods
CHROMIUM	Enhances the activity of insulin, helps maintain normal blood glucose levels, and is needed to free energy from glucose	Meat, poultry, fish, eggs, potatoes, some cereals, nuts, cheese
COPPER	Plays an important role in iron metabolism and the immune system. Helps make red blood cells	Liver, shellfish, nuts, seeds, whole-grain products, beans, prunes, cocoa, black pepper
FLUORIDE	Encourages strong bone formation. Keeps dental cavities from starting or worsening	Water that is fluoridated, toothpaste with fluoride, marine fish, teas
IODINE	Part of the thyroid hormone, which helps set body temperature and influences nerve and muscle function, reproduction, and growth. Prevents goiter and a congenital thyroid disorder	Iodized salt, processed foods, seafood

IRON	Helps hemoglobin in red blood cells and myoglobin in muscle cells ferry oxygen throughout the body. Needed for chemical reactions in the body and for making amino acids, collagen, neurotransmitters, and hormones	Red meat, poultry, eggs, fruits, green vegetables, fortified bread and grain products
MAGNESIUM	Needed for many chemical reactions in the body Works with calcium in muscle contraction, blood clotting, and regulation of blood pressure. Helps build bones and teeth	Green vegetables such as spinach and broccoli, legumes, cashews, sunflower seeds and other seeds, halibut, whole-wheat bread, milk
MANGANESE	Helps form bones. Helps metabolize amino acids, cholesterol, and carbohydrates	Fish, nuts, legumes, whole grains, tea
MOLYBDENUM	Part of several enzymes, one of which helps ward off a form of severe neurological damage in infants that can lead to early death	Legumes, nuts, grain products, milk
PHOSPHORUS	Helps build and protect bones and teeth. Part of DNA and RNA. Helps convert food into energy. Part of phospholipids, which carry lipids in blood and help shuttle nutrients into and out of cells	A wide variety of foods, including milk and dairy products, meat, fish, poultry, eggs, liver, green peas, broccoli, potatoes, almonds
POTASSIUM	Balances fluids in the body. Helps maintain a steady heartbeat and send nerve impulses. Needed for muscle contractions. A diet rich in potassium seems to lower blood pressure. Getting enough potassium from the diet may benefit bones	Meat, milk, fruits, vegetables, grains, legumes
SELENIUM	Acts as antioxidant, neutralizing unstable molecules that can damage cells. Helps regulate thyroid hormone activity	Organ meats, seafood, walnuts, sometimes plants (depends on soil content), grain products
SODIUM	Balances fluids in the body. Help send nerve impulses. Needed for muscle contractions. Impacts blood pressure; even modest reductions in salt consumption can lower blood pressure	Salt, soy sauce, processed foods, vegetables
SULFUR	Helps form bridges that shape and stabilize some protein structures. Needed for healthy hair, skin, and nails	Protein-rich foods, such as meats, fish, poultry, nuts, legumes

ZINC	Helps form many enzymes and proteins and create new cells. Frees vitamin A from storage in the liver. Needed for immune system, taste, smell, and wound healing. When taken with certain antioxidants, zinc may delay the progression of age-related macular degeneration	Red meat, poultry, oysters and some other seafood, fortified cereals, beans, nuts



Choice of Iron in Hemoglobin

There is an important question which constantly comes back while discussing the need and choice for minerals by the body and the function of these minerals in metabolism.
One of the most life stirring choices that nature did make is the choice for Iron as part of the Hemoglobin group. To understand the choice of iron a logical processes is followed.

Nature is controlled by different powers. These main powers are:

- Gravity
- Air pressure
- Electricity
- Magnetism

Beside other powers, it is needed to face these external forces as important to natural choices for the metabolism. The choice of the most important mineral in the body is one issue that needs to be understood.

Nature has a wide variety of minerals to choose from to select important carriers of O2 in the human body. It chose Iron (Fe). All other minerals do play a role in the metabolism, structural build up, functionality in a minor or major role. It is beside the goal of the book to address each separate mineral to explain. The conclusion is that Fe is the best option stays put. Nature did make the right choice.

The hemoglobin and myoglobin molecules are large, complex proteins, an active site is a non-protein group called *heme*. The heme consists of a flat organic ring surrounding an iron atom. The organic part is a porphyrin ring based on porphin (a tetrapyrrole ring).

Oxygenated hemoglobin (found in blood from arteries) is bright red, but without oxygen present (as in blood from veins), hemoglobin turns a darker red. Venous blood is often depicted as blue in color in medical diagrams, and veins sometimes look blue when seen through the skin. The appearance of blood as dark blue is a wavelength phenomenon of light, having to do with the reflection of blue light away from the outside of venous tissue if the vein is ~0.02 inches deep or more.

The iron atom in heme binds to the 4 nitrogen atoms in the center of the porphyrin ring, but this leaves two free bonding sites for the iron, one on either side of the heme plane. The heme group is located in a crevice in the myoglobin molecule, surrounded by non-polar residues except for two polar histidines. One of the free binding sites of iron is joined to one of these histidines, leaving the final bonding site on the other side of the ring available to bond with oxygen.

The second histidine group is nearby and serves several purposes. It modifies the shape of the crevice in a way that only small molecules can get in to react with the iron atom, and it helps to make the reaction reversible, such that the oxygen can be released when required by nearby tissues.

Both O2 and CO2 bind reversibly to hemoglobin, but certain other molecules, like carbon monoxide, are small enough to fit into the protein crevice, but form such strong bonds with the iron that the process is irreversible. Thus high concentrations of CO rapidly use up the body's limited supply of hemoglobin molecules and prevent them from binding to oxygen. This is why CO is poisonous. Hemoglobin binding affinity for CO is 200 times greater than its affinity for oxygen, meaning that small amounts of CO dramatically reduces hemoglobin’s ability to transport oxygen.

Only 3 mineral metals are sensitive, to an extent, to ferromagnetism; Iron, Cobalt, and Nickle. The prefix ferro- refers to iron, because permanent magnetism was first observed in

lodestone, a form of a natural iron ore called magnetite, Fe3O4. All other materials are influenced to some extent by a magnetic field, by several other types of magnetism.

The magnetic state (or magnetic phase) of a material depends on temperature and other variables such as pressure and the applied magnetic field. A material may exhibit more than one form of magnetism as these variables change. The magnetic behavior of a material depends on its structure, particularly its electron configuration, for the reasons mentioned above, and also on the temperature. At high temperatures (such as in the body), random thermal motion makes it more difficult for the electrons to maintain alignment.

A general description of magnetism as the action is given with the following: When a material is put in a magnetic field, the electrons circling the nucleus experience, in addition to their Coulomb attraction to the nucleus, a Lorentz force from the magnetic field. Depending on which direction the electron is orbiting, this force may increase the centripetal force on the electrons, pulling them in towards the nucleus, or it may decrease the force, pulling them away from the nucleus. This effect systematically increases the orbital magnetic moments that were aligned opposite the field and decreases the ones aligned parallel to the field (in accordance with Lenz's law). This results in a small bulk magnetic moment, with an opposite direction to the applied field.

The force of magnetism is determined by the magnetic moment, a dipole moment within an atom which originates from the angular momentum and spin of electrons. Materials have different structures of intrinsic magnetic moments that depend on temperature; the Curie temperature is the critical point at which a material's intrinsic magnetic moments change direction.

Magnetic moments are permanent dipole moments within the atom which are made up from electron's angular momentum and spin, *by the relation μl = el/2me (me here is mass of an electron), (μl = magnetic moment) and (l is angular momentum)* this ratio is called as a gyromagnetic ratio.

Electrons inside atoms contribute magnetic moments from their own angular momentum and from their orbital momentum around the nucleus. Magnetic moments from the nucleus are insignificant in contrast to magnetic moments from electrons. Thermal contribution results in higher energy electrons causing disruption to their order and alignment between dipoles to be destroyed.

To explain this little inside on the different laws is needed:

- Coulomb's law is a law of physics for quantifying the amount of force with which stationary electrically charged particles repel or attract each other.
- Lorentz force is the combination of electric and magnetic force on a point charge due to electromagnetic fields. A particle of charge q moving with velocity v in the presence of an electric field E and a magnetic field B experiences a force

- Bohr–van Leeuwen theorem states that when statistical mechanics and classical mechanics are applied consistently, the thermal average of the magnetization is always zero. This makes magnetism in solids solely a quantum mechanical effect and means that classical physics cannot account for diamagnetism.
- Curie temperature (TC), or Curie point, is the temperature above which certain materials lose their permanent magnetic properties, to be replaced by induced magnetism. The Curie temperature is named after Pierre Curie, who showed that magnetism was lost at a critical temperature.

A ferromagnet, like a paramagnetic substance, has unpaired electrons. However, in addition to the electrons' intrinsic magnetic moment's tendency to be parallel to an applied field, there is also in these materials a tendency for these magnetic moments to orient parallel to each other to maintain a lowered-energy state. Thus, even in the absence of an applied field, the magnetic moments of the electrons in the material spontaneously line up parallel to one another.

Every ferromagnetic substance has its own individual temperature, called the Curie temperature, or Curie point, ***above which it loses its ferromagnetic properties***. This is because the thermal tendency to disorder overwhelms the energy-lowering due to ferromagnetic order.

This is the main reason why the human body is only very slightly magnetic and have huge magnetic fields as an MRI scan machine nearly no effect on the body.

The human body has a specific pH dependency. As mentioned pH is a semi-electric potential. Fe (Iron) is able to function well in all pH levels. This is not the case for Nickel neither Cobalt. Both metals act differently at changing pH levels. Their stability in chelation is weak, which makes them less of a choice for being a carrier of a third easy connect / easy release component such as O2.

Christian Bohr stated that at lower pH (more acidic environment, e.g., in tissues), hemoglobin would bind to oxygen with less affinity. Since carbon dioxide is in direct equilibrium with the concentration of protons in the blood, increasing blood carbon dioxide content, according to the Bohr effect, causes a decrease in pH, which leads to a decrease in affinity for oxygen by hemoglobin (and easier oxygen release in capillaries or tissues). For example, without the Bohr effect, a human could not walk or run for even 3-5 minutes. Why? In normal conditions, due to the Bohr effect, more oxygen is released in those muscles, which generate more CO2. Hence, these muscles can continue to work with the same high rate.

Toxicity: Cobalt and Nickle are both toxic to the metabolism and easily pass the toxic threshold of the body. As hemoglobin enters every part of the body and interacts

everywhere a level of toxicity of the host carriers of O2 would be seriously dangerous for the body.

Since everything in the human body is based on electric current it is important to choose a mineral that is a not a strong conductor but has higher resistivity activity at given physical temperature (36 / 37 degree) and pH level in the body. The blood is a transport system and not a part of the neural transmission system. If the blood becomes a conductor of electrical currency, the powers of the neural system will be diluted and less effective.

Material	Resistivity p(Ω•m) at 20°C	Conductivity σ(S/m) at 20°C
Copper	$1.68x10^{-8}$	$5.98x10^{7}$
Calcium	$3.36x10^{-8}$	$2.82x10^{7}$
Magnesium	$4.66x10^{-8}$	$2.15x10^{7}$
Zinc	$5.945x10^{-8}$	$1.682x10^{7}$
Cobalt	$6.25x10^{-8}$	$1.60x10^{7}$
Nickel (electrolytic)	$6.84x10^{-8}$	$1.46x10^{7}$
Lithium	$8.54x10^{-8}$	$1.17x10^{7}$
Iron	$\mathbf{9.58x10^{-8}}$	$\mathbf{1.04x10^{7}}$
Selenium	$1.197x10^{-7}$	$8.35x10^{6}$

The relative atomic weight also has a factor in the choice of elements:
Iron Atomic weight: 55.847
Nickel Atomic weight: 58.693
Cobalt Atomic weight: 58.9332
One of the reasons is the formerly mentioned powers of gravity which influence the circulation of the blood. A lower atomic weight gives a lesser total weight.

Directly after the importance of the atomic weight, the configuration
Cobalt:
Electrons: 27
Protons: 27
Neutrons in most abundant isotope:32

Nickel:

Electrons: 28
Protons: 28
Neutrons in most abundant isotope:30

Iron:
Electrons: 26
Protons: 26
Neutrons in most abundant isotope:30
There is only a little difference of 1 or 2 electrons which is of minimal influence on the total of powers.

The connective power to the most important oxidant (O2) is the weakest with Fe. The many different electrical configurations of Fe gives the body the opportunity – in the gelation of the hemoglobin group – to maximize the connective O2 possibility to 4 - O2 per hemoglobin group, which cannot be reached with other metals.

The body is air pressure sensitive. Although the percentage of oxygen in the inspired air is constant at different altitudes, the fall in atmospheric pressure at higher altitude decreases the partial pressure of inspired oxygen and the driving pressure for gas exchange in the lungs. An ocean of air is present up to 9-10 000 m, where the troposphere ends and the stratosphere begins. The weight of air above a person is responsible for the atmospheric pressure, which is normally about 100 kPa at sea level. This atmospheric pressure is the sum of the partial pressures of the constituent gases, oxygen, and nitrogen, and also the partial pressure of water vapor (6.3 kPa at 37°C). As oxygen is 21% of dry air, the inspired oxygen pressure is $0.21\times(100-6.3)=19.6$ kPa at sea level. Atmospheric pressure and inspired oxygen pressure fall roughly linearly with altitude to be 50% of the sea level value at 5500 m and only 30% of the sea level value at 8900 m (the height of the summit of Everest). A fall in inspired oxygen pressure reduces the driving pressure for gas exchange in the lungs and in turn produces a cascade of effects right down to the level of the mitochondria, the final destination of the oxygen.
Initially, traveling to altitude hemoglobin concentrations rise through a fall in the plasma volume due to dehydration. Later, hypoxia stimulates the production of erythropoietin by the juxtaglomerular apparatus of the kidney so hemoglobin production increases and hemoglobin concentrations may rise to 200 g/l. The increased viscosity of the blood coupled with increased coagulability increases the risk of stroke and venous thromboembolism.
In every part it is possible to conclude that Iron was good – maybe the best possible – choice of nature for the human body. It is very important at all time to control Fe levels during each age. While aging the ability of Fe availability (through digestion) becomes lesser. Additional Fe is advised, this said it strongly depends on physical fitness, altitude, and air quality.

The importance of Blood in aging

Defining and detecting anemia
Anemia means having a lower-than-normal count of red blood cells circulating in the blood.
Red blood cells are always counted as part of a “Complete Blood Count” (CBC) test, which is a very commonly ordered blood test.

A CBC test usually includes the following results:

- **White blood cell count** (WBCs): the number of white blood cells per microliter of blood
- **Red blood cell count** (RBCs): the number of red blood cells per microliter of blood
- **Hemoglobin** (Hgb): how many grams of this oxygen-carrying protein per deciliter of blood
- **Hematocrit** (Hct): the fraction of blood that is made up of red blood cells
- **Mean corpuscular volume** (MCV): the average size of red blood cells
- **Platelet count** (Plts): how many platelets (a smaller cell involved in clotting blood) per microliter of blood

A "normal" level of hemoglobin is usually in the range of 14-17gm/dL for men, and 12-15gm/dL for women. However, different laboratories may define the normal range slightly differently.

Anemia is often described as:

- Microcytic: red cells smaller than normal
- Normocytic: red cells of a normal size
- Macrocytic: red cells larger than normal

Symptoms of anemia

The red blood cells in the blood use hemoglobin to carry oxygen from the lungs to every cell in the body. When a person doesn't have enough functioning red blood cells, the body begins to experience symptoms related to not having enough oxygen.

Common symptoms of anemia are:

- fatigue
- weakness
- shortness of breath
- high heart rate
- headaches
- becoming paler, which is often first seen by checking inside the lower lids
- lower blood pressure (especially if the anemia is caused by bleeding)

The most common causes of anemia

Compared to most cells in the body, normal red blood cells have a short lifespan: about 100-120 days. A healthy body must produce red blood cells. This is done in the bone marrow and takes about seven days, then the new red blood cells work in the blood for 3-4 months. Once the red blood cell dies, the body recovers the iron and reuses it to create new red blood cells.

Anemia happens when something goes wrong with these normal processes. In kids and younger adults, there is usually one cause for anemia. **But in older adults, it's quite common for there to be several co-existing causes of anemia.**

The decrease in immune function mediated by lymphocytes is the most significant change with aging. Thymus involution occurs after puberty and total thymic atrophy occurs by late middle age. With these changes, thymic-mediated T lymphocyte development disappears and older individuals are dependent on their existing T lymphocyte pool to mediate T cell-dependent immune responses. In the absence of thymic function, the number of naive T cells decreases in older individuals and memory T cells are the predominant type. B lymphocyte function is dependent on T cell accessory

roles and the decreased ability to generate antibody responses, especially to primary antigens, may be the result of T cell inadequacies rather than an intrinsic fault of B lymphocytes.

Natural killer cells are increased in number, but their function is disturbed. Delayed hypersensitivity reactions are reduced in the elderly. These immunologic deficits are correlated with overall mortality in individuals over age 60. Serum immunoglobulin M and G concentrations do not change significantly in older people. Serum IgA levels increase with age. An increased prevalence of autoantibodies (e.g., anti-IgG rheumatoid factor) occurs in older people. Monoclonal plasma immunoglobulins (essential monoclonal gammopathy) are found with increasing frequency with age, reaching three percent in people over age 70 and nearly six percent in those from 80 to 89.

Few pieces of advice on the treatment of anemia:

- Exercise. Moving strengthens bones, improves marrow quality and production of red blood cells.
- Eat Iron-rich foods
- Use the Sun as energy and vitamin source. Take the time to “enjoy” the sun.
- Electrostimulation (also possible in clothing)
- Water treatment (Death sea)

After reviewing the functions of vitamins and minerals in The human body it is still not clear what their function is during the aging process. The enclosed table gives an overview of the results of different studies. These studies show the use of supplements. The results of using additional (chemical based) vitamins and minerals is rather disappointing.

Examples of controlled trials of vitamins or supplements on specific diseases

Study	Population	Condition	Intervention	Results	Effect
Heart Protection Study Collaborative Group 2002	20 536 subjects followed 5 years	Coronary heart disease, vascular occlusive disease, diabetes mellitus, hypertension	Vitamin E 600 mg/d, plus vitamin C 250 mg/d, plus beta-carotene 20 mg/d or placebo	All-cause, vascular, or nonvascular mortality, or secondary measures including major coronary events, stroke,	No difference

Study	Population	Condition	Intervention	Results	Effect
				revascularization, and cancer	
The SU.VI.MAX Study 2004 – Hercberg et al 2004	13 017 persons, age 45–60, followed 7.5 years	Cancer, cardiovascular disease or cardiovascular mortality	120 mg ascorbic acid, 30 mg of vitamin E, 6 mg of beta-carotene, 100 µg of selenium, 20 mg of zinc vs placebo	Total cancer incidence 4.1% vs 4.5%; ischemic cardiovascular disease incidence 2.1% vs 2.1%, all-cause mortality 1.2% vs 1.5%	No difference; may have a small protective effect in men
HOPE and Hope-TOO Trial 2005	3994 persons, > 55 years with CVD or cardiovascular disease; diabetes mellitus followed 7 years	Cardiovascular events and cancer	Vitamin E 400 IU/d vs placebo	Cancer incidence 11.6% vs 12.3%; cancer deaths 3.3% vs 3.7%; major cardiovascular events 21.5% vs 20.6%	No difference. Higher risk of congestive heart failure (CHF) and hospitalization for CHF
Heart Protection Study Collaborativ	15 000 men aged 40–80,	Cardiovascular disease	Daily combination of vitamin E (600 mg) vitamin C	Incidence	No significant reduction

Study	Population	Condition	Intervention	Results	Effect
e Group 2002	followed 5 years		(250 mg), and beta-carotene (20 mg)		
Meta-analysis 2005 – Miller et al 2005	135 967 participants in 19 clinical trials	All-cause mortality	Vitamin E≥400 IU/d	39 deaths per 10 000 persons (3–74 per 10 000 persons; p = 0.035)	Higher mortality
Mullan et al 2002	30 patients, 45–70 years old, with type 2 diabetes, followed 4 weeks	Hypertension	500 mg of ascorbic acid daily	Mean systolic 9.9 mmHg, mean diastolic 6.0 mmHg	Reduced systolic blood pressure
Kim et al 2002	439 subjects followed 5 years	Hypertension	500 mg of vitamin C daily	Blood pressure	No reduction
Pfeifer et al 2001	148 women, mean age 74 years	Hypertension	1200 mg calcium plus 800 IU vitamin	The decrease in systolic blood pressure of 9.3%	Improved

Study	Population	Condition	Intervention	Results	Effect
			D3 or 1200 mg calcium/day		
Ram et al 2003	Six trials	Asthma	Vitamin C supplementation	Asthma outcome	No difference
Caraballoso et al 2003	109 394 subjects	Lung cancer	Beta-carotene, alone or in combination with alpha-tocopherol or retinol, or alpha-tocopherol alone	Cancer incidence	No reduction
The Beta-carotene and Retional Efficacy Trial 1996 – Omenn et al 1996	18 314 subjects, 45–74 years, at high risk, followed 4 years	Lung cancer	Beta-carotene and retinyl palmitate compared with placebo	28% (4%–57%) higher cancer incidence and 17% (3%–33%) higher total mortality in the supplemented group	Worse outcome

Study	Population	Condition	Intervention	Results	Effect
Virtamo et al 2003	25 390 persons followed 6 years	Prostate cancer	Alpha-tocopherol	Relative risk 0.88 (0.76–1.03)	No difference
Virtamo et al 2003	25 390 persons followed 6 years	Prostate cancer	Beta-carotene	Relative risk 1.06 (0.91–1.23)	No difference
Greenberg et al 1994	864 subjects	The incidence of colon polyps	Placebo, beta-carotene (25 mg daily), vitamin C (1 g daily) and vitamin E (400 mg daily), or beta-carotene plus vitamins C and E	Relative risk 1.01 (0.85–1.20) for beta-carotene and 1.08 (0.91 to 1.29) for vitamin C and E	No difference
Rodriguez-Martin et al 2003	50 subjects, followed 1 year	Alzheimer dementia	Thiamine supplementation	Cognitive status	No benefit

Study	Population	Condition	Intervention	Results	Effect
Alzheimer's Disease Cooperative Study 1997 – Sano et al 1997	341 subjects followed 2 years	Alzheimer dementia	Vitamin E 1000 mg twice a day, selegiline 5 mg twice a day, both or placebo	Time to either death, institutionalization, the decline in activities of daily living, or progression to severe dementia	Reduced in vitamin E group (670 days) and selegiline group (655 days) compared with placebo group (440 days), higher mortality 1.08 (1.01–1.14)
Lerner et al 2002	15 subjects	Schizophrenia	Vitamin B6 400 mg vs placebo	Mental status	No difference
Taylor et al 2003	247 subjects	Depression	Folic acid	Reduction in depression scores	2.65 points, CI 0.38–4.93
Christen et al 2003	22 071 male US physicians aged 40–84	Cataract	Beta-carotene 50 mg on alternate days vs placebo	Incidence	No benefit

Study	Population	Condition	Intervention	Results	Effect
	years, followed 1 year				
Evans 2003	4119 subjects in 7 trials	Age-related macular degeneration, progression to advanced disease	Antioxidant and zinc supplementation	Risk ratio 0.72 (0.52–0.98)	Less risk
Evans 2003	4119 subjects in 7 trials	Age-related macular degeneration	Vitamin E, beta-carotene or both	Prevention	No benefit
Girodon et al 1999	725 institutionalized elderly subjects > 65 years, followed 2 years	Antibody titers, respiratory infections, urinary tract infections, the survival rate	Trace elements (zinc and selenium sulfide) or vitamins (beta-carotene, ascorbic acid, and vitamin E) or a placebo	Antibody titers after influenza vaccine were higher in the group that received trace elements alone or associated with vitamins, but the vitamin group had	Higher titers with minerals but low with vitamins

Study	Population	Condition	Intervention	Results	Effect
				significantly lower antibody titers	
Chandra 1992	96 subjects	Infection-related illness, days taking antibiotics, nutritional deficiencies	Vitamin A 400 units, beta-carotene 16 mg; thiamine 2.2 mg; riboflavin 1.5 mg; niacin 16 mg; vitamin B6 3.0 mg; folate 400 µg; vitamin C 80 mg; vitamin D 4 µg; vitamin E 44 mg; iron 16 mg; zinc 14 mg; copper 1.4 mg; selenium 20 µg; iodine 0.2 mg; calcium 200 mg; and magnesium 100 mg vs placebo (calcium, 200 mg, and	23 (23–28) vs 48 fewer infection-related illness days; 18 (12–16) vs 32 fewer days taking antibiotics	Improved

Study	Population	Condition	Intervention	Results	Effect
			magnesium, 100 mg)		
El-Kadiki et al 2005	8 trials in older adults	Days with infection, at least one infection, incident infections	Any combination of vitamin or mineral supplements	14(10–18) fewer days with infection; at least one infection 1.10 (0.81–1.50); incident infections 0.89 (0.78–1.03)	Fewer days with an infection, no difference in incident infections
Gillespie et al 2003	Frail elderly subjects	Hip fracture and vertebral fracture incidence	Vitamin D3 supplementation along with calcium	Risk ratio 0.74 (0.60–0.91)	Less risk
Gillespie et al 2003	Frail elderly subjects	Hip fracture and vertebral fracture incidence	Vitamin D3 supplementation alone without calcium	Risk ratio 1.20 (0.83–1.75)	No difference
Gillespie et al 2003	In healthy younger,	Hip fracture	Vitamin D3 supplementatio	Risk ratio 0.36 (0.01–8.78)	No difference

Study	Population	Condition	Intervention	Results	Effect
	ambulatory subjects		n along with calcium		
Gillespie et al 2003	In healthy younger, ambulatory subjects	Nonvertebral fracture	Vitamin D3 supplementation alone with calcium	Risk ratio 0.46 (0.23–0.90)	Less risk

(with reference to Vitamins in Aging, Health, and Longevity. David R Thomas)

Conclusion: the use of additional vitamins and minerals in form of supplementation is only to advise with the assistance of professional assistance and laboratory testing of blood and other samples, otherwise any use of additional supplementation is a waste of money.

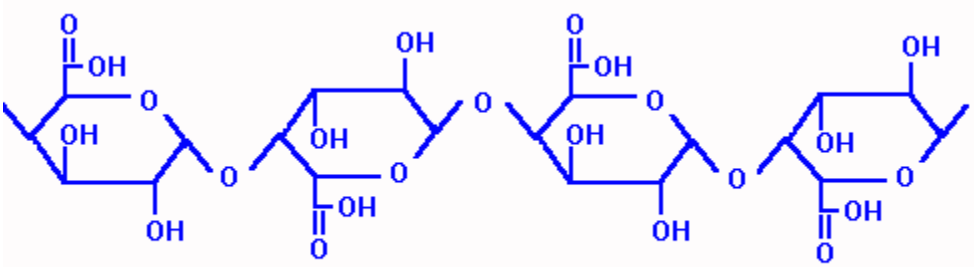
- **Fibers**

Dietary fiber is a plant-based nutrient and a type of carbohydrate, unlike other carbs, it cannot be broken down by the human digestive system into digestible sugar molecules. Fiber passes through the intestinal tract relatively intact.

Fiber is important to digestion and regularity, weight management, blood sugar, cholesterol maintenance and it is linked to longevity and decreasing the risk of diseases.

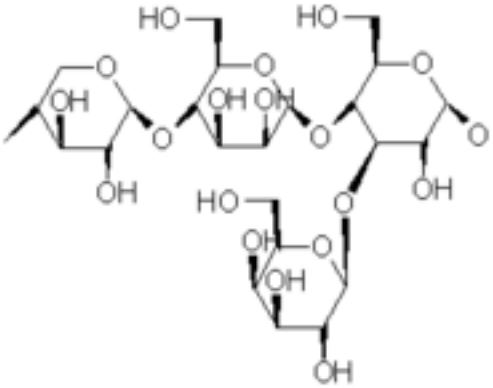
Fiber can be put into two categories: soluble and insoluble fiber. Plant-based foods contain both soluble and insoluble fiber. Soluble fiber, such as pectin, gum, and mucilage, dissolves in water; insoluble fiber, such as cellulose and lignin, do not. In the body, soluble fiber dissolves and becomes a gel-like substance. Insoluble fiber mostly retains its shape while in the body.

Soluble fiber helps to decrease blood glucose (blood sugar) levels. It also helps lower blood cholesterol. Insoluble fiber speeds up the passage of food through the digestive system. This helps maintain regularity and prevent constipation. It also increases fecal bulk, which makes stools easier to pass.



Pectin (polygalacturonic acid)

Solvable fiber

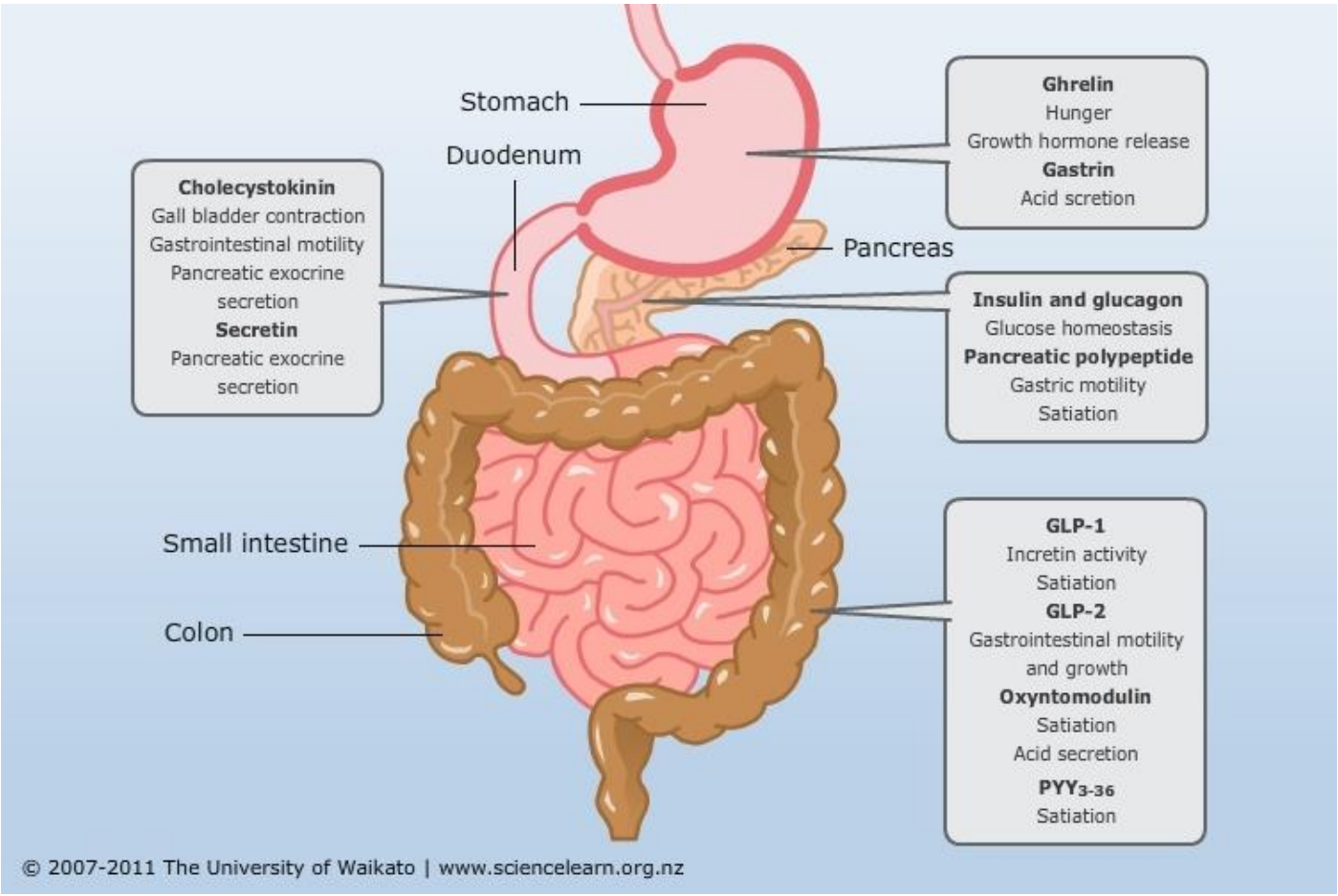


- Xylose - ß(1,4) - Mannose - ß(1,4) - Glucose -
- alpha(1,3) - Galactose

Hemicellulose

Unsolvable fiber

The difference is found in the chemical structure (open or closed) which makes the fiber solvable or not. Fibers do play an important role in relation to function in age control. Fiber-rich diets show to give a better control of the gut flora. This gut flora is one of the first parts of the body which degenerate while aging. In current knowledge, it is not yet established how it happens but the first part of aging starts with a malfunctioning of digestion intake. When building materials (the mentioned other food parts) are not digestively prepared for uptake the body is no longer able to recover and restore damaged tissues, nor has the energy to fight diseases. This is the main area fibers are active. in.



The effects of fibers on health are;

- Digestive aid – there is a need for fibers to keep the liquids inside the system so that “water” can be trapped and used to fill the colon and intestine. Both muscular based organs need to have a “grip” on foods to let them pass, ***even against gravity***, from the mouth into the bloodstream. All food is guided by the muscular movements of the digestive system. Fibers fill the foods until they are easier to transport.
- Bacteria in the digestive tract need food and foundation. Fibers can be used as vehicle and food. Bacteria look for fibers to settle down and do their part of work in the digestive system such as fermentation.

- Fibrin fibers are the most stretchable known fibers existing (be stretched to 4.3 times their length before breaking) in nature are important to our blood. They play a strong role in blood clotting but also in heart functions (attacks and strokes). Blood clots are a three-dimensional network or mesh of fibrin fibers, stabilized by another protein called factor XIIIa. Fibrin fibers measure about 100 nanometers in diameter, roughly 1,000 times smaller than a human hair.
- Elastic skin fibers are synthesized by fibrocytes. These fibers are capable of extension to approximately twice their length at rest. In contrast to collagen bundles, elastic fibers are wavy and branching. Elastic fibers in the papillary dermis are present either as bundles of microfibrils, oxytalan fibers or as cross-linked elastin on one hand or as elaunin fibers on the other. In the reticular dermis, elastic tissue appears mainly as elastin. The elastic fiber is formed from the elastic microfibril (consisting of numerous proteins such as microfibrillar-associated glycoproteins, fibrillin, fibulin, and the elastin receptor) and amorphous elastin.
- Resistant starch (RS) is a form of starch that resists digestion in the small intestine and, as such, is classified as a type of dietary fiber. RS can be categorized as one of five types (RS1–5), some of which occur naturally in foods such as bananas, potatoes, grains and legumes and some of which are produced or modified commercially, and incorporated into food products.
- RS-rich foods may be particularly useful for managing diabetes. Dietary fiber is almost universally defined as the material isolated by methods approved by the Association of Official Analytical Chemists (AOAC). Older AOAC methods measured non-starch polysaccharides (NSP), lignin, some inulin and some resistant starches and non-digestible oligosaccharides, but not all (Prosky et al. 1988; Lee et al. 1992). There are five types of RS.

    - RS1 – inaccessible to digestive enzymes due to the physical barriers formed by cell walls and protein matrices. Less resistant to digestion compared with other types.
    - RS2 – starches protected from digestion due to their crystalline structure.
    - RS3 – retrograded starch formed when starchy foods (e.g. potatoes, pasta) are cooked then cooled. Long-branched chains of amylopectin form double helices that cannot be hydrolyzed by digestive enzymes.
    - RS4 – chemically modified starch formed by cross-linking, etherization or esterification.
    - RS5 – two different components have been proposed as RS5. The first comprises amylose-lipid complexes, which either form during processing and reform after cooking or can be created artificially and added to foods (Seneviratne & Biliaderis 1991; Hasjim et al. 2010, 2013; Lau et al. 2016). The second is resistant maltodextrin, which is processed to purposefully rearrange starch molecules (Mermelstein 2009). The majority of publications describe RS5 as amylose-lipid complexes.
- Amylose is digested slowly, whereas amylopectin is digested rapidly. Resistant starch and gut health RS has been noted to increase the production of SCFA in the gut and also to modulate the composition of gut microbiota, but there appears to be significant inter-individual variation in responses and health implications of these changes remain to be elucidated.

Resistant starch and glucose metabolism

There is good evidence that postprandial glycemic responses to RS are reduced compared to digestible carbohydrates. As such, there is an approved health claim in the EU stating that baked products containing at least 14% RS in place of digestible starch reduce postprandial glycemia. There may be synergism between RS and other fiber types in reducing glycemic responses.

Different types of fibers for human consumption

Cellulose	E 460	cereals, fruit, vegetables (in all plants in general)
Chitin	—	in fungi, the exoskeleton of insects and crustaceans
Hemicellulose		cereals, bran, timber, legumes
Hexoses	—	wheat, barley
Pentose	—	rye, oat
Lignin	—	stones of fruits, vegetables (filaments of the garden bean), cereals
Xanthan gum	E 415	production with Xanthomonas-bacteria from sugar substrates
Resistant Starch		Can be starch protected by seed or shell (type RS1), granular starch (type RS2) or retrograded starch (type RS3)
Resistant Starch	—	high amylose corn, barley, high amylose wheat, legumes, raw bananas, cooked and cooled potatoes etc.
water-soluble dietary fibers		
Arabinoxylan (a hemicellulose)	—	psyllium[13]
Fructans		replace or complement in some plant taxa the starch as a storage carbohydrate

Inulin	—	in diverse plants, e.g. topinambour, chicory, etc.
Polyuronide		
Pectin	E 440	in the fruit skin (mainly apples, quinces), vegetables
Alginic acids (Alginates)	E 400–E 407	in Algae
Sodium alginate	E 401	
Potassium alginate	E 402	
Ammonium alginate	E 403	
Calcium alginate	E 404	
Propylene glycol alginate (PGA)	E 405	
agar	E 406	
carrageen	E 407	red algae
Raffinose	—	legumes
Xylose	—	monosaccharide, pentose
Polydextrose	E 1200	synthetic polymer, ca. 1kcal/g

Lactulose	—	synthetic disaccharide

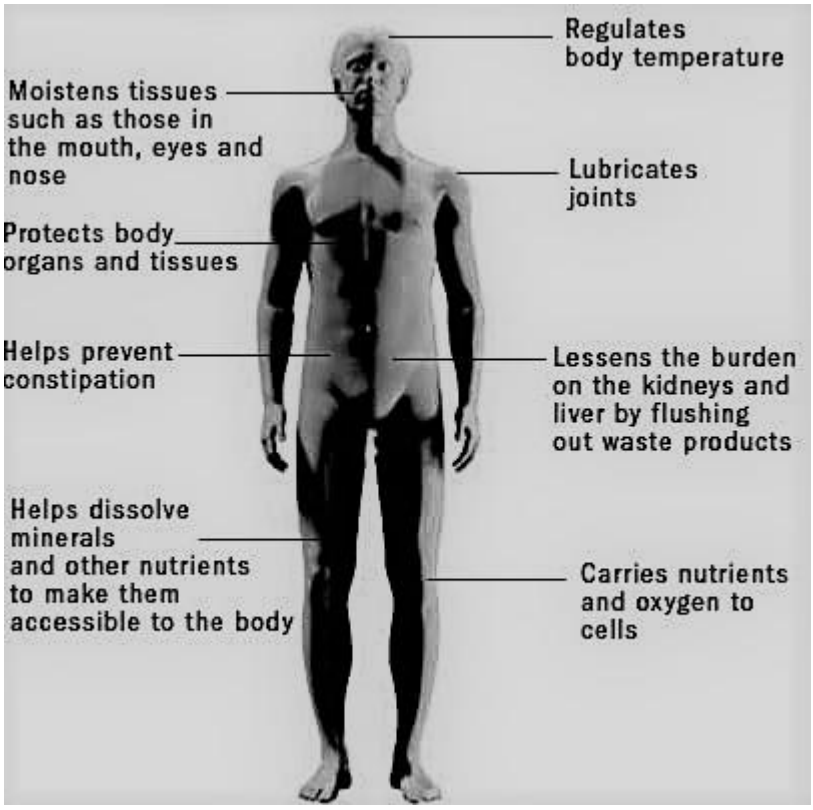
Conclusion; Fibers do have a wide range of functions in the body. It must be clear that there is a distinction between pure carbohydrate constructed fibers and fiber networks made of proteins when we define the right group of fibers.

Liquids

Why call it liquid and not water? Nobody drinks water. Water in its purest form does not contain anything else than H2O. This is hardly available on earth. All water known to men is a solution of minerals and other chemicals in this base of H2O. To get pure water it is needed to sterilize and let the liquid pass many chemical actions. That is why it is all about liquids.

DETERMINANTS CONSTITUENTS	Results expressed in mg/ℓ unless specifically stated.	
	Purified Rainwater	WHO-QC Standard Recommended Limits
Conductivity (µS/cm)	148	Not Specified
Total Dissolved Solids (TDS @ 105 °C)	103	< 500
Total Suspended Solids (TSS)	BDL	Must be absent
Turbidity (NTU)	0.16	< 0.5 (Target < 0.2)
NTU after 0.2-µ lab filtration test	0.14	Shows filterable content
Colour (Pt/Co Units)	15	< 30 (Target < 20)
Odour (Instrumentation) (TON)	Not Done	< 5.0 (Target < 4.0)
ρH	7.12	6.5 to 8.5
Alkalinity (Total)	29.3	20 to 200
Total Hardness (TDH as $CaCO_3$)	3.73	20 to 200
Calcium (Ca as $CaCO_3$)	3.44	10 to 200
Magnesium (Mg as $CaCO_3$)	0.29	5 to 150
Aluminium (Aℓ) (µg/ℓ)	BDL	< 150
Copper (Cu) (µg/ℓ)	7	< 200
Iron (Fe) Total (µg/ℓ)	BDL	< 200 (Target < 20)
Iron (Fe – Dissolved) (µg/ℓ)	BDL	Target < 20
Manganese (Mn) Total (µg/ℓ)	BDL	< 50 (Target < 10)
Total Heavy Metal Content (µg/ℓ)	BDL	< 10 (Target = 0)

This is a typical liquid water analysis. It is clear that water is never really “clean”.
It is important to know this fact in coming topics. There is interference of ingredients of the liquids with all that is eaten and the human body. These chemical reactions are partly responsible for actions in the body initiating aging processes. Hereby a summary of liquids active in the body:



Other body fluids are:

1. Bile

Bile is a brown to the dark green fluid that is produced by the liver, stored in the gallbladder (a synonym for bile is gall), and released into the intestines when we eat. It is partly responsible for the color of vomitus and stool. Its most important ingredient is bile salts, which function like soap to break down dietary fats, enabling them and fat-soluble vitamins such as A, D, and E to be absorbed. They also help to prevent the cholesterol-containing bile in the gallbladder from forming gallstones.

About 15 grams of bile salts are excreted into the intestine each day, yet the human body contains only about five grams in total. How is this possible? The answer is that bile salts are recycled, being reabsorbed into the blood through the small intestine and then secreted again by the liver.

2. Blood

The most important body fluid is blood. The average adult contains about six liters of blood, which functions to transport oxygen to cells, carry metabolic waste products such as carbon dioxide away from cells and transport infection-fighting white blood cells, glucose, hormones and other essential substances throughout the body. Blood also contains cell fragments called platelets and clotting factors that help to seal leaks that may develop in blood vessels.

An adult's body contains about 25 trillion red blood cells – about one-third of all the body's cells. Red blood cells survive on average about 120 days, which means that every second of every day, an adult human produces about two million red blood cells. If lined up end to end, the tiny blood vessels in which gas is actually exchanged, the capillaries, would reach a length of about 40,000 km.

3. Menstrual fluid

The average woman menstruates every 28 days over 42 years of her life, for a total of about 520 menstrual periods. The average volume of menstrual fluid is approximately 40 milliliters or about 2.5 tablespoons in total. The fluid itself is about one-half blood and contains tissue from the inner lining of the uterus, mucus, and secretions from the vagina. If the amount of bleeding is abnormally high, it can result in anemia, a deficit of red blood cells.

4. Mucus

A slippery, clear liquid produced by mucous glands, it lines the cells of the bronchi in the lungs, the stomach and intestines, the urinary and reproductive tracts, and the eyes and ears. Mucus contains a variety of important substances, including antiseptic enzymes, antibodies, and mucins that give mucus its gel-like properties. The average adult produces about one liter of mucus per day.

Mucus keeps the lining of the respiratory system from drying out and also filters out dust and infectious agents in the air we breathe. Microscopic hair-like projections from the cells lining the lung's air passages help to propel the mucus back up toward the mouth at a speed of about one millimeter per minute, where it can be swallowed or expectorated.

5. Pus

A white, yellow or brown viscous fluid that accumulates at sites of infection, pus usually consists of bacteria, white blood cells, and other proteins and cell debris. Pus under the skin is often found in a pustule, but deeper in the body a larger collection is known as an abscess. Pimples and abscesses represent the body's attempt to contain the spread of an infection.

6. Semen

Semen, the fluid released by males at ejaculation, generally contains spermatozoa, the gametes that fertilize the female egg, though this is not the case for males who have undergone the most common sterilization procedure, vasectomy.

In addition to providing a medium through which sperm can "swim," semen also contains fructose, a sugar that nourishes the sperm, as well as alkaline secretions that help to neutralize the normally acidic environment of the vagina.

7. Saliva

Saliva is secreted by salivary glands in and around the mouth. The average adult produces about a liter of saliva per day, with peak secretion at meals. Like mucus, saliva contains antibacterial enzymes and antibodies, as well as mucus itself. Saliva helps to moisten food, which is important to lubricate chewing and swallowing. It also enhances taste, because if the chemicals in food were not in a liquid medium, they could not be detected by taste receptors.

8. Sweat

Sweat, like saliva, consists almost entirely of water, though it also contains minerals that account for its salty taste. Sweat production can vary widely between one-tenth of a liter and eight liters per day, and during intense exercise, an adult may produce two liters per hour or more. The body's three million sweat glands come in two types. Eccrine glands are found all over the body, with the highest density in palms and souls. Apocrine glands are located most prominently in the armpits.

9. Tears

Tears are produced by the lacrimal glands above and lateral to the eye and are spread over the eye's surface by blinking. They are drained into the nasal cavity, which explains why people often get a runny nose when they cry. Tears serve three functions: to lubricate the eye, to remove irritants such as smoke

(and a sulfuric acid-producing chemical from cut onions) and in association with emotional states such as sorrow and joy.

Dry eye syndrome, the most common eye disease, affects as many as one-third of elderly people, though it can occur at any time in life. The most common cause is decreased tear production, which in most patients occurs for no known reason, though it is associated with a variety of diseases and medications. The most common treatment involves, naturally enough, the use of eye drops.

10. Urine

The average adult produces about 1.5 liters of urine per day. Produced by the kidneys and stored by the bladder, urine contains many substances that must be removed from the body to maintain a state of health. These include the breakdown products of protein metabolism, which would become toxic if they were allowed to accumulate in the blood. Urine also serves as the principal means for removing excess salt and water from the body.

A common diagnostic procedure in medicine is urinalysis. Finding glucose in urine could indicate that a patient is suffering from diabetes mellitus, a disease that got its name in part from the fact that the urine of diabetic patients tastes sweet. Likewise, finding bacteria suggests that the patient is suffering from a urinary tract infection. Interestingly, most of the amniotic fluid that cushions a fetus in utero is made up of urine produced by the fetus' kidneys.

11. Vomitus

Vomitus differs from the other body fluids discussed here because it is not produced under everyday circumstances. Everyone vomits at some point in their life in response to one of several types of stimuli. The balance center of the inner ear can induce vomiting, as in motion sickness. Another cause is irritation of the gastrointestinal tract by infections and poisons.

In some cases, vomiting purges the body of toxins, but in other cases, vomitus contains only food. In either case, the fluid is usually highly acidic, because of the acids normally secreted by the stomach. In individuals who vomit frequently, such as patients with bulimia, this acid can erode the surface of the teeth and cause dangerous changes in the pH balance of the blood. The presence of blood in vomitus is generally a sign of bleeding from the esophagus or stomach.

In the human body, there are many active liquids with each its specific function. These functions vary in interior and exterior excretion. Fact is that they all are based on the water with additional chemicals. The amount of liquid in the body is decreasing with age. The total amount of water-related substances goes slowly down which makes blood thicker, digestion more difficult, sweating harder and urination more often. The balance slowly turns to negative which has an effect on all bodily functions. To drink more liquids is not an option as the body will not store more liquids than it can handle.

Conclusion: during the aging process the water balance is changing. Hydration is an important tool for activity. It is important to pay attention to the way how the body responds to certain liquids and how it will be possible to keep the body in a constant state of optimal saturation. One of the first physical responders on bad liquid filling is the skin. Watch the skin flexibility and tonus for a clear view on liquid balancing.

Antioxidants & Pro-oxidants

Substances that inhibit oxidative changes in molecules. Many oxidative changes are destructive and this applies as much to the human body as to non-biological chemistry. But oxidation is also a need to get energy. Without energy, there is no living. This implies we do need controlled oxidation and when it becomes a threat to wellbeing it should be constrained. This is the role of anti-oxidant: constrain the negative effects of oxidation.

Radicals in Biology

In 1956, Denham Harman published his seminal Free Radical Theory of Aging. In 1972, Harman identified the mitochondria as the primary source of cellular ROS generation. Much research focused on mitochondrial ROS (mtROS mitochondrial Reactive Oxidative Species), in particular, the possibility of mtROS "leakage" to other cellular compartments, and the effects of oxidative damage to sensitive mitochondrial DNA (mtDNA). Subsequent research has shown that mtROS "leakage" is much less than originally thought. "The physiological level of ROS emission from mitochondria is minimal. Experiments have shown that oxidase overexpression lowering mtOS (mitochondrial Oxidative Stress) and mtDNA mutations, does not increase lifespan. Furthermore, increased mutations in mtDNA (500 fold) produce no signs of accelerated aging.

Given the recognized destructive potential of ROS and the ability of antioxidants to neutralize them, why has antioxidant supplementation failed to produce consistent, positive outcomes, in many cases, causing harm, even increasing oxidative stress?

ROS, RNS, and RSS

The oxygen molecule (O2) is relatively stable. Many oxygen-containing compounds on the other hand, such as peroxides and superoxide's, are highly reactive free radicals, collectively called "reactive oxygen species" or ROS. ROS are often byproducts of cellular energy production. Many, like superoxide, are produced by the body using enzymes for goal related purposes. Free radicals containing nitrogen are referred to as "reactive nitrogen species" or RNS. RNS result from the reaction of nitric oxide and superoxide to produce peroxynitrite, and related compounds. Both ROS and RNS are highly reactive and can damage proteins, lipids, and DNA. RNS-induced damage is sometimes referred to as "nitrosative stress, to distinguish it from "oxidative stress."

Due to their destructive potential, superoxide and RNS are produced by the body as a defense to foreign pathogens. Superoxide production is controlled by a regulated network of enzymes. Sulfur-containing radicals are referred to as "RSS" (reactive Sulphur species). They result from the reaction of thiols with ROS. Both RNS and RSS result from reactions involving ROS.

Reactive oxygen species (ROS) some returning questions answered.
(1) Are all free-radicals are positively charged?
positively charged free radicals in biological systems are not common. The fact is that most biological free radicals are negative or neutral. They follow the octet rule.
(2) Are all antioxidants negatively charged?

There are a few, but most of them are neutral. Generally, antioxidants have conjugated pi systems, which allow electron delocalization and different resonance structures. This allows the antioxidant to donate an electron to a radical without becoming overly reactive itself.

Prooxidants

Prooxidant refers to any endobiotic or xenobiotic that induces oxidative stress either by the generation of ROS or by inhibiting antioxidant systems. It can include all reactive, free radical containing molecules in cells or tissues. Prooxidants may be classified into several categories.

Some antioxidant flavonoids have acted as prooxidant when a transition metal is available. The antioxidant activities and the copper-initiated prooxidant activities of these flavonoids depend on their structures. The OH substitution is necessary for the antioxidant activity of a flavonoid. Flavone and flavanone, which have no OH substitutions and which provide the basic chemical structures for the flavonoids, show neither antioxidant activities nor copper-initiated prooxidant activities. The copper initiated prooxidant activity of a flavonoid also depends on the number of free OH substitutions on its structure. The more the OH substitutions, the stronger the prooxidant activity. O-Methylation and probably also other O-modifications of the flavonoid OH substitutions inactivate both the antioxidant and the prooxidant activities of the flavonoids.

Sample: The antioxidant activity of quercetin (a yellow crystalline pigment C15H10O7 occurring usually in the form of glycosides in various plants) has been found to be better than its monoglucosides in a test system wherein lipid peroxidation was facilitated by aqueous oxygen radicals. Luteolin (a yellow coloring substance, C15H10O6, obtained from the weed Reseda luteola: used in dyeing silk and, formerly, in medicine.) has proved to be a significantly stronger antioxidant than its two glycosides.

Flavonoids generally occur in foods as O-glycosides with sugars bound at the C3 position. Methylation or glycosidic modification of the OH substitutions leads to inactivation of transition metal-initiated prooxidant activity of a flavonoid.

The protection provided by fruits and vegetables against diseases, including cancer and cardiovascular diseases, has been attributed to the various antioxidants, including flavonoids, contained in these foods. Flavonoids, such as quercetin and kaempferol, induce nuclear DNA damage and lipid peroxidation in the presence of transition metals.

Antioxidants

To counteract the harmful effects taking place in the cell, the physical system has evolved itself with some strategies like prevention of damage, repair mechanism to alleviate the oxidative damages, protection mechanism against damage and the antioxidant defense mechanisms.

Based on the oxidative stress-related free radical theory (Denham Harman), the antioxidants are the first line of action against the effects of the stress. Endogenous antioxidant defenses include a network of antioxidant enzymic and nonenzymic molecules that are distributed within the cytoplasm and various cell organelles. In eukaryotic organisms, several ubiquitous primary antioxidant enzymes, such as SOD, catalase, and several peroxidases catalyze a complex cascade of reactions to convert ROS to more stable molecules, such as water and O2. Besides the primary antioxidant enzymes, a large number of secondary

enzymes act in close association with small molecular-weight antioxidants to form redox cycles that provide necessary cofactors for primary antioxidant enzyme functions.

Small molecular-weight non-enzymic antioxidants (e.g., GSH, NADPH, thioredoxin, vitamins E and C, and trace metals, such as selenium) function as direct scavengers of ROS. These enzymatic and non-enzymatic antioxidant systems are necessary for sustaining life by maintaining a delicate intracellular redox balance and minimizing undesirable cellular damage caused by ROS. Endogenous and exogenous antioxidants include some high molecular weight (SOD, GPx, Catalase, albumin, transferring, metallothionein) and some low molecular weight substances (uric acid, ascorbic acid, lipoic acid, glutathione, ubiquinol, tocopherol/vitamin E, flavonoids).

Natural food-derived components have received attention in the last two decades, and several biological activities showing promising anti-inflammatory, antioxidant, and anti-apoptotic-modulatory potential have been identified. Flavonoids comprise a large heterogeneous group of benzopyran derivatives present in fruits, vegetables, and herbs. They are secondary plant metabolites and more than 4000 molecular species have been described. Flavonoids exert a positive health effect, owing to their free radical-scavenging activities. One flavonoid present in a large number of fruits and vegetables is quercetin (3,5,7,3′,4′, pentahydroxyflavone) which prevents oxidative injury and cell death by scavenging free radicals, donating hydrogen compound, quenching singlet oxygen, and preventing lipid peroxidation or chelating metal ions. Red wines have a high content of phenolic substances including catechin and resveratrol, which are responsible for the antioxidant action, anti-inflammatory, antiatherogenic property, oestrogenic growth-promoting effect, and immunomodulation.

Oxidative Stress

The mitochondrion is the major cell organelle responsible for ROS production. It generates ATP through a series of oxidative phosphorylation processes. During this process, one- or two-electron reductions instead of four electron reductions of O2 can occur, leading to the formation of superoxide and H2O2, and these can be converted to other ROS. Other sources of ROS may be reactions involving peroxisomal oxidases, cytochrome P-450 enzymes, NAD (P)H oxidases, or xanthine oxidase (黄嘌呤；黄质.

The central nervous system (CNS) is extremely sensitive to free radical damage because of a relatively small defensive antioxidant capacity. The ROS produced in the tissues can inflict direct damage to macromolecules, such as lipids, nucleic acids, and proteins. Oxygen-free radicals, particularly superoxide anion radical, hydroxyl radical (OH•−), and alkylperoxyl radical (•OOCR), are potent initiators of lipid peroxidation. Once lipid peroxidation is initiated, a propagation of chain reactions takes place until termination products are produced. The end products of lipid peroxidation, are such as malondialdehyde (MDA), 4-hydroxy-2-nonenol (4-HNE), and F2-isoprostanes, are accumulated in biological systems.

DNA bases are very susceptible to ROS oxidation, and the predominant detectable oxidation product of DNA bases in vivo is 8-hydroxy-2-deoxyguanosine. Oxidation of DNA bases can cause mutations and deletions in both nuclear and mitochondrial DNA. Mitochondrial DNA is prone to oxidative damage due to its proximity to a primary source of ROS and its deficient repair capacity compared with nuclear DNA. These oxidative modifications lead to functional changes in various types of proteins (enzymatic and structural), which can have a substantial physiological impact. Similarly, redox modulation of transcription factors produces an increase or decrease in their specific DNA binding activities, thus modifying the gene expression.

Among different markers of oxidative stress, malondialdehyde (MDA) and the natural antioxidants, metalloenzymes Cu, Zn-superoxide dismutase (Cu, Zn-SOD), and selenium-dependent glutathione peroxidase (GSHPx), is currently considered to be the most important markers. Malondialdehyde (MDA) is a three-carbon compound formed from peroxidized polyunsaturated fatty acids, mainly arachidonic acid. It is one of the end products of membrane lipid peroxidation. Since MDA levels are increased in various diseases with an excess of oxygen free radicals, many relationships with free radical damage were observed.

Cu, Zn-SOD is an intracellular enzyme present in all oxygen-metabolizing cells, which dismutases the extremely toxic superoxide radical into potentially less toxic hydrogen peroxide. Cu, Zn-SOD is widespread in nature, but being a metalloenzyme, its activity depends upon the free copper and zinc reserves in the tissues. GSHPx, an intracellular enzyme, belongs to several proteins in mammalian cells that can metabolize hydrogen peroxide and lipid hydroperoxides.

The Body's Natural Antioxidant Defenses

To detoxify ROS, the body uses a system of antioxidants, such as antioxidative enzymes, e.g. superoxide dismutase, catalase, glutathione peroxidase. This system consists of degradative yet and other enzymes such as proteases, peptidases, phospholipases, acyltransferases, endonucleases, exonucleases, polymerases, ligases, etc., to leave and replace irreversibly damaged macromolecules. Importantly, the systems are integrated, they work in to continue the close interaction.

Superoxide Dismutase (SOD) catalyzes the reduction of superoxide into hydrogen peroxide and water. In mammals, there are three isoforms which function in distinct cellular compartments. SOD1 is found in the cytosol and mitochondrial intermembrane. SOD2 is located in the mitochondrial matrix; and SOD3 functions in the extracellular space.

Glutathione Peroxidase (Gpx) transforms peroxides, especially lipid hydroperoxides, into water and alcohol. Specialized GPx forms function in distinct cellular compartments in specific tissue types. Analysis of the selenoproteome identified five glutathione peroxidases (GPxs) in mammals: cytosolic GPx (cGPx, GPx1), phospholipid hydroperoxide GPx (PHGPX, GPx4), plasma GPx (pGPX, GPx3), gastrointestinal GPx (GI-GPx, GPx2) and, in humans, GPx6, which is restricted to the olfactory system. GPxs reduce hydroperoxides to the corresponding alcohols by means of glutathione (GSH). They have long been considered to only act as antioxidant enzymes. Increasing evidence, however, suggests that nature has not created redundant GPxs just to detoxify hydroperoxides. In conclusion, cGPx, PGPX, and GI-GPx have distinct roles, particularly in cellular defense mechanisms.

Catalase (CAT) uses an iron to reduce peroxides. Hundreds of different forms are widely distributed in animal, plant and *fungi tissues*. Some contain manganese, and some are bifunctional catalase-peroxidases.

In addition to these principal antioxidant enzymes, the secondary antioxidant enzymes, thioredoxin, glutaredoxin, and peroxiredoxin systems also aid in the control, and selective removal, of ROS. The body is able to increase or decrease their activity in target locations, as needed, to maintain ideal redox homeostasis. Antioxidant enzymes cannot be taken orally; it would not be advisable to do so, even if possible.

Oxidative Stress and Altered Immune Function

The relationship between oxidative stress and immune function of the body is well established. The immune defense mechanism uses the lethal effects of oxidants in a beneficial manner with ROS and RNS playing a pivotal role in the killing of pathogens. The skilled phagocytic cells (macrophages, eosinophils, heterophils), as well as B and T lymphocytes, contain an enzyme, the nicotinamide adenine dinucleotide phosphate (NADPH) oxidase (还原型辅酶Ⅱ). It is made up of six subunits.

These subunits are a Rho guanosine triphosphatase (GTPase), usually Rac1 or Rac2 (Rac stands for Rho-related C3 botulinum toxin substrate), Five "phox" units. (Phox stands for phagocytic oxidase.) gp91-PHOX (contains heme)(Nox2)/p22phox / p40phox/ p47phox / p67phox, which is responsible for the production of ROS following an immune challenge. At the onset of an immune response, phagocytes increase their oxygen uptake as much as 10–20 folds (respiratory burst). The generated superoxide by this enzyme serves as the starting material for the production of a suite of reactive species. Direct evidence also certifies production of other powerful pro-oxidants, such as hydrogen peroxide (H2O2), hypochlorous acid (HOCl), peroxynitrite (ONOO–), and, possibly, hydroxyl (OH•) and ozone (O3) by these cells. Although the use of these highly reactive endogenous metabolites in the cytotoxic response of phagocytes also injures the host tissues, the nonspecificity of these oxidants is an advantage since they take care of all the antigenic components of the pathogenic cell.

Several studies have demonstrated the interdependency of oxidative stress, immune system, and inflammation. Increased expression of NO has been documented in dengue and in monocyte cultures infected with different types of viral infections. Increased production of NO has also been accompanied with enhancement in oxidative markers like lipid peroxidation and an altered enzymatic and nonenzymatic antioxidative response in dengue-infected monocyte cultures. More specifically, the oxygen stress related to immune system dysfunction seems to have a key role in senescence, in agreement with the oxidation/inflammation theory of aging. Moreover, it has been revealed that reduced NADPH oxidase is present in the pollen grains and can lead to the induction of airway associated oxidative stress. Such oxidative insult is responsible for developing allergic inflammation in sensitized animals.

The immune status directly interplays with disease production process. The role of physical and psychological stressors contributes to incidences and severity of various viral and bacterial infections. Both innate, as well as acquired immune responses, are affected by the altered IFN-γ secretion, expression of CD14, production of the acute-phase proteins, and induction of TNF-α. Fatal viral diseases produce severe oxidative stress (OS) leading to rigorous cellular damage. However, initiation, progress, and reduction of damages are governed by the redox balance of oxidation and antioxidation. The major pathway of pathogenesis for cell damage is via lipid peroxidation particularly in microsomes, mitochondria, and endoplasmic reticulum due to OS and free radicals. All the factors responsible for the oxidative stress directly or indirectly participate in the immune system defense mechanism. Any alteration leading to immunosuppression can trigger the disease production.

Oxidative Stress and Aging

Aging is an inherent mechanism existing in all living cells. There is a decline in organ functions progressively along with the age-related disease development. Two most important theories related to aging are free radical and mitochondrial theories, and these have passed through the test of time. There

is claim by such theories that a vicious cycle is generated within mitochondria wherein reactive oxygen species (ROS) is produced in increased amount thereby augmenting the damage potential. Oxidative stress is present at genetic, molecular, cellular, tissue, and system levels of all living beings and is usually manifested as a progressive accumulation of diverse deleterious changes in cells and tissues with advancing age that increase the risk of disease and death. Recent studies have shown that with age, ROS levels show accumulation in major organ systems such as liver, heart, brain, and skeletal muscle either due to their increased production or reduced detoxification. Thus, aging may be referred to as a progressive decline in biological function of the tissues with respect to time as well as a decrease in the adaptability to different kinds of stress or briefly an overall increase in susceptibility to diseases. Oxidative stress theory is presently the most accepted explanation for the aging which holds that increases in ROS lead to functional alterations, pathological conditions and other clinically observable signs of aging, and finally death. No matter whether mitochondrial DNA damage is involved or electron transport chain damage is responsible for aging, modulation of cellular signal response to stress or activation of redox-sensitive transcriptional factors by age-related oxidative stress causes the upregulation of pro-inflammatory gene expression, finally leading to an increase in the ROS levels.

Hormesis

“Hormesis” is the theory that regular exposure to small amounts of toxins, or other forms of biological stress have salutary effects, by activating defensive mechanisms. Hormesis is introduced for its possible relevancy as an anti-aging strategy. How increased oxidative stress promotes longevity and metabolic health. Recent evidence suggests that calorie restriction and specifically reduced glucose metabolism induces mitochondrial metabolism to extend lifespan. In conflict with Harman’s free radical theory of aging (FRTA), these effects may be due to increased formation of reactive oxygen species (ROS) within the mitochondria causing an adaptive response that culminates in subsequently increased stress resistance assumed to ultimately cause a long-term reduction of oxidative stress.

This type of retrograde response has been named mitochondrial hormesis or mitohormesis, and may, in addition, be applicable to the health-promoting effects of physical exercise in humans and, hypothetically, impaired insulin/IGF-1-signaling in model organisms. Consistently, the abrogation of this mitochondrial ROS signal by antioxidants impairs the lifespan-extending and health-promoting capabilities of glucose restriction and physical exercise, respectively. The findings indicate that ROS are essential signaling molecules which are required to promote health and longevity. Hence, the concept of mitohormesis provides a common mechanistic denominator for the physiological effects of physical exercise, reduced calorie uptake, glucose restriction, and possibly beyond.

There is evidence that hormesis is the result of epigenetic adaptations. Recent experimental studies clearly indicate that environmental fluctuations can induce specific and predictable epigenetic-related molecular changes, and support the possibility of the adaptive epigenetic phenomenon. The epigenetic adaptation processes implying alterations of gene expression to buffer the organism against environmental changes support adaptability to the expected life-course conditions. It appears likely that adaptive epigenetic rearrangements can occur not only during early developmental stages but also through the adulthood, and they can cause hormesis, a phenomenon in which adaptive responses to low doses of otherwise harmful conditions improve the functional ability of cells and organisms. In this review, several lines of evidence are presented that epigenetic mechanisms can be involved in hormesis-like responses.

Physical Exercise and Stress

Health benefits of regular physical exercise are undebatable. Both resting and contracting skeletal muscles produce reactive oxygen and nitrogen species (ROS, RNS). Low physiological levels of ROS are generated in the muscles to maintain the normal tone and contractility, but the excessive generation of ROS promotes contractile dysfunction resulting in muscle weakness and fatigue. This is perhaps the reason why intense and prolonged exercise results in oxidative damage to both proteins and lipids in the contracting muscle fibers. The magnitude of exercise-mediated changes in superoxide dismutase (SOD) activity of skeletal muscle increases as a function of the intensity and duration of exercise. Adaption to exercise is the key to prolonged regulation of an oxidant / anti-oxidant "balance". Here we have to distinguish several levels;

- Pre-conditioning. The first generation of promotion of oxidation for energy. ROS/RNS is up
- Rest and recuperation. ROS / RNS is down
- Conditioning. Regular training intervals depending on age and achievement. ROS/RNS up
- Rest and recuperation. ROS / RNS is down but needs a shorter time to come down
- Specialism. High level of training with a maximum production of ROS/RNS
- Rest and recuperation. ROS / RNS is down but needs a shorter time to come down
- Aging sets in. Unstable ROS / RNS levels and changing recuperation times. More bad/good days interchange.
- Aging becomes apparent. Different levels of ROS / RNS throughout the body. Fall out occur but recuperation is high.
- Aging only becomes a hazard when the actual damage overrules the recuperation and decline is complete.

Physiological Role of Stress

The physiological role of ROS is associated with almost all of the body processes;

- With reproductive processes, since under physiological conditions, a certain level of free radicals and reactive metabolites is required, complete suppression of FR (free radical) formation would not be beneficial. One further beneficial example of ROS seen at low/moderate concentrations is the induction of a mitogenic response. Mitogenesis is the induction (triggering) of mitosis, typically via a mitogen. A mitogen is usually some form of a protein

- Stress leads to activation of the hypothalamic-pituitary-adrenal axis. The increased endogenous catecholamine release has been observed in cold environmental conditions. The activity of succinate dehydrogenase gets elevated indicating the influence of ROS as evident in cold environmental conditions. Coronary blood flow is reduced and an altered basophils activity in the myocardium is observed.

- Free radicals play an irreplaceable role in phagocytosis as one of the significant microbicidal systems, or in several biochemical reactions, for example, hydroxylating, carboxylating, or peroxidation reactions, or in the reduction of ribonucleotides. At present, free radicals and their metabolites are assumed to have important biomodulating activities and a regulatory ability in signal transduction process during transduction of intercellular information.

In the presence of metals such as iron or copper, H2O2 can form the reactive and toxic hydroxyl radical (HO•). Increasing evidence indicates that H2O2 is a particularly an intriguing candidate as an intracellular

and intercellular signaling molecule because it is neutral and membrane permeable. Specifically, H2O2 can oxidize thiol (–SH) of cysteine residues and form a sulphenic acid (–SOH), which can get glutathionylated (–SSG), form a disulfide bond (–SS–) with adjacent thiols, or form a sulfenyl amide (–SN–) with amides. Each of these modifications modifies the activity of the target protein and thus its function in a signaling pathway. Phosphatases appear to be susceptible to regulation by ROS in this manner, as they possess a reactive cysteine moiety in their catalytic domain that can be reversibly oxidized, which inhibits their dephosphorylation activity. Specific examples of phosphatases known to be regulated in this manner are PTP1b, PTEN, and MAPK phosphatases.
Hydrogen peroxide (H2O2) production due to oxidative stress is also associated with apoptosis and melanogenesis in melanocytes.

Nutritional Stress

Nutrition is one of the most important external factors for oxidative stress if not the most important. Food and drinks come in all combinations. Ingredients interact, react and deliver reactive parts into the body. Oxidants and anti-oxidant are just a few of it. The amount delivered through the digestive tracks all depend on diet, amount of product, a combination of particles, time and place of delivery and conditions under which it is delivered. There is more than one food regime. To name a few:

- Regular eater, 3 meals a day. Standard local combination.
- Irregular eater. Eat when feels like doing so or when the time is available
- Regulated eater =
    - Vegetarian also lacto-vegetarian
    - Hindu, Jewish or Muslim food regime
    - Disease dieting
    - Another Religious dieting
- Driven eater. Emotional eating.

All food intake supposed to be climate controlled, which is no longer the case. This has positive and negative effects. New products in the wrong time of the year can deliver a negative instead of a positive physical reaction of the body.

Food regimes have a local, environmental, traditional or religious background. Going back in time there were times of lavishly overproduction or availability of food and times of limitation or not the availability of products. This periodical change strengthened the body and soul. Only recently it has been discovered that it also can make us stronger.

Fasting induces an increase in total leukocytes counts, eosinophils, and metamyelocytes in the blood profile, accompanied by a decrease in the basophils and monocytes, a typical “stress leukogram” produced in the animal body due to the increased endogenous production of cortisol from the adrenal glands during oxidative stress. The leukocytosis with neutrophilia associated with fasting may be a consequence of an inflammatory reaction, caused by the direct action of ammonia on the rumen wall. The monocytopenia may be a result of adaptation and defense mechanism undergoing in the body and leads to higher susceptibility to pathogens.

Nutritional stress causes adrenal gland hyperfunction and, thus, an increased release of catecholamines in the blood, with a simultaneous inhibition of the production of insulin in the pancreas. The process of glycogenolysis is observed in the first 24 hours of fasting. Thereafter, gluconeogenesis from amino acid precursors and lipolysis from glycerol, as well as from lactate through the Cori cycle, maintain a regular

supply of glucose. Lactate gets transformed into pyruvate and participates in the gluconeogenesis along with the deaminated amino acids. The increased production of catecholamines (epinephrine and dopamine) owing to fasting results in peripheral vasoconstriction and redistribution in the blood which is expressed as erythrocytosis, leukocytosis, and neutrophilia

Unlike innate antioxidant defensive enzyme systems, nutritional antioxidants are non-enzymatic, meaning that they are not enzymes which catalyze redox reactions directly affecting pro-oxidant substrates. For the most part, they work by breaking oxidative chains, either by accepting (or donating) electrons, thereby eliminating the unpaired electron. They are inferior to the body's natural enzymatic antioxidants because they cannot be activated selectively in response to the continually changing redox status of specific cellular compartments. Their activity is indiscriminate. Since ROS serve many important functions, neutralizing them is not always beneficial. Furthermore, by interfering with the normal signaling pathways that activate the body's natural enzymatic defenses, in many cases, exogenous antioxidants can actually increase oxidative stress (OS).

Certain botanical phenolic compounds appear to work indirectly. Rather than interrupt oxidative chains by directly reducing pro-oxidants, they appear to decrease OS through a variety of signaling pathways, some of which may result in upregulation of the body's innate enzymatic antioxidants. This is true for the so-called "hormetic" botanicals including catechins, quercetin, and curcumin which are actually mild pro-oxidants, even though they indirectly decrease OS.

Assessment of Oxidative Stress

The concentration of different reductant-oxidant markers is considered an important parameter for assessing the prooxidant status in the body tissues. Several indicators of in vivo redox status are available, including the ratios of GSH to GSSG (glutathione(GSH)= is a tripeptide (γ-glutamylcysteinylglycine) / oxidized glutathione(GSSG), NADPH to, and NADH to, as well as the balance between reduced and oxidized thioredoxin. Out of these redox pairs, the GSH-to-GSSG ratio is thought to be one of most abundant redox buffer systems in mammalian species.

A decrease in this ratio indicates a relative shift from a reduced to an oxidized form of GSH, suggesting the presence of oxidative stress at the cellular or tissue level. In aging, an age-related shift from a redox balance to an oxidative profile is observed which results in a reduced ability to buffer ROS that is generated in both "normal" conditions and at times of challenge. Thus, a progressive shift in cellular redox status could potentially be one of the primary molecular mechanisms contributing to the aging process and accompanying functional declines.

Ascorbic acid has both antioxidant and prooxidant effects, depending upon the dose. Low electron potential and resonance stability of ascorbate and the ascorbyl radical have enabled ascorbic acid to enjoy the privilege as an antioxidant. In ascorbic acid alone treated rats, ascorbic acid has been found to act as a CYP (Cytochrome P) inhibitor. Similar activity has also been observed for other antioxidants-quercetin and chitosan oligosaccharides, which may act as potential CYP inhibitors.

Specifically, Phase I genes of xenobiotic biotransformation, namely, CYP1A1, CYP2E1, and CYP2C29, have been previously reported to be downregulated in female rats in the presence of the antioxidant, resveratrol. The antioxidant and prooxidant role of ascorbic acid in low (30 and 100 mg/kg body weight) and high doses (1000 mg/kg body weight), respectively, have also been reported in case of ischemia-

induced oxidative stress. Recently, the toxicity of ascorbic acid has also been attributed to its autooxidation. Ascorbic acid can be oxidized in the extracellular environment in the presence of metal ions to dehydroascorbic acid, which is transported into the cell through the glucose transporter (GLUT). Here it is reduced back to ascorbate. This movement of electrons changes the redox state of the cell influencing gene expression.

The in vivo prooxidant/antioxidant activity of beta-carotene and lycopene has also been found to depend on their interaction with biological membranes and the other co-anti-oxidant molecules like vitamin C or E. At higher oxygen tension, carotenoids tend to lose their effectiveness as antioxidants. In a turn around to this, the prooxidant effect of low levels of tocopherol is evident at low oxygen tension.

α-lipoic acid exerts a protective effect on the kidney of diabetic rats but a prooxidant effect in nondiabetic animals. The prooxidant effects have been attributed to dehydroxylipoic acid (DHLA), the reduced metabolite of α-lipoic acid owing to its ability to reduce iron, initiate reactive sulfur-containing radicals, and thus damage proteins such as alpha 1-antiproteinase and creatine kinase playing a role in renal homeostasis. An increase in α-lipoic acid and DHLA-induced mitochondrial and submitochondrial production in rat liver and NADPH-induced and expression of p47phox in the nondiabetic kidney has also been observed.

Use of ginseng and Eleutherococcus senticosus is thought to increase the body's capacity to tolerate external stresses, leading to increased physical or mental performance. Although an extensive literature documenting adaptogenic effects in laboratory animal systems exists, results from human clinical studies are conflicting and variable. However, there is evidence that extracts of ginseng and Eleutherococcus sp. can have an immunostimulatory effect in humans, and this may contribute to the adaptogen or tonic effects of these plants. From laboratory studies, it has been suggested that the pharmacological target sites for these compounds involve the hypothalamus-pituitary-adrenal axis due to the observed effects upon serum levels of adrenocorticotropic hormone and corticosterone. However, it should also be noted that the overall effects of the ginsenosides can be complex due to their potential for multiple actions even within a single tissue. (see food congruence)

The flavonoids present in ginkgo extracts exist primarily as glycosylated derivatives of kaempferol and quercetin. These flavonoid glycosides have been shown to be effective free radical scavengers. It is believed that the collective action of these components leads to a reduction in damage and improved functioning of the blood vessels. Depending on the type and level of ROS and RNS, duration of exposure, antioxidant status of tissues, exposure to free radicals and their metabolites leads to different responses—increased proliferation, interrupted cell cycle, apoptosis, or necrosis.

Conclusions

Oxidative stress is the imbalance between oxidants and antioxidants in favor of the oxidants which are formed as a normal product of aerobic metabolism but during pathophysiological conditions can be produced at an elevated rate.

Both enzymatic and nonenzymatic strategies are involved in antioxidant defense, and antioxidant efficacy of any molecule depends on the co-oxidant. Well proven free radical scavengers can be prooxidant unless linked to a radical sink. Moreover, as the free radicals share a physiological as well as a pathological role in the body, the same antioxidant molecule just due to its free radical scavenging

activity may act as disease promoter, by neutralizing the physiologically desired ROS molecules, and as disease alleviator by removing the excessive levels of ROS species.

The importance of several vitamins like vitamin A and tocopherols as well as carotenes, oxycarotenoids, and ubiquinols in their lipid phase has been understood in recent years. Low molecular mass antioxidant molecules that include nuclear as well as mitochondrial matrices, extracellular fluids, have been studied to understand how they accelerate the body defense.

Industrial use of antioxidants

Besides the human biochemical active (anti)-oxidants there is a large amount of active (anti)-oxidants of industrial nature. Some of these (anti)-oxidants enter the body. For the purpose of healthy aging, awareness is needed of the effects of these chemicals on the system.

An antioxidant is useful in increasing the shelf life of food products by preventing their oxidation which results in fat rancidity and color changes. They not just help in extending the shelf life of food products but are also used as additives in cosmetics and animal to thwart damage to cells and lessen singlet oxygen. The global market for antioxidants is powered primarily by the soaring demand for cosmetics and other skincare products such as anti-aging creams and lotions. Antioxidants prevent the skin from aging by lessening the formation of radicals in the skin and protecting the cell membranes. Besides, the spike in consumption of meat worldwide on account of a burgeoning population has also provided a major fillip to their market. As per a report by Transparency Market Research, the global market for antioxidants will likely reach a value of US$3.11 bn by 2020 in terms of revenue.

Antioxidants can be broadly segmented into two types – synthetic and natural. Both find application in the feed industry. Synthetic antioxidants are manmade and find application in stabilizing fat, oil, and lipid-containing feed and are primarily phenolic. Such phenolic derivatives are comprised of more than one methoxy or hydroxyl groups. Ethoxyquin is the sole compound containing heterocyclic and Nitrogen (N) which find application in animal feeds.

Natural antioxidants, as opposed to synthetic oxidants, occur naturally in food and feed ingredients. Some natural antioxidants, namely vitamin C, vitamin E, and carotenoids aid in bringing down the risk of cancer and heart disease by preventing the formation of free radicals. Natural antioxidants also find application in formulating cosmetics, including anti-aging products.

Easy availability of synthetic antioxidants such as BHA, BHT, propyl gallates, and EDTA is predicted to dampen demand for natural antioxidants in the foreseeable future. However, rising demand for natural antioxidants in particular applications such as in coloring agents will likely help to overcome the roadblock.

Depending upon technology, the global market for antioxidants can be classified into radiography testing, ultrasonic testing, electromagnetic testing, and visual testing, among others, including magnetic particle testing and liquid penetrant testing. Depending upon end-use industry again, the market for antioxidants can be segregated into the automotive industry, power generation industry, aerospace and defense industry, and oil and gas industry. There are others too such as plastic and polymer and medical.

From a geographical standpoint, Asia Pacific is a key region whose market is expected to expand at a healthy clip in the upcoming years. The market in the Asia Pacific, in particular, is fragmented because of a large unorganized sector of natural antioxidants manufacturers in the region. The growth in the Asia Pacific, driven by the fast-expanding populous and emerging economies of India and China, is mainly on account of the increasing health concerns and a growing demand for healthier dietary supplements.

Europe and North America are other crucial antioxidants markets. Other emerging economies too are experiencing a swift expansion in their markets. Brazil in South America is one such nation. With growing per capita income that has resulted in a shift in dietary preferences, the nation is seeing phenomenal growth in the market.

Overall, the global antioxidants market is choc-a-bloc with players of different sizes. Some of the noteworthy names in the market are Vitablend Nederland B. V. Naturex S.A and Nutreco N.V., ADM, Kemin Industries, BASF, DuPont, Kalsec Inc., Cargill Incorporated, and Koninklijke DSM N.V.

2 Where does aging start and how we measure it

Aging depends on different forces.

1. External forces
2. Internal forces

The external forces are the same for every individual but vary per place on earth. These forces cannot be influenced. It is possible to relieve the body of impact but that is the maximum possible.
These external forces are:

- Gravity
- Air pressure
- Environment

The internal forces are many. This chapter deal with the "master force" of life, the source of our energy and living. In fact the "key of life".

- Electricity

Gravity and aging

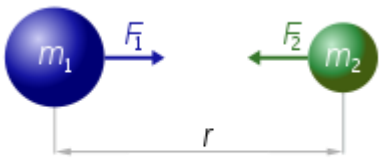
Unseen but always around, a force that makes everyone aging without being aware of it. It is impossible to escape of it. The force that keeps the human being down on earth and gives the "hated" weight gain, makes people exercise and most of all it makes forces the body to grow and shrink again. Gravity is all around, always. The law of Newton explains these powers in the following equation:

Mathematically, this translates into the force equation:

$F_G = Gm_1m_2/r^2$

In this equation, the quantities are defined as:

- F_g = The force of gravity (typically in newtons)
- G = The *gravitational constant*, which adds the proper level of proportionality to the equation. The value of G is 6.67259×10^{-11} N * m^2 / kg^2, although the value will change if other units are being used.
- m_1 & m_1 = The masses of the two particles (typically in kilograms)
    - r = The straight-line distance between the two particles (typically in meters)



$$F_1 = F_2 = G\frac{m_1 \times m_2}{r^2}$$

Interpreting the Equation

This equation gives the magnitude of the force, which is an attractive force and therefore always directed *toward* the other particle. As per Newton's Third Law of Motion, this force is always equal and opposite. Newton's Three Laws of Motion give the tools to interpret the motion caused by the force and we see that the particle with less mass (which may or may not be the smaller particle, depending upon their densities) accelerate more than the other particle. This is why light objects fall to the Earth considerably faster than the Earth falls toward them. Still, the force acting on the light object and the Earth is of identical magnitude, even though it doesn't look that way.

Newton's law of gravitation resembles Coulomb's law of electrical forces, which is used to calculate the magnitude of the electrical force arising between two charged bodies. Both are inverse-square laws, where force is inversely proportional to the square of the distance between the bodies. Coulomb's law has the product of two charges in place of the product of the masses, and the electrostatic constant in place of the gravitational constant.

When someone sits in a chair, the body exerts a downward force on the chair and the chair exerts an upward force on the body. There are two forces resulting from this interaction - a force on the chair and a force on the body. These two forces are called action and reaction forces and are the subject of Newton's third law of motion. Formally stated, Newton's third law is:

For every action, there is an equal and opposite reaction.

The statement means that in every interaction, there is a pair of forces acting on the two interacting objects. The size of the forces on the first object equals the size of the force on the second object. The direction of the force on the first object is opposite to the direction of the force on the second object. Forces always come in pairs - equal and opposite action-reaction force pairs.

His third law states that for every action (force) in nature there is an equal and opposite reaction. In other words, if object A exerts a force on object B, then object B also exerts an equal and opposite force on object A. Notice that the forces are exerted on different objects.
Newton’s 3rd law of motion tells us four characteristics of forces.
•Forces always occur in pairs (action and reaction forces).
•Action and reaction are equal in magnitude.
•Action and reaction are opposite in direction.
•Action and reaction act on different bodies

These, and many others, laws refer to the interaction between the human body and other objects and also the gravity of mother earth. What is the direct relationship between gravity and aging?

Spine
The most noticeable effect of gravity on the body is the compression of the spine. The spine consists of vertebrae and sponge-like discs. The downward force of gravity causes the discs to lose moisture throughout the day, resulting in a daily height loss! The moisture returns to the disc overnight, but not 100%. Over a lifetime, a person can permanently lose between 15 – 60 cm in height!

Waist
The organs are compressed while standing and walking by the forces of gravity. The waist measurement increases (without actual weight gain) and it is possible to measure this in the morning and in the

evening. This affects the ability to move and bend, which can seriously hinder the ability to perform simple daily activities.

Organs
Over time, organs begin to prolapse, or fall, from their original place in the body. Due to this displacement organ function becomes less efficient. It's not uncommon for people to experience bladder, kidney and digestive problems due to prolapsed organs. Yoga practitioners have performed headstands to ensure proper organ placement. Classical therapies did “understand” the problem of gravity and try to deal with it by using counter force exercises.

Flexibility
Due to the disc pressure and the diminishing of the vertebrate joints become pressurized. Ligaments slowly turn stiff and muscles become weaker. Each muscle has a 24-hour work-out even when we are not aware of it.

Circulation
Over time, gravity takes a toll on the circulatory system, which may cause varicose veins, decreased scalp circulation and swollen limbs. Poor circulation to the eyes, ears, skin, scalp, and brain is one reason why most valuable organs deteriorate over a lifetime. The heart can only pump as hard as it is empowered to do so. When losing strength the returning power of blood in the veins of the extremities (arms and legs) also is losing pressure. Limitation of pressure lowers returns and make blood stuck in micro veins (blood cluttering). This is the most visible effect of gravity on the body.

If gravity is not pulling the body this happens: astronauts grow over 6 cm while in space! During weeks in orbit, astronauts' discs continue to absorb moisture from the bloodstream. With no gravitational pull to squeeze moisture out, the discs remain plump, making their spines longer and themselves taller. In fact, space suits are designed to accommodate the extra centimeters spinal stretch.

Is it possible to influence gravity? Yes, it is possible, even minimal but there are some ways to relieve the problems that gravity is causing. The following are such possibilities.

1) By reversing the body's position under its force. Use gravity to stretch and elongate the body. The Nachemson study indicated that compression can be overcome by applying traction to 60% of the body weight. Mechanical traction is an option but not possible without professional guidance or at home. A simple possibility for personal traction is the upside down fitness machine.
2) Water treatment. In water, the body is relieved partially from the largest forces of gravity as the water around takes over most of it. Saltwater (sample Deadsea) has an even greater relieve factor. Using the oxygen dress (a body suit filled with oxygen and a minor amount of ozone) keeps the skin in a high condition without the negative effects of long-term water explosion.
3) Air floating. This experience takes place in special air pressured cabins were the person is able to float on air in a weightless like position. This releases the body of some pressure.

Sea creatures are among the longest living beings on earth:
Top 8 list of longest living sea creatures.
Galapagos Tortoise - 177 years.
Red Sea Urchin - 200 years.

Rougheye Rockfish - 205 years.
Bowhead Whale - 211 years.
Koi fish - 226 years.
Ocean Quahog - 400 years.
Antarctic Sponge - 1,550 years.
Turritopsis Nutricula Jellyfish - immortal.

One of the main reasons is the minimal gravity and no continue air pressure. Due to the different powers of the sea life can be prolonged.

Air pressure, the outside force we depend on

Air pressure is the force exerted by the weight of air molecules which obey the law of gravity. Atmospheric pressure is determined by the amount of air directly above a person or object. At sea level (mean sea level pressure (MSLP), the atmospheric pressure is 1013.25 mbar (101.325 kPa; 29.921 inHg; 760.00 mmHg) or PSI. At higher altitudes, the PSI decreases due to lower air pressure and density. Skin adjusts easily to changes in pressure, but the cavities within the body, such as the lungs, ears, and sinuses, do not adjust automatically. This is why many people experience a popping in their ears while taking off in an airplane or driving through mountains.

The highest adjusted-to-sea level barometric pressure ever recorded on Earth (above 750 meters) was 1084.8 hPa (32.03 inHg) measured in Tosontsengel, Mongolia on 19 December 2001. The highest adjusted-to-sea level barometric pressure ever recorded (below 750 meters) was at Agata in Evenk Autonomous Okrug, Russia (66°53'N, 93°28'E, elevation: 261 m, 856 ft) on 31 December 1968 of 1083.8 hPa (32.005 inHg). The Dead Sea, the lowest place on Earth at 430 meters (1,410 ft) below sea level, has a correspondingly high typical atmospheric pressure of 1065 hPa.
The lowest non-tornadic atmospheric pressure ever measured was 870 hPa (0.858 atm; 25.69 inHg), set on 12 October 1979, during Typhoon Tip in the western Pacific Ocean. The measurement was based on an instrumental observation made from a reconnaissance aircraft.

Boiling water
Pure water boils at 100 °C (212 °F) at earth's standard atmospheric pressure. The boiling point is the temperature at which the vapor pressure is equal to the atmospheric pressure around the water. Because of this, the boiling point of water is lower at lower pressure and higher at higher pressure. Cooking at high elevations, therefore, requires adjustments to recipes. A rough approximation of elevation can be obtained by measuring the temperature at which water boils.

The pressure of air that is present outside the body is the same as that of the air present 'inside' the body. The air that is constantly present in the lungs, ears, and nose has the same atmospheric pressure as the air on the outside of the ears, nose, and chest. (Newton's third law)

Just below the lungs is a muscle called the diaphragm. When a person breathes in, the lungs get air in it (or expands). The lungs on expansion move the diaphragm down. The diaphragm, which is a dome-shaped muscle becomes more "flattened". When the lung volume increases, the pressure in the lungs decreases (Boyle's law). Since air always moves from areas of high pressure to areas of lower pressure, air will now be drawn into the lungs because the air pressure outside the body is higher than the pressure in the lungs.

Boyle's law, also called Mariotte's law, a relation concerning the compression and expansion of a gas at constant temperature. This empirical relation, formulated by the physicist Robert Boyle in 1662, states that the pressure (p) of a given quantity of gas varies inversely with its volume (v) at a constant temperature; i.e., in equation form, **pv = k, a** constant.

The British scientist James Clerk Maxwell and the Austrian physicist Ludwig Boltzmann, in the 19th century, led in establishing the theory, which became one of the most important concepts in modern science.

The simplest kinetic model is based on the assumptions that: (1) the gas is composed of a large number of identical molecules moving in random directions, separated by distances that are large compared with their size; (2) the molecules undergo perfectly elastic collisions (no energy loss) with each other and with the walls of the container, but otherwise do not interact; and (3) the transfer of kinetic energy between molecules is heat. These simplifying assumptions bring the characteristics of gases within the range of mathematical treatment.

Such a model describes a perfect gas (q.v.) and is a reasonable approximation to a real gas, particularly in the limit of extreme dilution and high temperature. Such a simplified description, however, is not sufficiently precise to account for the behavior of gases at high densities.

Based on the kinetic theory, pressure on the container walls can be quantitatively attributed to random collisions of molecules the average energy of which depends upon the gas temperature. The gas pressure can, therefore, be related directly to temperature and density. Many other gross properties of the gas can be derived, such as viscosity, thermal and electrical conduction, diffusion, heat capacity, and mobility. In order to explain observed deviations from perfect gas behavior, such as condensation, the assumptions must be appropriately modified. In doing so, considerable insight has been gained as to the nature of molecular dynamics and interactions.

The opposite process happens when a person breathes out. When a person breathes out the diaphragm moves upwards and causes the volume of the lungs to decrease, the air inside lungs takes up the lesser volume or has now higher pressure. The pressure in the lungs will increase, and the air that was in the lungs is forced out towards the lower air pressure outside the body.

Human bodies are used to air pressure. The air pressure in the lungs, ears, and stomachs is the same as the air pressure outside of the body, which ensures that nobody gets crushed. The body is flexible enough to cope when the internal and external pressures aren't exactly the same.

The effects of air pressure on the body can be illustrated by:

Blood pressure: Just as its name implies, blood moves through the body using a pressure system created by the heart. It makes sense that this pressure would be affected by the pressure in the air around. According to biometeorologist Jennifer Vanos, Ph.D., when the barometric pressure drops, so does the blood pressure. For some, this might mean a feeling of dizziness or even blurred vision.

Headaches: In an interview with the New York Times, Dr. Matthew Fink, a neurologist in chief at New York-Presbyterian Hospital/Weill Cornell Medical Center, explained that low barometric pressure can

cause headaches or migraines by creating a pressure difference between the atmosphere and the air-filled sinuses. The problem is exacerbated when the sinuses are congested or blocked for any reason.

Joint pain: Researchers at Tufts-New England Medical Center in Boston surveyed 200 patients with knee osteoarthritis and found a link between changes in barometric pressure and ambient temperature and changes in knee pain severity. It's not clear why a falling barometer would exacerbate joint pain and arthritis. It could be that barometric pressure affects the viscosity of the fluid that lines joint sacs, or it could be that it triggers the pain responses in the nerve endings of the joint. Either way, it's what your grandma has been saying for years: Some people feel pain in their joints when a storm is approaching.

The electric connection, the "key of life"

After reading all the reasons for aging and what can do to measure and work on it is most important to understand the source of life itself. Most scientists struggle to make sense of what life itself is. Many religions are built to explain the reasons for living and how to do it. But the source has remained a secret until now.

When people eat or drink, the large pieces of food get broken down by digestion, creating smaller and smaller parts until reaching the level of molecules. Those molecules can absorb by cells for the next step. This process is called cellular respiration. All of those molecules and elements in the body have the potential to create electrical impulses. Those impulses are dependent on the situations within the specific body systems, like the brain or heart, at the time.

Everything is made up of atoms, and atoms are made up of protons, neutrons, and electrons. Protons have a positive charge, neutrons have a neutral charge, and electrons have a negative charge. When these charges are out of balance, an atom becomes either positively or negatively charged. The switch between one type of charge and the other allows electrons to flow from one atom to another. This flow of electrons, or a negative charge, is what is called electricity. Since the body is huge masses of atoms, its generates electricity

The most famous electrical current within the body is the heart rhythm. Hearts contain within them, a grouping of cells known as Sinoatrial node (SA node). The cells within the SA node, contain electrolytes both inside and outside of the cells. The most common electrolytes within the body are sodium, potassium, calcium, magnesium, phosphorus, and chloride.

Interesting to note: according to the special theory of relativity, electric and magnetic fields are two aspects of the same phenomenon depending on a chosen reference frame of observation—an electrical field in one reference frame may be perceived as a magnetic field in a different reference frame.

Electricity is a key to survival. Electrical signals are fast. They allow for a nearly instantaneous response to control messages. If the body did rely on the movement of chemicals to we would've died out a long time ago as chemical reactions are relatively slow to perform. If chained to go from point A to B it would take much too long to generate a fast response.

Electrolytes crossing cell membranes, creating electrical discharges, is only one of the countless ways the body uses the food we eat to create energy and power to do work. This is why the food content is classified into calories. A calorie is a unit of energy.

It is important to review the initial process more closely. The negative charge is the natural resting state of cells. It's related to a slight imbalance between potassium and sodium ions inside and outside the cell, and this imbalance sets the stage for electrical capacity.

The sodium-potassium gate.: At rest, cells have more potassium ions inside than sodium ions, and there are more sodium ions outside the cell. Potassium ions are negative, this implies that the inside of a cell has a slightly negative charge. Sodium ions are positive, on its turn the area immediately outside the cell membrane is positively charged. At rest, there isn't a strong enough charge difference to generate electricity, though.

When the action is needed the body opens the gate. The membrane gate opens, sodium and potassium ions move freely into and out of the cell. Negatively charged potassium ions leave the cell, attracted to the positivity outside the membrane, and positively charged sodium ions enter it, moving toward the negative charge. The result is a switch in the concentrations of the two types of ions -- and a rapid switch in charge. The first impulse creates a serial effect and the gate of the next cell opens, creating another charge, and so on. Like an electrical series connection, the electrical impulse moves from a cell to cell in microseconds moving the message around.

Generally, it is considered that each cell in the human body has a "membrane potential." That is a difference in (electrical) charge between the inside and the outside of the cell. In most cells, the difference is approximately 70 millivolts. Body capacitance is the physical property of the human body that has its act as a capacitor. Like any other electrically-conductive object, a human body can store electric charge if insulated. The actual amount of capacitance varies with the surroundings; it would be low when standing on top of a pole with nothing nearby, but high when leaning against an insulated, but grounded large metal surfaces, such as a household refrigerator, or a metal wall in a factory.

Synthetic fabrics and friction can charge a human body to about 3 kV. Low potentials may not have any notable effect, but some electronic devices can be damaged by modest voltages of 100 volts.
Body capacitance was a significant nuisance when tuning the earliest radios; touching a tuning knob would couple the body capacitance into the tuning circuit, slightly changing its resonant frequency.

A practical proof of the bodies electric current are the “Touch sensors” everyone uses every day. The body capacitance can be used to operate pushbutton switches, elevators, or faucets. Certain voltage tester probes rely on body capacitance. A capacitive touch sensor responds to close approach (but not a force of touch) of a part of a human body, usually a fingertip. The capacitance between the device itself and the fingertip is sensed. Capacitive touchscreens don't require applying any force to their surfaces, which makes them easier to use and design in some respects. Furthermore, because of body capacitance, people act as good antennas, and some small televisions use people to enhance reception (besides this we also have the so-called Triboelectric effect / (General Physics) static electricity generated by friction. Also called: frictional electricity. This can generate high powers)

A strong reason why it is possible to see aging from the skin is the fact that the skin is the most "electropositive" everyday material, because of the electrolytes in the cells such as sodium, calcium, and

magnesium. These elements readily give up electrons to form a positive voltage in the skin. That voltage can get quite high; the average static spark is in the low tens of thousands of volts. The reason the average static spark isn't really damaging (painful, yes,) is because of the relatively high resistance of the skin (which helps to hold that charge; the skin becomes a "dielectric", like the materials in a capacitor), which can be in the high hundreds of thousands of ohms, meaning the actual amount of current moving during a static spark is normally in the milliamps.

Pregnancy is the transfer of life instead of the event of new life

Many scientists speak of “new life” when referring to the birth of a baby. But this is factual a mistake. New life should come from absolutely nothing. It should occur from an unsupported material which does not carry life in itself.

Conception is the moment the sperm cell enters the egg cell and is accepted. The first zygote is a fact followed by mitosis (cell dividing) and a further growth of a fetus into a baby. This biology is commonly known and accepted by all scientist and common people in the world.

Everybody also agrees on the fact that the spermatozoid and the egg cell are both living and fully functioning organisms. Both do carry life inside. When two living cells interact and melt to start a new organism we can assume that the life in both living cells is transferred into the new organism. There is no moment of death, stop or complete reboot of these cells before the new organism starts to grow.

With this fact it is proven that life never START to exist but that it is TRANSFERRED from a living organism through fertilization into a new organism. It is transferred, not new.

Nerve cells communicate with each other by acting as “transducers:” creating electrical signals (very small voltages and currents) in response to the input of neurotransmitters, and when stimulated by electrical signals. If an electric current of sufficient magnitude is conducted through a living creature (human or otherwise), its effect to override the tiny electrical impulses normally generated by the neurons, overloading the nervous system and preventing both reflex and volitional signals from being able to actuate muscles. Muscles triggered by an external (shock) current than involuntarily contract, and there’s nothing the victim can do about it.

This problem is especially dangerous if the victim contacts an energized conductor with the hands. The forearm muscles responsible for bending fingers tend to be better developed than those muscles responsible for extending fingers, and if both sets of muscles try to contract because of an electric current conducted through the person’s arm, the “bending” muscles win, clenching the fingers into a fist. If the conductor delivering current to the victim faces the palm of the hand, this clenching action forces the hand to grasp the wire firmly, thus worsening the situation by securing excellent contact with the wire. The victim is completely unable to let go of the wire.

Medically, this condition of involuntary muscle contraction is called tetanus. Electricians familiar with this effect of electric shock often refer to an immobilized victim of electric shock as being “froze

on the circuit." Shock-induced tetanus can only be interrupted by stopping the current through the victim.

Even when the current is stopped, the victim may not regain voluntary control over the muscles for a while, as the neurotransmitter chemistry has been thrown into disarray. This principle has been applied to "stun gun" devices such as Tasers, which is based on the principle of momentarily shocking a victim with a high-voltage pulse delivered between two electrodes. A well-placed shock has the effect of temporarily (a few minutes) immobilizing the victim.

Electric current is able to affect more than just skeletal muscles in a shock victim. The diaphragm muscle controlling the lungs, and the heart can also be "frozen" in a state of tetanus by electric current. Even currents too low to induce tetanus are often able to scramble nerve cell signals enough that the heart cannot beat properly, sending the heart into a condition known as fibrillation. A fibrillating heart flutters rather than beats and is ineffective at pumping blood to vital organs in the body. In any case, death from asphyxiation and/or cardiac arrest surely result from a strong enough electric current through the body. Ironically, medical personnel uses a strong jolt of electric current applied across the chest of a victim to "jump start" a fibrillating heart into a normal beating pattern.

How AC affects the body depends largely on frequency. Low-frequency (50- to 60-Hz) AC is used in the US (60 Hz) and European (50 Hz) households; it can be more dangerous than high-frequency AC and is 3 to 5 times more dangerous than DC of the same voltage and amperage. Low-frequency AC produces extended muscle contraction (tetany), which may freeze the hand to the current's source, prolonging exposure. DC is most likely to cause a single convulsive contraction, which often forces the victim away from the current's source. [MMOM]

AC's alternating nature has a greater tendency to throw the heart's pacemaker neurons into a condition of fibrillation, whereas DC tends to just make the heart stand still. Once the shock current is halted, a "frozen" heart has a better chance of regaining a normal beat pattern than a fibrillating heart. This is why "defibrillating" equipment used by emergency medics works: the jolt of current supplied by the defibrillator unit is DC, which halts fibrillation and gives the heart a chance to recover.

CURRENT THEORIES OF AGING

The mentioned theories of aging are focused on parts of human existence, on the details.
Each part has its importance in the total of the aging process. It is clear that only the total creates the permanence of living. Not the individual part. But an individual "weakness" is a disturbance in the optimum living situation. The parts should be addressed and researched but to get a maximum out of life, the real focused should be the improvement of strong points and not the focus on the weak. Age Control is focused on the promotion of the strong, researching the weak, creating a balance and find ways to improve the best parts to let last health the longest possible.

1. Disengagement Theory

Withdrawal may be initiated by the aging person or by society and may be partial or total. As people age, they experience greater distance from society & they develop new types of relationships with society. Some spiritually developed societies (such as the American Indians) created a system where elderly

voluntary did withdraw from all activities to die. Being disconnected from a strong social environment loads a lot of stress on the individual.

2. Activity Theory
Activity theory emphasizes the importance of ongoing social activity. This theory suggests that a person's self-concept is related to the roles held by that person i.e. retiring may not be so harmful if the person actively maintains other roles, such as familial roles, recreational roles, volunteer & community roles. To maintain a positive sense of self the person must substitute new roles for those that are lost because of age.

3. The Neuroendocrine Theory
This system is a complicated network of biochemicals that govern the release of hormones which are altered by the walnut-sized gland called the hypothalamus located in the brain. The hypothalamus controls various chain-reactions to instruct other organs and glands to release their hormones etc. The hypothalamus also responds to the body hormone levels as a guide to the overall hormonal activity. But as while growing older the hypothalamus loses it precision regulatory ability and the receptors which uptake individual hormones become less sensitive to them. Accordingly, as aging continues the secretion of many hormones declines and their effectiveness (compared unit to unit) is also reduced due to the receptors down-grading

4. The Free Radical Theory
1956. The term free radical describes any molecule that has a free electron, and this property makes it react with healthy molecules in a destructive way. Because the free radical molecule has an extra electron it creates an extra negative charge. This unbalanced energy makes the free radical bind itself to another balanced molecule as it tries to steal electrons. In so doing, the balanced molecule becomes unbalanced and thus a free radical itself. It is known that diet, lifestyle, drugs (e.g. tobacco and alcohol) and radiation etc., are all accelerators of free radical production within the body.

5.The Membrane Theory of Aging
According to this theory, it is the age-related changes of the cells ability to transfer chemicals, heat and electrical processes that impair it. As aging continues the cell membrane becomes less lipid (less watery and more solid). This impedes its efficiency to conduct normal function and in particular, there is a toxic accumulation

6. The Mitochondrial Decline Theory
The mitochondria are the power-producing organelles found in every cell of every organ. Their primary job is to create Adenosine Triphosphate (ATP) and they do so in the various energy cycles that involve nutrients such as Acetyl-L-Carnitine, CoQ10 (Idebenone), NADH and some B vitamins etc.
Enhancement and protection of the mitochondria is an essential part of preventing and slowing aging. Enhancement can be achieved with nutrients, as well as ATP supplements themselves

7. The Cross-Linking Theory
The Cross-Linking Theory of Aging is referred to as the Glycosylation Theory of Aging. In this theory, it is the binding of glucose (simple sugars) to protein, (a process that occurs in the presence of oxygen) that causes various problems. Once this binding has occurred the protein becomes impaired and is unable to perform as efficiently. Living a longer life is going to lead to the increased possibility of oxygen meeting

glucose and protein and known cross-linking disorders include senile cataract and the appearance of tough, leathery and yellow skin.

8. Aging by Program *
There is strong evidence supporting the suggestion that aging is in some manner programmed into each species, including humans. This may be controlled neurologically or hormonally through the hypothalamus. Other studies suggest that aging is controlled by the thymus. The gland atrophies at about the onset of adolescence. This implies that aging occurs more readily in the absence of the thymus gland. In studies, cultured cells of a specific type divided a consistent number of times. This implies that the cell's life cycle is controlled within the cell, rather than externally by the hypothalamus or thymus. Scientists agree that although normal cells may have a limited number of times they can divide this is only rarely if ever, reached in the body.

9. Gene Theory *
The gene theory states that aging is programmed due to one or more harmful genes within each organism. The gene theory suggests that human lifespan is an inherited trait. Studies show that identical twins die at similar ages when compared to fraternal twins or siblings.

10. Autoimmune Theory
The autoimmune theory proposes that the immune system is programmed so that it is no longer able to faultlessly distinguish foreign proteins from the body's own proteins. If this happens the body's immune system will attack and destroy its own cells. It is well documented that the effectiveness of the immune system peaks at puberty and gradually declines thereafter with the advance in age.

11. Wear-and-Tear Theory *
The wear and tear theory of aging was first introduced by Dr. August Weismann, a German biologist, in 1882. It is very logical because it is what happens to the nonliving things that people observe around them (i.e. components of an aging car break due to repeated use). Cells and tissues have vital parts that wear out resulting in aging. Parts of the body eventually wear out from repeated use killing the parts and then the body.

12. The rate of Living Theory *
The rate of living theory suggests that each animal, and perhaps each cell, has a specific amount of metabolic energy available to it and that the rate at which this energy is used determines the animal's length of life. Studies have demonstrated that rats kept on restricted diets and in cold environments live longer. Rats in these conditions have the appearance and behavior of younger animals.

*- These theories have been proven invalid due to the introduction of the Gravity / Air pressure facts. As this is not a theory but a proven everyday fact of life.

In order to comply with the more traditional culture of aging, it is advised to follow the current order of "help aging to be healthy" such as :

The process of aging is not easy to understand and often scientist takes parts of the process to define all of it. Arnaud van der Veere suggests that it is impossible to explicitly tell when and where aging starts

after birth as this is an individual path. Fact is that it needs a vision from a biological and psychological point of view. It is impossible to separate one from the other.

Growing up and getting older is a matter of biological change in balance. At the first stages of life, all is focused on growth, change, build and get to a point of fertility where multiplication is the goal. The theory of Bio-balance could explain this more clearly. This theory of bio-balance is created to distinguish the levels of biological activity and biochemical levels within the human system without calculating the psychological factors which play an important role in the developments as human beings.

The bio-balance is measured in the degree of recuperation and physical activity of the human body:
Bio-balance level 90+ % refers to a body in constant repair and growth. There is
90% is referring to a positive repair/building function with less than 10 % breakdown or destruction.
80% is referring to a positive repair/building function with less than 20% breakdown/destruction
70% is referring to a positive repair/building function with less than 30% breakdown/destruction
This does continue until death.

It is possible to divide the life period into several biological phases:

- Zero to 4 is the time where growing up (building) takes around 90+% of biological abilities. In normal disease-free circumstances, a child develops all fundaments with which it has to do all its life. The development and programming of the digestive tract which rules all future digestive processes are founded during this first 4 years. The theory is that during this phase in life all digestive fundaments are built for later digestive functions and little or no changes can be made to influence this. This fact is important for diets, physical relocation of the individual and disease development due to relocation.
- 4 – 8 is a child development stage where motoric control, biological choices (what food to like) and environmental choices are made. Besides the neurological tuning of the system, there is an activity planning. This activity planning creates a design for future health and movement of the individual. The growth and recuperation factor is slowing down to 80+%. It is of vital importance for further development that the child learns to be physically active and gender-specific in coordination. Gender specificity is important in all of its developments on a physical and mental level. Hereby it is – from a science point of view – important that there is a complete gender acceptance of the individual and role play is not enforced nor encouraged. Things all have their natural ways. (Gender is not specified)
- 8 – 12 is an age of biological awareness for most children. A difference starts to occur between boy and girl. A small group becomes aware that they are different. This group steps into a new psychological reality which can affect its biological processes. The growth rate is around 80+ % but there is a partial separation in biological development structure. The hormone activity is increasing and at some parts of the body, the biological rate moves up to 90+ % while other parts stay the same. This is an important factor of bio-balancing. This bio-balance affects the biological/psychological development of the child. Environmental effects are strong. One of the reasons why the environmental effects are important is a change in information gathering and processing. Both have a direct effect on biology.
- 12 – 16 / 18. During this phase a more distinctive development difference between boys and girls becomes apparent. The biological development is visible and selective. Biologically different boys and girls features with all physical shapes based on past developments and genetic information become visible. Environmental influence is a marker in individual biological development. Some parts of the body (also dependent on physical activity) are moving to bio-

balance state 70+% while other parts are varying between 80-90%. Cultural influences have a strong influence on the gender differences and roleplay. In many countries, the female is brought into an inferior position and male dominance becomes the norm. This has a biological effect on the defense system of the body. Due to this cultural differences, male development becomes more testosterone depended and female tends to be forced into an estrogen ruled behavior. This seems to have the first effect of lifespan.

- After 18 there is a measurable change in bio-balance in most children / young adults. Stabilization is the general term. The balance becomes evenly for most body parts and a slowing down of biological activities to a rating of 70%. In many cases, in the current physical activity level, a tendency occurs to go for the minus 70%. But there seems to be a change in city and countryside development. The city development shows a slower biological pace than this in the countryside. Again the physical activity could be the indicated factor of this difference.
- At around 22 – 25 the biological activity slows down in most people. As mentioned before the difference between city and countryside physical and mental development becomes apparent. Currently, it is considered an age differentiation of at least 5 – 7 years between city and countryside persons, male and female. A major factor is pears, environment, and psychological pressure. One of the major differences – still – is the biological factor. City youth, in general, has a lower physical development. The bio-balance goes to minus 70% with a hang to 65+%. In current statistics, people who grow up in the countryside starts a family (multiplication factor) at this age.
- Between 25 – 30 There is a bio-balance of around 65+% stable. Most city people come to the multiplication phase and a new lifestyle start is set to develop. Biological this period in life is a stable area but also one where most slow developing diseases get their roots for further growth. Physical and mental condition development is most important for a strong foundation in the future. For city citizen, this period is often one where studies are finished and in which work becomes a major important part of life and also a source of conflicts and stress in development. Career planning is the cause of most “modern” diseases.
- After 30 the changes in bio-balance become stronger to the “negative” side. Old habits kick in, injuries get a new appearance and the mental part becomes a ruling factor over the biological processes. During this time the differentiation gap between men and women becomes wider. The bio-balance gets more and more off-balance. Lifestyle and genetic load seem to be a major part. Physical activity and the right balance of mental development, training and actual application (challenges) is important. The first move for less physically dangerous to more skill based must be made. Introduction of breath control, balance improvement, and food changes are needed. Rethinking the food balance is important. Psychologically the feeling that aging starts in this period of life is one of the most important markers in the aging study. If to set a psychological / feel marker for when aging starts it is here. That is why this period is said to be the FIRST AGE MARKER.
- For both genders the age of 35, generally speaking, is a turning point in the bio-balance state. Most people enter the 50% state at which the balance of building and breaking comes to a critical stage. During the last few hundred years, the 50% moment moved from 27-28 in the 19th century (the period between 1800-1900) to 29-30 (1900 – 1940) and moved on to 30-32 between 1940 – 1960 with another move upward to 35 now. We expect this to increase under good circumstances to 40 in 2050. One of the reasons seems to be that life is extended from 65 to 84+ within a relatively short period of fewer than 100 years. With the life extension, the biological balance also changes. This implies that the older people get the bio-balance to vary with it. During this period (fixed between 32 – 37/38 for most people) the psychological change

has a major influence on biological stability. A factor such as stress and environment can cause a biological impact on capacity and quality. In the female, the factor of fertility ability plays an unconscious but strong role. When women did not have children at this particular age period regret is strong or in search for confirmation of her decision. The cortisol/adrenalin struggle for energy levels becomes stronger during this period.

- Around 40 – 50 the bio-balance moves to the negative side of 50%. More downsides of age become ruling the daily life. Past and present gets entangled and visible in biological functioning. People enter a critical stage of life were biological aspects and psychological effects develop a personal scale of activity. This scale of (physical) activity defines the future health developments. On the other hand, when most people experience physiological aging they also experience a growing psychological wellbeing. Time of "have too" performance has passed, consolidation begins and to many, it becomes a time for experiments on a mature level. Aging becomes psychological maturity which has also a biological calming effect.
- Between 50 – 60 the bio-balance tumbles further. Here the SECOND AGE MARKER is set. In most cases, people enter the 40% level which implies that the individual is losing more than recuperating. Slowly there is a decrease in abilities varying from physical to mental. But it is a fact that people seek other ways of living and loving. The individual who develops strong survival skills will have fewer problems during this stage of life. There is two major chemical impact crisis on the physical scale. Both male and female enter the "midlife crisis" which has a completely different impact on both. Testosterone and estrogen are the main fertility hormones which have a strong effect in this period. Female end there fertility at this stage of life and lose the ability to carry children. This has an emotional destabilizing effect which appears to be different in each individual. Male, on the other hand, seems unconscious to react to this phenomena by a twist of testosterone production and a psychological change of interest. Most males become, conscious or not, interested in younger women. It is suggested that the main reason is the loss of fertility in females of the same age.
- In the period between 60 – 70 the bio-balance moves to the 30% level were many physical abilities of the past must be considered lost. They do not return either improve. On the biological level, the defense system becomes weaker and more diseases have a chance to attack. Most long-term diseases occur during this period and reduce abilities with an even greater factor. Muscular and joint system suffer the most of this period. Strength and flexibility decline through dysfunctioning of red muscle tissue and cartilage leaking. Additional supplementation of specific nutrients should be applied as a precaution for too many losses.
- The THIRD AGE MARKER is placed after the 70's. It is here that the biomarker slowly moving to a different age border. Where the 70's where considered a real old age less than 100 years ago it is now considered the new 60's. Most 70+ persons are still vital and often even able to live an active life. But this all depends on how active they have been before. During this period the personal investment in physical and psychological development pay off. This is the Accumulative Activity theory of health. All past activities leave a mark for later use. At this stage, more people die and the factor of survival of the fittest becomes reality. The fittest are able not only to survive but enjoy life. Others have a life but are not sure they are still living a meaningful life. The bio-balance gets back to minus 30 and lower. **"Fun to live, fine to love"** is a saying that actually suits this period of life the most.

In current age-related studies there is the opinion most people become old but have a too long period of "sickness" / disease stretching out from 10 – 20 years, sometimes more. The economic effects of this are enormous.

Bringing this into general statistics and consider the male becomes 80+ and female 84+ years of age a 10 or 20 years of sickness it is compared to a 12,5 – 25% of a lifetime. The main goal of Age Control is to limit this as much as possible. Keeping every person physically able also cut the general cost of healthcare with around 25-30%.

Each older person not only suffers personally but need the care of at least 3 – 4 persons. This besides time spends in consultations, revalidation, therapy, operations and medication treatments. The aging of the population is continuing and expected to reach a global level of over 30% in 2030 and in some countries, this level is reached before this time.

For professionals in the care industry, it is important to have tools to work with. Using biomarkers is one way. Currently, biomarkers are considered measuring points on a chemical level. The goal is to create operational tools to improve life quality by measuring and comparing statistical data. A bio-balance can be measured using different age-marking points which have an individual value. These age-marking points are divided into different layers (levels) of research and goal. The proposal is to use a simple and professional leveling.

Measuring aging is an individual undertaking. Hereby dividing in genders and put on other criteria. Important effective trigger points are;

- Gender
- Climate
- Environment
- Work
- Family base
- Free time
- Mental state
- Intelligence

The 8 points of interest divide people into more specific measuring groups for the aging scale theory. A bio-balance can be measured using different bio-trickier points which have an individual value. These bio-trickier points are divided into different layers (levels) of research and goal.

Microcurrent and ATP

The body is very sensitive to the level of intensity of outside energy that is being applied. For example, with the use of microcurrent, studies indicate that the most dominant levels of ATP synthesis—300–500% increase in ATP—occurred when using values less than 400 µA, which follows the Arnold Shultz law (*highly diluted pharmaca or poisons enhance life processes, while strong concentrations may inhibit these processes and even terminate them and the rule that therapeutically applied energy (e.g., thermal agents, ultrasonic* energy) must be of the proper intensity per unit of time to stimulate the desired physiological response..) that states small doses stimulate cell activity, larger doses hinder it, and still larger doses destroy it.

The frequency-specific body
Each person is frequency-specific and therefore affected by different specific sequences of frequencies combined with lower levels of µA. Some good medical device manufacturers utilize proprietary frequency-sequencing technology that canvasses a wide array of frequencies in a short

period of time, allowing maximum potential results. Attempting to gain a positive result from aimless low levels of electrical current without specific frequency sequences is simply not effective.

It is possible to measure the magnetic proportions of the human body by following instruments: the magneto-cardiogram (MCG) and the magnetoencephalogram (MEG), respectively. The magnetic fields of the body are very low level and typically require specialized equipment such as superconducting quantum interference devices (SQUIDs).

Galvanic skin response (GSR) measures the electrical conductance between two electrodes placed on the skin. This value is a mainstream measure used in lie detectors to help determine veracity and in biofeedback technology to help promote relaxation. Besides relaxation, it also allows measuring currency differences which show stress levels of muscles, tissues, and ligaments (joints). This technic is found in different Asian health-science methods (f.i. acupuncture)

The human body is a strong emitter of infrared radiation, on the order of 100 watts, and visualization of this emission is used in medical imaging. Thermography uses an infrared camera and an associated software system to visualize the pattern of infrared emission, which it is not possible to see directly but experience as heat. This method can detect changes as small as 0.01° C in the human body. Thermography can detect acute and chronic inflammatory conditions. This method is documented by many research studies to show toxic accumulations, tumors, and other diseases, often much earlier than x-ray mammography or other imaging procedures, for example, in the case of breast thermography (Amalu et al, 2006). Typically, thermography is used to locate hot spots and left-right imbalances.

The gas discharge visualization (GDV) camera, developed by the Dr. Korotkov Co., St. Petersburg, Russia, is perhaps the best-known form of contemporary high-voltage electrophotography-based on the Kirlian effect (Kirlian and Kirlian, 1961) and was first discovered in Russia in 1948. Kirlian photography was not introduced to the West until the 1970s because of communication difficulties during the Cold War. This digital camera, introduced in the West in the late 1990s by its inventor, physicist Dr. Konstantin Korotkov, comes with software and offers the advantage of using a lower voltage than conventional Kirlian photography that is not felt as an electric shock by subjects.

The Vega-Grieshaber Company manufactured cameras to record the Kirlian emission of hands and feet. In this setting, energy emission analysis on patients was developed by Peter Mandel, who documented many clinical cases (Mandel, 1986).

The GDV camera uses pulses (10-microsecond) of high-frequency (1024 Hz), high-voltage electricity (10-15 kV) that is selectable from several ranges. The time exposure of the sample is selectable from 0.5 to 30 seconds. In addition to still digital photography, recording digital video is also possible for up to 30 seconds. A charge-coupled detector (CCD), which is a standard detector of low-level visible light used in telescopes and other scientific instruments, detects the pattern of photons emitted from each fingertip.

The simple recording takes place of 2 scales.

- The physical scale of measuring

- The chemical scale of analyzing

Physical scale parameters of aging/biomarkers. Different markers are used on an individual scale as it has proven to be impossible using the same method for all people. Here a number of possibilities.

- Physical length measured every 5 / 10 years
- Body weight
- Body fat % and calculated lean body mass
- Core temperature (different points of measurement)
- Grip strength (hand power is a possibility) *
- Lifting power in 1RM *
- Cardiovascular condition by measuring recovery time after exercise *
- Balance *
- Reaction time *

*- implies that this measurement is situation depended on and need more than one measuring the moment

The chemical analyzing test consists of;

- Blood parameters as Fe and O2 transport (Hemoglobin)
- Testosterone / estrogen level
- Free protein/amino acids
- A genetic test (DNA)
- Insulin

Other tests on a laboratory level for professional research of Aging are:

• Analysis of total IgG, IgE, IgM and IgA, serum/plasma concentrations of 14 cytokines, blood counts and differential blood counts (performed by the recruiters locally), and phenotyping of T cells, B cells NK cells and monocytes by immunofluorescence in proband samples
• Analysis of immune responses against CMV, in order to assess the effect of latent viral infection
• Analysis of autoantibodies against thyroglobulin (as an example of a tissue-specific antigen) and antinuclear antibodies (as for an example for a systemic immune response)
• Analysis of susceptibility to Damage-Induced Cell Death (DICD) and Activation-Induced Cell Death (AICD), respectively, by using apoptosis markers.

These tests are expensive but effective and can determine the level of bio-balance even more specific. But they are used for general population research data.

Surprisingly, not all the useful DNA in chromosomes comes from evolutionary ancestors – some of it was borrowed from elsewhere. DNA includes the genes from at least eight retroviruses. These are a kind of virus that makes use of the cell's mechanisms for coding DNA to take over a cell. At some point in human history, these genes became incorporated into human DNA. These viral genes in DNA now perform important functions in human reproduction, yet they are entirely alien to our genetic ancestry.

Genes have been seen for decades as being the controlling factor that determines what each individual is like physically, but genes are only a tiny part of DNA. The other 97% was thought to be junk until recently, but now it is realized that epigenetics – the processes that go on outside the genes – also have a major influence on development. Some parts act to control "switches" that turn genes on and off or program the production of other key compounds. For a long time, it was a puzzle how around 20,000 genes (far fewer than some breeds of rice) were enough to specify exactly a living human being. The realization now is that the other 97% of DNA is equally important

The feeling of aging is relative. Most people get used to a changing body and environment. Adaptivity of body in and mind makes the aging a relative process. But to enhance aging we need to approach the change in a way to measure it. In former parts, it is mentioned that reference tables are needed to compare.
Important factors that easily can be measured against a changing younger population are;

- Speed (sprint or fast actions)
- Reaction time (how fast do you react on certain stimulus)
- Power (how often can you lift or move a specific weight)
- Cognitive reaction and solving (test = a problem occur and how (also with what and when) to solve it)

Beside mentioned figures to monitor aging it is important to take emotional levels as part of the process. A number of hard to measure but very interesting figures are:

- Emotional freedom. The feeling of being free in society.
- Interrelationship with friends
- Interaction with colleagues and higher placed persons
- Environments such as house and neighborhood
- Emotional connection with the family. Hereby we look at the levels of “love” within following relationships
    - In relation to spouse or partner
    - Relationship to children if available
    - Connection to rest of family

Emotions have a proven but irrational and difficult to measure the effect on aging. The samples of people who got grey overnight when facing a serious emotional break or disaster are well known.
One of the most important parts of the aging process is how to cope with emotions. People who are emotionally stable and able to suit every event into the harmony of their lives are able to reach a high age. Stress is an important factor in diseases and death cases.

But control of the measuring process is needed for obvious reasons. It is important to collect data to reach a consensus for treatment and lifestyle. It is possible to check stress levels and other negative age-related factors with testing the levels of;

- Cortisol
- Testosterone / estrogen balance
- Ca / Mg level

In other parts of the book, there are more test methods.

Establishing the onset of aging is not an easy matter as it is completely individual and also different per race, region, and lifestyle. Most people in the beauty industry have taken the age 20 / 21 as a start when the first wrinkles appear. It is important to understand the difference between actual aging and environmental influences. Skin is constantly exposed on the weather and environmental variations such as buildings and nature. These influences do have an effect on toning, strength, and flexibility of the skin. The idea that aging sets in on this particular age must be considered a commercial goal. Targeted age group is venerable for commercial marketing messages and easily convinced to buy products they do not need

Following the bio-balance, it is most likely to set the date of real aging at the moment the scale change negatively and passes the 50/50 level. At that moment the body is no longer able to compensate for the losses made. The negative scaling reduces the recuperation rate and influences all abilities. Aging is a physical but also a cognitive process. Changes on a cognitive level are directly linked to the levels of hormones and other active biochemicals in the body.

There is a difference between male and female aging. Both processes in different levels of chemistry and psychological. The female aging process is faster in the first 2 decennia of maturation but seems to slow down around the age of 23. The male maturation has a distinctive separation between a biological and mental development. In recent decennia, the difference seems to have grown bigger and longer. One of the main reason is the need for physical labor has decreased and males do no longer have the ability and need to show high physical performances. The lack of wear out of the energy of physical labor got a side effect in mental development. Most males take a longer mental/psychological time to develop from male to mature. Currently, it is considered a male mature at age 30 – 35 years. This used to be 21 – 25 years in the 1950 and before.

Some theory has developed the idea that with an increase of overall age the time of maturity also is changing. This accounts for male more than in the female. The female body still seems to be naturally prepared for relatively young motherhood while the male becomes less able to become a father. The physical and mental development of both is driving them apart in age and maturity. Here there is a change in nature of which the consequences cannot be overseen yet.

An open case study in female electricity

This topic came along while researching the electric capacity of the human body. The statements made are not scientifically verified yet. Many women experience electric shock sensations during menopause. These electric shocks can affect the head and the inner layers of the skin. This menopause symptom may occur on its own or it may precede a hot flash, a sudden and intense feeling of heat in the body.

While researchers are trying to better understand this menopause symptom, some evidence suggests that sensations of electrical shocks are the result of hormone fluctuations during menopause, as estrogen directly affects the nervous and cardiovascular systems.

About Electric Shocks
Many women report that electric shocks occur just before a hot flash episode.

It is estimated that 80% of middle-aged women suffer from back pain throughout their life. In some of them, these problems are accompanied by electric-like shocks in several parts of their back. Numerous known causes include disc compression, vitamin deficiency, or hormonal imbalance, most of which can be successfully managed.

Although less common than hot flashes, electric shock sensations affect many menopausal women. They happen not only during the day but also strike women during sleep.

During menopause, hormonal fluctuations have a direct effect on the nervous system. Changing levels of estrogen can affect the nerve tissue, potentially causing women to feel sensations of electric shocks. Some researchers postulate that misfiring of the neurons in the nervous system may be responsible for feeling electrical shocks during menopause.

Hormone imbalance during menopause can disturb the hypothalamus in the brain, producing vasomotor symptoms such as hot flashes. Electric shocks in menopause are experienced as a precursor to hot flash episodes.

They might be a rare symptom for some women, but electric shocks in the legs can become a real everyday obstacle. They are experienced in the lower extremities, but in many cases, they originate in the lower back as a result of numerous conditions, such as disc herniation or diabetes.

Support Vitamin B complex
Vitamin E
Calcium
Potassium
Herbal supplements

Goodwin, J. (2012). What Causes Hot Flashes, Anyway? Retrieved April 27, 2016, from http://consumer.healthday.com/women-s-health-information-34/estrogen-news-238/what-causes-hot-flashes-anyway-663671.html

Office on Women's Health. (2012). Menopause and menopause treatments fact sheet. Retrieved April 27, 2016, from http://www.womenshealth.gov/publications/our-publications/fact-sheet/menopause-treatment.html

Processes that negatively influences aging:

Addiction; during the aging process it is possible to distinguish two major periods in which addiction develops. The first period is for 12 – 18 years, the hormonal system is going through a turbulent phase and substance addiction easily can develop. Most addictive substances have a direct effect on the hormones such as adrenaline (ephedrine), dopamine and some others. As these hormones have a direct link to testosterone and estrogen major parts of the metabolism do get involved. Addiction tendencies such as a genetic predisposal of having addicted parents of family improve the possibility to a dangerous level.

Another sensitive period is between 30-35 years. During this period most environmental stressors reach their highest level and addiction is one escape from reality. In most cases, the foundation of addiction is laid during the puberty or young adolescence. Alcohol addiction is one of the best known.

Addiction has many shapes. The definition is; Addiction is a primary, chronic “disease” of brain reward, motivation, memory and related circuitry. Dysfunction in these circuits leads to characteristic biological, psychological, social and spiritual manifestations. This is reflected in an individual pathologically pursuing reward and/or relief by substance use and other behaviors.

Addiction is characterized by an inability to consistently abstain, impairment in behavioral control, craving, diminished recognition of significant problems with one’s behaviors and interpersonal relationships, and a dysfunctional emotional response. Addiction often involves cycles of relapse and remission.

Climate and infections;

Tropical climates are breeding ground for many infectious diseases caused by animals such as mosquitoes (malaria). In most tropical countries the physical defense system has to work harder than in sea- and colder land climates. Extremities in temperature differences (polar region as an example) force the body to work harder on keeping it in the right condition and put a higher toll on the complete energy and defense cycle (energy drain).

Disabilities;

Being born with a disability gives a lower degree of survival chance but also a need for more care. Each disability demands specific care and most can be treated to a level of independent living. In general, reasons must be found (research is needed), disable people die younger than not disable persons.

Genetic and chronical diseases

Longevity come through the female side of the family (mitochondrial DNA). This places the male side under considerable pressure when chronic diseases or even genetic malfunctioning is on that side of the family. Age is controlled by many different segments as found in this book but it is discovered that if the longevity on the female side does not exist the person has a lower chance to get extended aging. The changes on both sides decrease when there is a (negative) genetic condition or a serious chronic disease (COPD for instance). In both cases, lifestyle becomes vitally important for a long-term healthy living.

Lifestyle;

To most people, their lifestyle is the biggest threat to become healthy old. Sedative, food consumption and irregular living are a danger to long life.

Sleep disorders;

Sleep is vital to healthy aging. Sleep should be between 6-8 hours a day. There may be exceptional people who have a shorter need but these are rare. Sleep disorder has a disturbing effect on the body and mind. In the book of Arnaud van der Veere on sleep-disorder, there is mentioned that many different reasons and treatments are possible. One conclusion can be made: having a lack of healthy sleep is always of negative influence on aging.

Neural downgrading

Sedative lifestyle, monotonous movements/repetitions and other reasons why the neural system does not receive enough stimulation increases fall out.

Beside all passive test mentioned it is also possible to apply more active physical tests. To apply any of these tests it is important to work with basic knowledge of physical education and testing. Grip power is already mentioned, 1 RM and cardiovascular activities. But there are other types such as;

- cycling test
- endurance (for instance long hiking)
- obstacle race, the individual has to pass a route with obstacles
- resistance trial, taking a distance while overcoming a resistance (weight, elastic or otherwise)
- water test, swimming or water game

There are many ways to improve interest of the individual to put energy in personal performance and health situation. Meeting other people is often one of the major stimuli to offer. People like to meet during activities.

Immortality

The major question of the masses of the topic of aging is; When or how to become immortal. But during all research it was discovered, not immortality itself is impossible, but in the current situation is the mind of people not able to carry the burden of immortality. Why not?

During every interview with persons over 90 years old, the question of immortality came along. Not a single person wanted to have it, even it was for free and without conditions. Amazing right? Especially when after hearing the answers to the same question of 30+ persons.

Immortality is something of interest when people are young. Being young feels good and there is a wish to continue the same situation forever. But that does not happen. The body is changing while aging and these changes are not comfortable, nobody really likes them. The changes limit the joy of life.
Aging is gradually giving in to the abilities to be young. Step by step the abilities are lost. Even people with extraordinary skills lose gradually all major abilities of their youth. And it irritates them but they learn to accept and live with it. Underneed the acceptation there is still that young person desiring to perform once again the way they did. Looking at old pictures or movies enlightens the fire and their mind is at the same activity level again, but the body is no longer able to respond in the same way.

1. Is immortality what a person wish for? If so consider the following:
2. People die, each death leaves a scare. When the number of scares becomes a burden, they will tear even the strongest mind apart.
3. The world is changing all the time, it is impossible to keep up with all the changes.
4. During a lifetime many build favorite habits, have special places, meet interesting people and more, they all change and disappear
5. If every day is a different life is great but what if every day becomes the same
6. Making plans is possible for a short time (approx. 100 years) but what if time has no end

Age Control does not desire immortality. The goal is to live a healthy life as long as possible. To decrease the unhealthy years to a minimum is the desire. Offer knowledge and all other possibilities to enhance the individual life with years of happiness in good health and energy. That is the goal of the movement of Age Control. Everybody should participate as one day the time comes for every person to use what we offer.

3 – Hormones, enzymes, and neural system

Vital to all physiological processes in the body is the functioning of hormones and enzymes. Both are considered the keys to vital living and the core of cell health. Keeping both in an optimal condition is the first task of healthy aging. But before moving into the optimization it is important to understand functioning and production. In enclosed tables, a short oversight of major functions is given.

List of Hormones and their Functions in the human body

HORMONE	FUNCTION	ENDOCRINE GLAND SECRETING
Thyrotropin-releasing hormone (TRH)	Stimulates the thyroid gland to synthesize T3 & T4 hormones	Hypothalamus (HYP)
Corticotropin-releasing hormone (CRH)	Stimulates cortex of the adrenal gland to secrete gluco and mineralocorticoids	(HYP)
Growth hormone-releasing hormone (GHRH)	Stimulates formation of growth hormone,	(HYP)
Growth hormone inhibitory hormone (GHIH) (somatostatin)	Inhibits release of growth hormone, TSH, insulin	(HYP)
Gonadotropin-releasing hormone (GnRH) or luteinizing hormone-releasing hormone.	Controls release of FSH, LH	(HYP)
Dopamine or prolactin-inhibiting factor (PIF)	Inhibits prolactin secretion.	(HYP)
Growth hormone	Stimulates growth of the body	Anterior pituitary (AP)
Thyroid-stimulating hormone (TSH)	Releases T3 & T4	(AP)
Adrenocorticotropic hormone (ACTH)	Stimulates adrenal cortex to produce	(AP)

HORMONE	FUNCTION	ENDOCRINE GLAND SECRETING
Prolactin	Stimulates milk formation	(AP)
Follicle-stimulating hormone (FSH)	Stimulates to form sperms in male and Ova in the female.	(AP)
Luteinizing hormone (LH)	Formation of ova in females & production of testosterone	(AP)
Antidiuretic hormone (ADH) (also called vasopressin)	Limit water expulsion by the kidney. It also constricts blood vessels and raises blood pressure	Posterior pituitary
Thyroxine (T4) and triiodothyronine (T3)	Regulates body metabolism and heat	Thyroid
Calcitonin	Reduces blood calcium. by enhanced deposition in bone, decrease in intestinal absorption and expulsion by the kidney.	Thyroid
Cortisol	Increases blood sugar levels and suppress the immune system	Adrenal cortex
Aldosterone	regulate blood pressure, sodium conservation in the kidney	Adrenal cortex
Norepinephrine	Also called noradrenaline, mobilize the brain and body for action, promotes vasoconstriction, increase blood glucose levels and levels of circulating free fatty acids	Adrenal medulla, locus coeruleus (brain)
Epinephrine	Also known as Adrenaline, increase in heart rate, muscle strength, blood pressure, and sugar metabolism, causes smooth muscle relaxation in the airways but causes contraction of the smooth muscle that lines most arterioles	Adrenal medulla
Insulin (β cells)	Helps absorb glucose from the blood to tissue and also release from the liver	Pancreas

HORMONE	FUNCTION	ENDOCRINE GLAND SECRETING
Glucagon (α cells)	Helps absorb glucose into the liver to form glycogen	Pancreas
Parathyroid hormone (PTH)	stimulates osteoclast activity within the bone marrow,	Parathyroid
Testosterone	Builds muscles, give masculine character and also stimulate the formation of sperms	Testes
Estrogens	Development of female reproductive system.	Ovaries & Placenta
Progesterone	Menstruation, Aids zygote implantation, Lactation & sexual drive	Ovaries & Placenta
Human chorionic gonadotropin (HCG)	Supporting the ovarian corpus luteum, which in turn supports the endometrial lining and therefore maintains pregnancy but also a cancer marker when increased levels measured in mature subjects	Placenta
Human somatomammotropin (HCS)	Regulates carbohydrate and protein metabolism of the mother to ensure delivery to the fetus of glucose for energy and protein for fetal growth	Placenta
Renin	Helps maintain blood volume and thereby blood pressure	Kidney
1,25-Dihydroxycholecalciferol	Rises Blood calcium levels	kidney/nephron
Erythropoietin	Stimulates formation of red blood cells.	Kidney
Atrial natriuretic peptide (ANP)	the balance of water, sodium, potassium, and fat in the body	Heart muscle
Gastrin	To secrete gastric juice	Stomach
Secretin	Water levels and water balance in the body	Small intestine/duodenum

HORMONE	FUNCTION	ENDOCRINE GLAND SECRETING
Cholecystokinin (CCK)	Stimulates fat and protein digestion in the intestine.	
Leptin	Regulates energy balance. Inhibits hunger if needed	adipose cells
Ghrelin	Stimulates hunger	Gastro intestine

Amino Acid-Derived Hormones

The amino acid-derived hormones are relatively small moleculees that are derived from the amino acids tyrosine and tryptophan. Its chemical name end in “-ine”. Examples include epinephrine and norepinephrine, thyroxine and melatonin.

Peptide Hormones

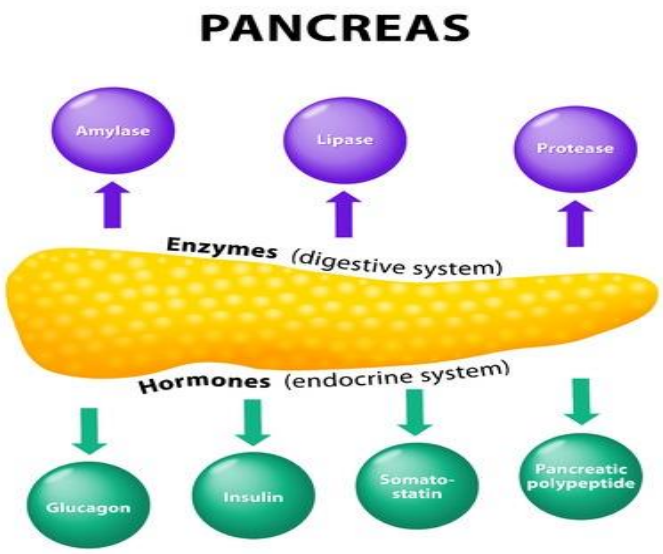
Peptide hormones include molecules that are short polypeptide chains, such as antidiuretic hormone and oxytocin produced in the brain and released into the blood. This class also includes small proteins, like growth hormones and large glycoproteins such as follicle-stimulating hormone produced by the pituitary. Amino acid-derived and polypeptide hormones are water-soluble and insoluble in lipids. These hormones cannot pass through plasma membranes of cells; therefore, their receptors are found on the surface of the target cells. The structures of peptide hormones oxytocin, growth hormone and follicle-stimulating hormone are much larger than those derived from cholesterol or amino acids.

Lipid-Derived Hormones (or Lipid-soluble Hormones)

Most lipid hormones are derived from cholesterol and thus are structurally similar to it. The primary class of lipid hormones in humans is the steroid hormones. Chemically, these hormones are usually ketones or alcohols; their chemical names end in “-ol” for alcohols or “-one” for ketones. Examples of steroid hormones include estradiol and testosterone. Other steroid hormones include aldosterone and cortisol, which are released by the adrenal glands along with some other types of androgens. Steroid hormones are insoluble in water and transported by transport proteins in the blood.

Eicosanoids

Eicosanoids also called 'local hormones' as they act on cells close to their site of production. Eicosanoids have a short lifespan and break down fast. There are different types of eicosanoids. Three most known types are prostaglandins, thromboxanes, and leukotrienes. Most eicosanoids are produced from arachidonic acid. Arachidonic acid is a polyunsaturated fatty acid and a type of omega-6 fatty acid.



Both enzymes and hormones, have specific functions in the body and often interact with each other.

The Pancreas produces both enzymes and hormones which are both active on the same channel but at a different angle. Amylase breaks down carbohydrate-containing food into solvable nutrients. After entering the blood system Insulin assist to get the glucose (carbohydrates) into the cell. Here we see an important additional effect of enzyme/hormone.

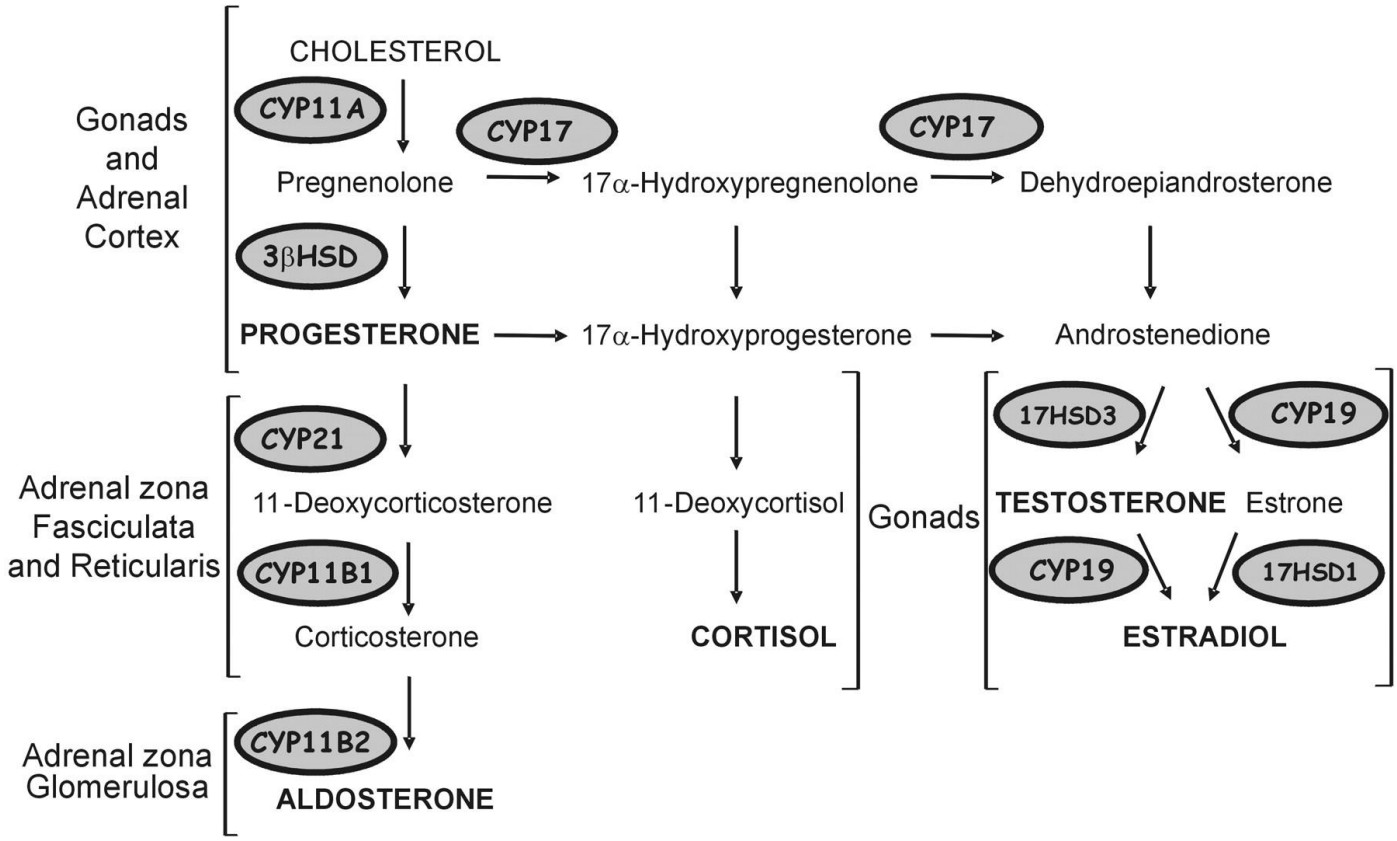
Another sample is the Adrenal cortical steroids promoting adenosine triphosphatase within the energy system. In the study of the aging process it is important to know which action comes first; the hormone activity or the enzymatic reaction.

The answer to this is complicated as it depends on the chemical pathway. Most hormones only become active after an exchange with enzymes. These enzymes are needed to change the shape of pro-hormones and actual active hormones to other active products.

Hormones have specific interaction levels at target cells:
Permissiveness – one hormone cannot function without the assistance of another hormone. This teamwork is needed for a full functioning of the reaction

Synergism – more than one hormone produces the same effect on a target cell. This avoids problems when a specific hormone shows a malfunction/error

Antagonism – one or more hormones oppose the action of another hormone. This is needed to end specific reactions and bring back to a neutral state.



The start of the action of enzymes is at the change of cholesterol in the first production step. There are many types of enzymes. Too many to mention all in this book.

The Digestive Enzymes				
Enzyme Category	**Enzyme Name**	**Source**	**Substrate**	**Product**
Salivary Enzymes	Lingual lipase	Lingual glands	Triglycerides	Free fatty acids, and mono- and diglycerides
Salivary Enzymes	Salivary amylase	Salivary glands	Polysaccharides	Disaccharides and trisaccharides
Gastric enzymes	Gastric lipase	Chief cells	Triglycerides	Fatty acids and monoacylglycerides
Gastric enzymes	Pepsin*	Chief cells	Proteins	Peptides

Brush border enzymes	α-Dextrinase	Small intestine	α-Dextrins	Glucose
Brush border enzymes	Enteropeptidase	Small intestine	Trypsinogen	Trypsin
Brush border enzymes	Lactase	Small intestine	Lactose	Glucose and galactose
Brush border enzymes	Maltase	Small intestine	Maltose	Glucose
Brush border enzymes	Nucleosidases and phosphatases	Small intestine	Nucleotides	Phosphates, nitrogenous bases, and pentoses
Brush border enzymes	Peptidases	Small intestine	• Aminopeptidase: amino acids at the amino end of peptides • Dipeptidase: dipeptides	• Aminopeptidase: amino acids and peptides • Dipeptidase: amino acids
Brush border enzymes	Sucrase	Small intestine	Sucrose	Glucose and fructose
Pancreatic enzymes	Carboxy-peptidase*	Pancreatic acinar cells	Amino acids at the carboxyl end of peptides	Amino acids and peptides
Pancreatic enzymes	Chymotrypsin*	Pancreatic acinar cells	Proteins	Peptides
Pancreatic enzymes	Elastase*	Pancreatic acinar cells	Proteins	Peptides
Pancreatic enzymes	Nucleases	Pancreatic acinar cells	• Ribonuclease: ribonucleic acids • Deoxyribonuclease: deoxyribonucleic acids	Nucleotides
Pancreatic enzymes	Pancreatic amylase	Pancreatic acinar cells	Polysaccharides (starches)	α-Dextrins, disaccharides (maltose), trisaccharides (maltotriose)

Pancreatic enzymes	Pancreatic lipase	Pancreatic acinar cells	Triglycerides that have been emulsified by bile salts	Fatty acids and monoacylglycerides
Pancreatic enzymes	Trypsin*	Pancreatic acinar cells	Proteins	Peptides

Other enzymes worth to mention are these active on a steroid-related level which involves other important metabolic functions.

The interconnection of hormone and enzyme systems is strong. Very strong. When a malfunction occurs in one system it is followed by errors in the other system with an accumulative effect. In the "wear and tear theory of aging," a layout for the "error effect" of this malfunctioning is produced. Production of all hormones and enzymes takes place in the glands. Each gland receives orders through the transmission of neurotransmitters send by nerve system which in the turn is controlled by the brain. The brain is a responsive organ and reacts to different circumstances and observations in general from external sources.

The fundament of all action is the neural system. Only after this system starts transmitting information through its pathways the body is able to respond to anything. Here is also the first part of aging which we must control. Neurex is one way to get and keep a grip on it.

Neural system

The neural system is the true lifeline and transfers all "orders" of the brain into other parts of the body. Each signal passes through a connected range of neurons and passes the neurites and dendrites with lightning speed. A true electrical system.

The most general functional definition divides neural systems into

- sensory systems among which offer vision, hearing, touch, tasting, smell, and senses that acquire and process information from the environment
- motor systems allow the organism to respond to received information by generating reactions and responses. Action-reaction effect.

A less known but highly active system is collectively referred to as associational systems, they carry out the most complex and least well-characterized brain functions.

- Neuroscientists and neurologists have divided the vertebrate nervous system anatomically into the central system
- peripheral system

The central nervous system comprises the brain (cerebrum, cerebellum, and brainstem) and the spinal cord. There are over 100 trillion neural connections in the average human brain, though the number and location can vary. A synapse gives a command to the cell and the entire communication process typically takes only a fraction of a millisecond. Signals travel along an alpha motor neuron in the spinal cord 431 km/h the fastest transmission in the human body. The peripheral nervous system includes sensory neurons, which link sensory receptors on the body surface and specialized receptor structures such as the ear, with processing circuits in the central nervous system. The motor portion of the peripheral nervous system consists of two components. Motor axons that connect the brain and spinal cord to skeletal muscles which make up the somatic motor division of the peripheral nervous system. The

visceral or autonomic motor division consists of cells and axons that innervate smooth muscles, cardiac muscle, and glands.

In the peripheral nervous system, nerve cells are located in ganglia, which are simply local accumulations of nerve cell bodies (and supporting cells). Peripheral axons are gathered into nerves, which are bundles of axons, many of which are enveloped by the glial cells of the peripheral nervous system, the Schwann cells. In the central nervous system, nerve cells are arranged in two different configurations. Nuclei are compact accumulations of neurons having roughly similar connections and functions, these collections of nerve cells are found throughout the brain and spinal cord. Axons in the central nervous system are gathered into tracts. Within a tract, glial cells of the central nervous system—astrocytes and oligodendrocytes—envelop the central axons.

In the sensory portion of the peripheral nervous system, sensory ganglia lie adjacent to either the spinal cord or the brainstem. The nerve cells in sensory ganglia send axons to the periphery that end in (or on) specialized receptors that transduce information about a wide variety of stimuli. The central processes of these sensory ganglion cells enter the spinal cord or brainstem. In the somatic motor portion of the peripheral nervous system, axons from motor neurons in the spinal cord give rise to peripheral motor axons that innervate muscles to control skeletal movements and most voluntary behaviors. The autonomic division of the peripheral nervous system is more complicated.

Preganglionic visceral motor neurons in the brainstem and spinal cord form synapses with peripheral motor neurons that lie in the autonomic ganglia. The motor neurons in autonomic ganglia innervate smooth (white) muscle, glands, and cardiac muscle, controlling most involuntary (visceral) behavior. In the sympathetic division of the autonomic motor system, the ganglia are in front of the vertebral column and send their axons to a variety of peripheral targets. In the parasympathetic division, the ganglia are found within the organs they innervate. Another component of the visceral motor system, called the enteric system, is made up of small ganglia scattered throughout the wall of the gut. This gives the impression and effect of an independent “brain system”. (2001, Sinauer Associates, Inc. Bookshelf ID: NBK11061)

In reference to the aging process, it is understandable that the neural system is the weak link. Many things can go and do go wrong. The first steps of neural growth and distribution are the training in childhood. Coordination is programming the neural system in where to react. Precision training is how to do it. Slowly movement is built that includes coordination, speed, and accuracy. Through training of repetition more useful reflexes are built. With a built up “database” of reflexes more room in the brain and neural system for other movement is created. The most important part of reflexes is the unconscious reaction to programmed and suspected events. This programming gives space for other movements. By programming, a complete personal movement and reaction sequences are created. A good sample is the learning how to drive a car or bike.

Within this, due to the multifunctional neural actions, fear and joy are embedded. Emotions become a part of the neural system and have an influence on personality and movement. How does it work?

Neurons have three basic parts:

1. Cell body: This part has a nucleus (contains DNA), endoplasmic reticulum and ribosomes (for building proteins) and mitochondria (for making energy). Cell bodies are grouped together in clusters called ganglia, which are located in various parts of the brain and spinal cord.

2. Axons: These long, thin, cable-like cells send electrochemical messages (nerve impulses or action potentials) along the length of the cell. Depending upon the type of neuron, axons can be covered with a thin layer of myelin, like an insulated electrical wire and act like a true conductor. Myelin is made of fatty acids, which helps to speed transmission of a nerve impulse down the axon. Myelinated neurons are found in the peripheral nerves (sensory and motor neurons), while nonmyelinated neurons are found within the brain and spinal cord.
3. Dendrites or nerve endings: small, branchlike cell parts connect with other cells and allow the neuron to transfer its message to other cells or perceive the environment. Dendrites can be located on one or both ends of the cell.

Action Potentials

How does the neural system transfer its signal messages from one side to the other side of the system? The main reason is the existence of electric potential differences. These are called; Action potentials and they are generated when voltage-gated sodium channels open as a result of the passage of local electrical currents across the membrane.

These local currents occur at the site of an electrical stimulus
1 - depolarization produced by a generator potential at a sensory ending
2 - depolarization of the cell body produced by an EPSP (excitatory post-synaptic potential)
3 - depolarization produced by ligand-gated channels (receptors) on a post-synaptic membrane

Whenever a depolarization of the axon is sufficient to reach a threshold (when the resting potential drops to around - 50 to -55 mv), voltage-sensitive sodium channels in the membrane open. As a consequence, some Na+ ions move down both electrical and voltage gradients towards the Na+ equilibrium potential (about +40 to +60 mV) and cause the membrane potential to reverse for less than a millisecond.

The All or Nothing Law (which applies to single axons) states that an electrical stimulus of a particular size to an axon either produces an action potential or it does not.

The Threshold stimulus is the stimulus size (mV or mA) that just initiates an action potential
A stimulus that is insufficient to initiate an action potential is known as a Subthreshold Stimulus
A stimulus greater than the threshold stimulus is called a Suprathreshold stimulus: the action potential is no different from that induced by a threshold stimulus and the swing of membrane potential is constant in size

Classes of Neurotransmitters:

- Acetylcholine
- Biogenic amines (contains one or more amine groups)
  - Dopamina, Norepinephrine, and epinephrine
  - Serotonin
  - Histamine
- Amino acids
  - GABA (gamma-aminobutyric acid)
  - Glutamate

Glycerine
Peptides
Endorphins and enkephalins
Somatostatin

The neural system is fragile and it is possible to disrupt it. The following options of disruption do happen:

- Delayed transmission. Nerves need to be kept in a good condition. One of the major ways to keep nerves active is to feed them with different impulses and speed levels. Nerves must be "played" with to keep active and "young". When nerves serve the same speed day in and day out they become "lazy". Like a routine person does things without thinking a nerve act the same. But when these routines happen too often a nerve also get slower and sometimes obstructed. Using the same pathway leaves traces of energy in the neural shield (ganglia) which can create "false" energy and disrupt a signal (wear and tear principle). When the transmission is delayed all following procedures are delayed. This simple delay has a domino effect on all reactions following.
- Obstructed delay. As mentioned before obstruction can be caused by pollution of the passages but also by injury or defects. Most of the time it is possible the neural system creates alternative routes but not always. A neural obstruction in a chain creates delays or fall out of next steps.
- Fall out or complete removal. Amputation is a clear sample of a malfunctioning neural system. The system continues to send and "receive" ghost messages to not-existing parts of the body.
- Chemical disturbances. The use of drugs and medicines can disrupt the neural system by or take over the function of neurotransmitters with a different signal but "identical" chemistry or block the transmission completely for a period of time.
- Malfunctioning. Through a disease or otherwise, the nerves transmit parts of a wrong message. This malfunction can lead to a change in cell information (cancer) or even destruction of cells and tissue.

The sensitivity of the neural system is known as one of the major causes of aging. Keeping the system healthy and productive is a need. Stimulation a must. Neurex is still one of the only exercises to keep the neural system in a good condition until high age.

The connection between the neural, enzymatic and hormone system is one of impulse transfer. The brain is a Reaction system that only acts upon an external or internal action. Hormones are produced upon a need of the body while enzymes must make the use of the hormones possible. Many enzymes also prepare, for instance, food, factors for the hormones to act upon. Realizing the potential complete dependency of all three systems it is clear that any interruption leads to a domino effect in all systems.

Aging creates such disturbances by the following actions:

- Regular use of each part of the system in daily life
- Smaller than micro waste parts are left behind during these working days
- Waste accumulation which becomes an obstacle in transmission or functioning
- The neural system slows down and enzymes/hormones receive incomplete information
- Incomplete information leads to a not "perfect" task delivery
- Incomplete task delivery is followed by error accumulation
- Error accumulation leads to falling out of functions
- Fall out again tickers misfunctioning of tissues and organs
- This misfunctioning built up errors in tissue and organ functions

- Which leads to failing processes
- With finally a complete termination of organs, tissue, and body.

Even the smallest error leads by accumulation to a final halt of the tissue, organ or even body. Waste is something impossible to avoid. At every place, no matter where and how, when something works it leaves some waste. It is impossible to have a perfect score at all time.

Within the mentioned systems, it is possible to stimulate, train and increase the neural system and reach, doing so, a higher level of recuperation and cleaning. The neural system is in its best shape when used frequently and by the challenge. The challenge of the neural system create new pathways and that, in itself, promote the production and efficiency of the enzyme and hormonal system. It must be said that the more active a person is able to create new pathways, the higher the concentration of steroid hormones is.

It is proven that neural stimulation by improved activity also promotes the concentration and production of steroid hormones more than the peptide versions. This unbalances could be lowered by the import of high amino-rich foods through the digestive tracks (use of concentrated amino acids like Valine, Leucine, Iso-leucine, Glutamine, Arginine to name the most important).

During seminars and lectures one of the most important questions is; do hormones help with the aging process?

The answer is no. Why not?

The use of externally produced hormones is a disturbance of the local system. When an external dose is used the local homeostasis must react. First, it must accept the incoming intruder as part of the system. This intruder has a function which is stronger than the available levels. The hormone has a specific function and starts to act upon that. The body responds by reacting on the action potential of the steroid hormone. Enzymes must be produced to follow “orders” of the intruder and the neural system is set upon action to transmit information. All these actions need time to build up, stabilize and broken down.

A body seeks homeostasis at all time. The intruding steroid hormone will have an effective period. Often around 8 weeks and in some cases, it can go up to 12 weeks. After this period the body tries to undo the changes made after all the body has its own programmed homeostasis which the intruder did disturb.

Steroid hormones have a direct effect on muscles. These muscles are stimulated to be active. If the user is active the muscles respond by growth and demand for amino acids and ATP (energy). The use of steroids promotes activity, even in small doses. If there are not enough activity chances are high that the effectiveness of the steroid hormone is too low the measure.

Beside activity, the use of steroids also demands a food schedule that suits its use. There is a high demand for proteins, vitamins, and minerals. But the exact amounts may vary per person and intensity of activity. The exact amounts need to be guessed as calculation at this moment is still not possible. The effect of high doses of vitamin and minerals can become toxic or at least disturb to the homeostasis and create waste in the system. Waste that improves the already existing accumulation and disturbance of the system.

The effect of steroids on the body, even at low doses, is considered a disturbance and a reaction follow. One of the major reaction is a lowering of individual production by the equivalent or more of the imported product. Depending on the age it may result in a dependency and surely a fall back after stop. A fall back is the time when the external user is stopped but the internal production is still down or even not existing. The personal production must be promoted again, which, at a certain age, is no longer possible. This is a high risk.

The use of eternal products is temporary. Every external product is not of the same chemical composition as the personal body production. There are always chemical differences. These differences create waste during the actions as some of the products cannot be fully used. The generated waste could be cleaned but also some will be left behind causing hindering for other actions.

Using external action potential can exhaust the personal system. Most people who start using the products are in one way or the other in a form of mental stress. They eager to become younger, otherwise they do not take this drastic step to use the products. Being in a stress already caused an increase in hormonal production. The complete package of hormones (external and internal) causes a rush of energy which promotes activity and causes an emotional feeling of being younger. Actual nothing changes as age is not a clock that can be turned back.

The use of external products give a temporary feeling of youth but by using it for a prolonged period of time the effects are the opposite of what is desired for.

4 Sleep

Sleep is an underestimated entity in the aging process. Understanding the need of sleep as an age supporter there is a need to review the different phases and implications of it on health.

Before sleeping

Brain activity is measured in waves lengths with each of them a specific name and function.

- Beta waves are associated with day to day wakefulness. These waves are the highest in frequency and lowest in amplitude, and more dyssynchronous than other waves. That is, the waves are not consistent in their pattern. This desynchrony makes sense given the fact that day to day mental activity consists of many cognitive, sensory, and motor activities and experiences, and, thus, when awake, people are mentally dyssynchronous.
- During periods of relaxation, while still awake, the brain waves become slower, increase in amplitude and become more synchronous. These types of waves are called **alpha waves**. Such brain waves are often associated with states of relaxation and peacefulness during meditation and biofeedback.

Different stages in sleep

Sleep is divided into different phases. There are 4 stages and the REM sleep. All these stages progress in a cycle from stage 1-4 (also called NREM = Non-Rapid Eye Movement stage, divided in N1 – N4) and end with REM to start over again.

- During stage 1 the sleep is lightly and it is easy to wake up.
- When entering stage 2 control slowly slips away and the sleep becomes deeper. Some people have a feeling of falling down into a deep space, this phase takes around 50% of the sleep cycle.
- Phase 3 and 4 take around 30 % and the REM just 20%. Infants spend over 50% of REM sleep.

REM sleep.

REM = Rapid Eye Movement sleep. During REM the eyes start moving fast and the brain activity is speeding up at different levels. When entering REM sleep, breathing becomes faster, irregular, and shallow, the eyes jerk rapidly in various directions, and the limb muscles become temporarily paralyzed. The heart rate increases, blood pressure rises, and males develop penile erections, females can have a more vaginal extraction. When people awaken during REM sleep, they often describe bizarre and illogical stories called dreams.

The first REM sleep period usually occurs about 70 minutes after falling asleep. A complete sleep cycle takes 90 to 110 minutes on average. The first sleep cycle each night contain relatively short REM period and a long period of deep sleep (Phase 4). As the night progresses, REM sleep periods increase in length while deep sleep decreases. By morning, all time is spent in stages 1, 2, and REM.

A person awakened after sleeping just more than a few minutes is usually unable to recall the last minutes before falling asleep. This sleep-related form of amnesia is the reason people often forget phone calls or conversations from the middle of the night. It also explains why it is possible not to

remember the alarms ringing in the morning if going back to sleep after turning it off. During the aging process, this events become more frequent and take a long time for recuperation.

Since sleep and wakefulness are influenced by different neurotransmitter signals in the brain (serotonin and norepinephrine), foods and medicines that change the balance of these signals affect whether people feel alert or drowsy and how well they sleep. Caffeinated drinks such as coffee and drugs stimulate parts of the brain and can cause *sleep disorder (even insomnia),* or an inability to sleep.

Many antidepressants suppress REM sleep. Heavy smokers often sleep lightly and have reduced amounts of REM sleep. They tend to wake up after 3 or 4 hours of sleep due to nicotine withdrawal in the blood. Many people who suffer from sleep disorders try to solve the problem of alcohol – a so-called nightcap. While alcohol does help people fall into light sleep, it also takes away their ability to enter REM and deeper, the more restorative stages of sleep. Instead, it keeps them in the lighter stages of sleep, from which they can be awakened easily. Alcoholics show a disoriented consciousness in the morning. Sleep deprivation is a strong aging promotor, the effects are clearly visible in physical and mental expression.

Everybody loses some of the ability to regulate the body temperature during REM, temperatures changes in the environment can disrupt this stage of sleep. If REM sleep is disrupted one night, the body doesn't follow the normal sleep cycle progression the next time it dozes off. In different scientific sleep research projects, they discovered that instead of starting the new cycle, often people slip directly into REM sleep and go through extended periods of REM until finally "catch up" on the sleep cycle. Hereby the answer is “yes” to the question; can people catch up for lost sleep. But the answer is only “yes” when it happens coincidentally and not often.

The effects of REM sleep deprivation (RSD) on neurotrophic factors, specifically nerve growth factor (NGF) and brain-derived neurotrophic factor (BDNF), were assessed in 2000 by Sie et el. Neurotrophins are proteins found in the brain and periphery that aid in the survival, functioning, and generation of neurons; this is an important element in the synaptic plasticity process, the underlying neurochemical foundation in forming memories. BDNF protein has been shown to be necessary for procedural learning (a form of non-declarative memory). Since procedural learning has also exhibited consolidation and enhancement under REM sleep, it is proposed that the impairment of procedural learning tasks is due to the lack of BDNF proteins in the cerebellum and brainstem during RSD. In regards to NGF, the basal forebrain (production and distribution of AcH in the brain), more specifically the medial septal area, sends cholinergic (excitatory in the hippocampus) and GABAinergic (inhibitory) neurotransmitters through fibers to the hippocampus target cells. These target cells then secrete NGF which plays a key role in the physiological state of the hippocampus and its functions. It has been noted that REM sleep increases the secretion of NGF, therefore it has been proposed that during RSD cholinergic activity decreases leading to a decrease in NGF and impairment in procedural learning.

REM sleep begins in response to signals sent to and from different regions of the brain. Signals are sent to the brain's cerebral cortex, which is responsible for learning, thinking, and organizing information. Signals are also sent to the spinal cord to shut off movement, creating a temporary inability to move the muscles ("paralysis") in the arms and legs. Abnormal disruption of this temporary paralysis can cause people to move while they are dreaming.

REM sleep stimulates regions of the brain that are used for learning. Studies have shown that when people are deprived of REM sleep, they are not able to remember what they were taught before going to sleep. Lack of REM sleep has also been linked to certain health conditions, including migraines. This also refers directly to the aging process which accelerates with lack of sleep and even can exhaust a person completely cutting years of a healthy life.

Macroscopic brain systems

Previous research has shown REM sleep to reactivate cortical neural assemblies post-training on a serial reaction time task (SRT), in other words, REM sleep replays the processing that occurred while one learned an implicit task in the previous waking hours. Results of PET scans indicate that bilateral cuneus was significantly more activated during SRT practice as well as post-training REM. In addition, this activation was significantly increased during REM sleep versus the SRT task. This suggests that specific brain regions are specifically engaged in the post-processing of sequential information. This is further supported by the fact that regional CBF (rCBF) during post-training REM sleep is modulated by the level of high-order, but not low-order learning obtained prior to sleep. Therefore, brain regions that take part in a learning process are modulated by both the sequential structure of the learned material (increased activation in cuneus), and the amount of high-order learning (rCBF).

The positive correlation between sleep and memory breaks down with aging. In general, older adults suffer from decreased sleep efficiency. The amount of time and density of REM sleep and SWS decreases with age. Consequently, it is common that the elderly receive no increase in memory after a period of rest. To combat this, donepezil has been tested in healthy elderly patients where it was shown to increase time spent in REM sleep and improve next day memory recall.

Patients with Alzheimer's disease experience more sleep disruption than the healthy elderly. Studies have shown that in patients with Alzheimer's disease, there is a decrease in fast spindles. It has also been reported that spindle density the night before a memory test correlate positively with accuracy on an immediate recall task. A positive correlation between time spent in SWS and next day autobiographical memory recall has also been reported in Alzheimer's patients.

Sleep spindles are short and intense bursts of neurons firing in sync, occurring in the thalamocortical networks. This peak late in the night and are defining characteristics of stage two sleep. Sleep spindles are thought to aid in information consolidating during sleep and have been shown to increase after training on a motor task.

The first stage of sleep is characterized by theta waves, which are slower in frequency and greater in amplitude than alpha waves which occur when relaxing. The difference between relaxation and stage 1 sleep is gradual and subtle. During stage 1, light sleep, a person drift in and out of sleep and can be awakened easily. The eyes move slowly and muscle activity slows down. People awakened from stage 1 sleep often remember fragments of visual images. Many also experience sudden muscle contractions often followed by a sensation of falling.

As the sleeper moves to stage 2 sleep theta wave activity continues, interspersed with two other waves. These phenomena, which occur periodically every minute or so, and are defining characteristics of stage 2 sleep, are termed sleep spindles and K complexes. The former is a sudden increase in wave frequency,

and the latter is a sudden increase in wave amplitude. Stages 1 and 2 are relatively "light" stages of sleep. In fact, if someone is awoken during one of these stages, he or she will often report no being asleep at all. When entering stage 2 sleep, the eye movements stop and the brain waves (fluctuations of electrical activity that can be measured by EEG) become slower. This is measured by lengthening of the waves with occasionally a bursts of rapid waves (shown as spikes on the graph).

In stage 3, slow brain waves called *delta waves* (also called Slow wave sleep (SWS) begin to appear, interspersed with smaller, faster waves. At stage 4, the brain produces mainly delta waves. It is difficult to wake someone during stages 3 and 4, cause these phases are considered *deep sleep.* There is no eye movement or muscle activity. People awakened during deep sleep do not adjust immediately and often feel groggy and disoriented for several minutes after they wake up. It is strongly advised not to wake a person in this period. Some children experience bedwetting, nightmares, or sleepwalking during deep sleep as they lose all control over the body. Slow wave activity is increased by as much as 25% after implicit learning and time spent in this sleep stage has been shown to improve the performance of the implicitly learned task after sleep.

A person under anesthesia or in coma often said to be asleep. However, people in these conditions cannot be awakened and do not produce the complex, active brain wave patterns seen in normal sleep. Instead, the brain waves are very slow and weak, sometimes all but undetectable. After the operation, the waking up causes serious vomiting and an ill feeling. This is not only caused by the use of the anesthesia but also because of a disturbed sleep cycle. Most of the time it is cured within days.

One important aspect of sleep is memory efficiency. The storage of day to day affairs, faces, and meetings, learning, and processing. To compare with something easy to understand; it is a reset of the hard drive of the personal computer using a cleaning program. When the computer is rebooted it is supposed to work well.

Hormone actions and sleep patterns

Growth hormone is typically secreted in the first few hours after the onset of sleep and generally is released during slow-wave sleep (SWS). Cortisol is tied to the circadian rhythm, and peaks in late afternoon, regardless of the person's sleep status or the darkness/light cycle. Melatonin is released in the dark and is suppressed by light. Thyroid hormone secretion occurs in the late evening.

Consolidation

Consolidation of a memory is a process that takes an initially unstable representation and encodes it in a more sturdy, effective and efficient manner. In this new state, the memory is less susceptible to interference. There are essentially three phases of memory consolidation and all are thought to be facilitated by sleep or not sleep:

1. Stabilization is the encoding of a memory which takes only 6 milliseconds.

2. Enhancement is the continual process of consolidation which can occur over minutes, 7 hours, days but not longer. Post-sleep behavioral activities can be seen to show significant improvements in the absence of practice.

3. Integration can also take hours or years and is the process of connecting recently encoded memories into existing memory networks.

Reconsolidation

Reconsolidation of a memory involves the retrieval of an already consolidated memory (explicit or implicit), into short-term or working memory. Here it is brought into a labile state where subsequent information can 'interfere' with what is currently in memory, therefore altering the memory. This is known as retroactive interference and is a significant issue for court and eyewitness testimonies.

Positron emission tomography (PET) is used in viewing functional processes of the brain (or other body parts). A Positron-emitting radionuclide is injected into the bloodstream and emits gamma rays which are detected by an imaging scanner. Computer analysis then allows for a 3-dimensional reconstruction of the brain region or body part of interest.

Functional magnetic resonance imaging (fMRI) is a type of brain imaging that measures the change of oxygen in the blood due to the activity of neurons. The resulting data can be visualized as a picture of the brain with colored representations of activation

The main method of measuring sleep in humans is polysomnography (PSG). For this method, participants often must come into a lab where researchers can use PSG to measure total sleep time, sleep efficiency, wake after sleep onset, and sleep fragmentation. PSG can monitor various body functions including brain activity (electroencephalography), eye movement (electrooculography), muscle movement (electromyography), and heart rhythm (electrocardiography).

Electroencephalography (EEG) is a procedure that records electrical activity along the scalp. This procedure cannot record activity from individual neurons but instead measures the overall average *electrical* activity in the brain.

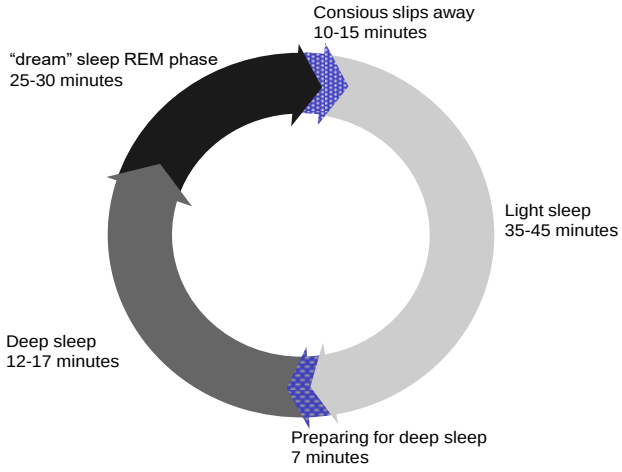
Electrooculography (EOG) measures the difference in electrical potential between the front and the back of the eye. This does not measure a response to individual visual stimuli but instead measures general eye movement.

Electromyography (EMG) is used to records the electrical activity of skeletal muscles. A device called an electromyograph measures the electrical potential of muscle cells to monitor muscle movement.

Electrocardiography (ECG or EKG) measures the electrical depolarization of the heart muscles using various electrodes placed near the chest and limbs. This measure of depolarization can be used to monitor heart rhythm.

Actigraphy is a common and minimally invasive way to measure sleep architecture. Actigraphy has only one method of recording, movement. This movement can be analyzed using different actigraphic programs. As such, an actigraph can often be worn similarly to a watch, or around the waist as a belt. Because it is minimally invasive and relatively inexpensive, this method allows for recordings outside of a

lab setting and for many days at a time. But, actigraphy often overestimates sleeps time (de Souza 2003 and Kanady 2011).



The amount of sleep needed varies according to age. The list below is for the average persons, it gives an idea of the amount of sleep one needs according to age.

a. First seven years one needs 12 to 16 hours sleep. (0-7 years old)
b. 8 to 10 years old needs 8 to 12 hours (7 – 14 yrs old)
c. In the third seven years of life, a person needs around 8 hours sleep (14 – 21 yrs)
d. In the fourth seven years, a person needs 6 to 8 hours (21 – 28 yrs)
e. In the fifth seven years, a person needs 6 to 7 years (28 – 35 yrs)
f. In sixth seven years, a person needs 5 to 6 hours (35 – 42 yrs)
g. In the seventh seven years and after that a person can often do with less than 6 hrs. depending on the daily activity of the person

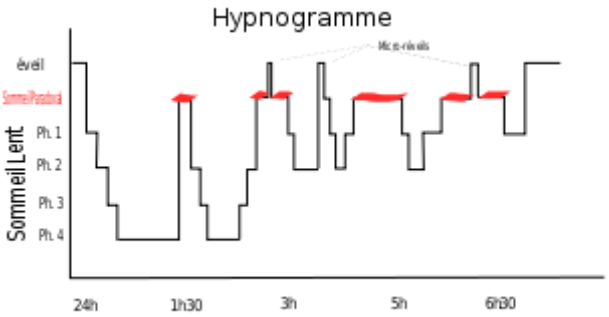
The question: enough sleep ? is an individual matter. To find out how much sleep one needs is a matter of experimenting. The best way to figure this out is to recall the past. Remember the physical and mental reaction to short sleep and long sleep. After a short sleep, the feeling occurs of "want to sleep" all day long with moments of drowsiness, but when sleeping long the feeling of being lazy, moody, dizziness and a feeling to do nothing.

How Much Sleep Do We Need?

The amount of sleep each person needs a night depends on many factors. Infants generally seem to need about 16 hours of sleep a day, while teenagers may seem to need about 9 hours on average but often more. For adults, 7 to 8 hours a night appears to be a reasonable amount of sleep, although some people can do with as few as 3 hours or as many as 10 hours of sleep each day.

Pregnant women need several more hours of sleep than a woman of the same age. When getting older it seems the need for sleep is lesser. About half of all people over 65 considered to have frequent sleeping problems, such as sleep disorder, and deep sleep stages in many elderly people become short or stop completely. This change is a normal part of aging, or it may be the result of medical problems that are common in elderly people and from the medications or other treatments. But sleep disorders can also be a matter of perception of the amount of sleep really needed by the elderly. Doctors and nurses (included other caregivers) still use the 8-hour sleep rule to judge sleep time. In fact, this is not right at all. When a person passes 60 years of age and does not have an active lifestyle the need of sleep is decreasing.

Separation of sleep time in two parts can be helpful for many people. It is a myth that sleep needs to be in one block only. A part in the afternoon and another part in the nighttime period. Each person has the best time to sleep. In care homes, it seems not possible to use this method which is rather remarkable as the method is most compelling for this target group.



These are signs of sleep deprivation ;

- Fall asleep within 5 minutes after laying down
- Having microsleeps during the day. A microsleep is a dozing off for a few minutes (seconds).
- Feeling drowsy during the daytime
- Dozing off when active performing something (for instance driving)
- (Severe) lack of concentration and difficult to focus on something
- Feeling of discomfort when becoming active

These signs are rather dangerous to the individual health and also the safety of a person. The main reason why this happens more and more often in society is the fact that people all seem to be too occupied to relax. On one hand, the social life is taking its toll and on the other side, the commercial life is putting high pressures.

Sleep depriving has become a serious problem in traffic and at the working place. A lot of accidents in traffic are happening because of sleep deprivation. Driving is an automatic activity. Most people experience automatic activities as boring. When the routine takes over and the concentration drops a sleep-deprived person feels drowsy at first and soon after that the driver experience microsleeps.

Drivers often take stimulating products such as caffeine (in coffee, tea or as energy drinks) in the beginning these products seem to have an effect. But often the effects ware out and the person falls

directly into a deeper sleep than if they should not have drunken the “simulative product”. The “energizing” products do not energize at all.

Calculation tips for sleep deprivation avoiding. Answer the following questions by writing down:

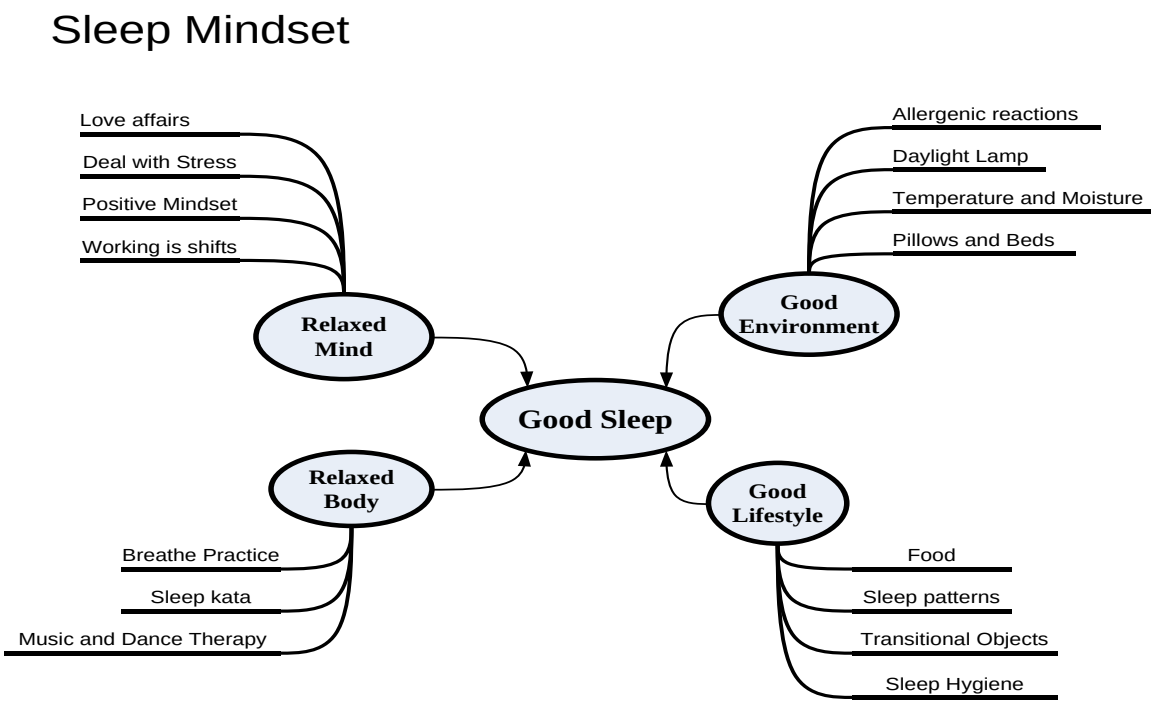
1 / How was the work performed after a couple of hours sleep?

2 / How and how much did a person sleep after the bad news? Did the person perform well the next day?

3 / After a long day in outside in nature, coming “home” was falling asleep directly or had enough energy to sit out the evening?

4 / After a boring day at the office, did you have enough energy to stay awake in the evening?

Is what commonly is known about sleep, what we think, or what we expect, correct?



All over the world researchers have collected huge databases with information on who is suffering from what kind of sleep disorder. In general, it has been found a world result of the following shocking numbers - percentage in relation to the national population divided by age group/gender in these countries;

Age / gender group	Cities	Countryside	Severe cases	periodically
Male child below 10 years	1 %	0,4%	0,2 %	0,3 %
Male child >10 and < 14 yrs	%	< 1%	< 0,3%	< 0,5%
Male > 14 yrs and < 21 yrs	5- 7 %	< 4 %	2 %	3 %

Male > 21 and < 35 yrs	10 – 17 %	< 7 - 9 %	8 %	7 %
Male > 35 and < 50 yrs	30 – 37 %	15 – 20 %	17 %	23 %
Male > 50 and < 65 yrs	39 – 42 %	25 – 30 %	15 %	32 %
Male > 65and 70 yrs	43 – 50 %	20 – 30 %	18 %	22 %
Male older than 70 yrs	40 – 45 %	< 25 %	15 %	>45%
Female child below 10 years	< 0,5 %	< 0,3 %	< 0,1 %	< 0,1 %
Female child >10 and < 14 yrs	7 – 9 %	4 – 5 %	3 – 5 %	9 %
Female > 14 yrs and < 21 yrs	18 – 22 %	12 – 15 %	12 – 15 %	15 %
Female > 21 and < 35 yrs	32 – 40 %	20 – 25 %	27 %	30 %
Female > 35 and < 50 yrs	45 – 50 %	35 – 40 %	33 %	42 %
Female > 50 and < 65 yrs	50 – 55 %	35 – 40 %	37 %	22 %
Female > 65and 70 yrs	35 – 40 %	20 – 25 %	25 – 30 %	20 %
Female older than 70 yrs	40 – 50 %	30 – 40 %	35 %	25 %
Given percentages are approximate and based on numbers of 2005 Bigger than, < smaller than				

Interpreting these numbers we come to the result that in some age groups the sufferers of sleep disorders go over 40% of the (area) population.

The given numbers are not as high as due to the fact used numbers are from many different countries in the world. The numbers in cities like Tokyo, Johannesburg, New York, Shanghai, and Paris are higher than for instance in The Hague, Cambridge, Barcelona, Utah, and Bangalore. The given numbers only refer to sleep disorders without diversifying in specific forms of sleep disorder.

There is a distinguished difference between city and countryside, sleep-disorder gives a clear signal that city life is less healthy than in the countryside if this concerns to once peace of mind. Another important – and hardly ever discussed the issue – is fresh air. Most parts of the countryside give the persons a proper breathing scale and are able to inhale with lesser pollution. Pollution seems to have a serious effect on the healthy sleeping.

The woman often suffers more from sleep problems than males. One of the main reasons is based on the female characteristics such as caring, sharing, bothering, considering and responsibility feelings. A woman, when compared to the man is more in contact with her environment on emotional levels than the man. This emotional evolvement brings a natural tension. When this tension does not find a reflection in others by solving the “problems” they become like an echo sound, returning in different tunes but still in the same person.

Animal studies show that sleep is necessary for survival. Rats normally live for two to three years, those deprived of REM sleep survive only about 5 weeks on average, and rats deprived of all sleep stages live only about 3 weeks. Sleep-deprived rats also develop abnormally low body temperatures and sores on their tail and paws. The sores may develop because the rats' immune systems become impaired. Some studies suggest that sleep deprivation affects the immune system in detrimental ways.

Sleep appears necessary for the neural systems to work properly. Too little sleep leaves a person drowsy and unable to concentrate the next day. It also leads to impaired memory and physical performance and reduced ability to carry out concentrated functions. If sleep deprivation continues (insomnia), hallucinations and mood swings develop. Sleep gives neurons which have been used while awake a chance to shut down and be repaired. Without sleep, neurons may become depleted in energy and/or polluted with byproducts of cellular activities that they begin to malfunction (this gives the hallucination feeling). Sleep gives the brain a chance to exercise important neuronal connections that might otherwise deteriorate from lack of activity. When a person is still in the growing phase during sleep new connections are created and tested.

Deep sleep coincides with the release of growth hormone in children and young adults. Many of the body's cells show increased production and reduced breakdown of proteins during deep sleep. Since proteins are the building blocks needed for cell growth and for repair of damage like stress and ultraviolet rays, deep sleep may truly be "beauty sleep." Activity in parts of the brain that control emotions, decision-making processes, and social interactions is drastically reduced during deep sleep, suggesting that this type of sleep help people maintain optimal emotional and social functioning while awake. A study in rats showed that certain nerve-signaling patterns which the rats generated during the day were repeated during deep sleep. This pattern repetition may help encode memories and improve learning.

Sleep has more to offer. Athletes who are in rigorous training phases unconsciously use sleep to program all muscles to cooperate in specific patterns. The neural pathways are exercising without actual movements. During sleep, the pathways are often tested and re-tested. Hormone production during sleep period is extremely important. The HGH = Human Growth Hormone is only produced during the resting/sleep phase. For athletes a good sleep boost performance a lot.

Everybody sleeps in a specific position. The basic position is the fetus when the body is rolled in with arms and legs to form a minimum surface. This position is a left over from the time in the mother’s womb. It is a very comfortable position when alone children sleep that way.

When growing up the position is changing. Females often start to hold on to something in the night, a pillow, bear and later a partner. The position is often fetus-like. Many people start in a “flat on the back” position. But after a while, this is not comfortable any longer and turn on the side. During the night everyone turns many times, this proves already that.

1 / a person keeps searching for a comfortable position but even when one is found it is not kept for a long time.

2 / Sleep shows its active state by turning around

The sleep position must be relaxed during the night, the body needs space to move. Even when sleeping with a partner this must be considered from both sides. There are many different postures for sleeping. Most people sleep on the side. In the side position, it seems that breathing is a little easier than on the back.

Laying on the belly is not comfortable for most people, especially not for females with big breast. The belly position depends on the comfort of the mattress and is, for instance, impossible in a hangmat.

Movement stimulates sleep. Sleep activate movements. The interaction between sleep and motion is clear but it is a fact that when the movement is good, sleep improves and the mental capacity increases. In other words, movement increases the total value of life with a measurable amount of energy and joy.

Sleep gives a lot; renewed energy, clear neural systems, better concentration, healthier blood circulation, growth and recuperation of all tissue and more stable emotions.

Neurotransmitter regulation

Memory development and storage is an important and fragile circuit during the aging process. Older people develop “empty spots” in memory. These “empty spots” are memories which are partial, incomplete, disturbed, not correct or otherwise. An important part of this seems to be related to the level and quality of sleep and activity. The lesser activity and lower quality of sleep, the more memory elements seemed to be affected.

The changes in the quantity of a certain neurotransmitter as well as how the post-synaptic terminal responds to this change are underlying mechanisms of brain plasticity. During sleep, there are remarkable changes in modulatory neurotransmitters throughout the brain. Acetylcholine is an excitatory neurotransmitter that is seen to increase to near waking levels during REM sleep while compared to lower levels during slow-wave sleep. Evidence has shown that the functioning of the hippocampus-dependent memory system (episodic memory and autobiographical memory) is directly affected by cholinergic changes throughout the wake-sleep cycle.

High levels of ACh would promote information attained during wakefulness to be stored in the hippocampus. This is accomplished by suppressing previous excitatory connections while facilitating encoding without interference from previously stored information. During NREM sleep, and especially slow-wave (SW) sleep, low levels of ACh would cause the release of this suppression and allow for spontaneous recovery of hippocampal neurons resulting in the facilitation of memory consolidation.

Chemistry of sleep

Melatonin

Melatonin is commonly called the sleep hormone. Created from the inhibitory neurotransmitter serotonin, melatonin is secreted by the pineal gland according to the circadian rhythm and availability of serotonin. Melatonin production increases as it gets dark to create the sleepy feeling. During the day, melatonin secretion is low to aid in alertness; however, there is a smaller increase in the afternoon (between 1:00 pm and 4:00 pm) that may explain common daytime sleepiness. During aging, the production tends to increase slowly.

Cortisol

Like melatonin, cortisol follows the circadian rhythm. Cortisol is often considered to be the stress hormone, as it increases in response to stress. However, cortisol also plays important roles in the immune response, blood pressure, conversion of norepinephrine to epinephrine, and metabolism of carbohydrates, proteins, and fats. Chronic circadian disruption and reduced sleep time are associated with elevated cortisol and increased obesity.

Cortisol increases the production of glucose from protein (gluconeogenesis), helping to maintain optimal blood sugar levels. This is especially helpful when sleeping. During the night when the body is in a fasting state, cortisol increases glucose availability for the body to use for energy and repair. Thus, cortisol levels are highest in the morning after waking. As per the circadian rhythm, the morning peak gradually decreases throughout the day, reaching its lowest point around midnight.

Adenosine Breakdown

Adenosine is a neurotransmitter with many functions, including regulating sleep-wake homeostasis. Adenosine levels increase while awake, and the body breaks adenosine down during sleep. Without sleep, increasing adenosine levels can cause the sleepy feeling, eventually prompting to give in to overwhelming sleepiness.

Ghrelin and leptin

Ghrelin is an important hormone that tells the brain to consume food. Leptin is another hormone that has the opposite effect and tells the body that it is full. Studies from the University of Luebeck and the University of Chicago reveal that a lack of sleep increases ghrelin levels and decreases leptin levels, which drives up food cravings.

HgH

Human growth hormone is a critical anti-aging hormone. This hormone makes it easier to build muscle, burn fat, and have a healthy immune system. The body produces growth hormone during deep sleep, and as one age, the production goes down. A study in the Journal of Psychiatry & Neuroscience showed that another way to produce less growth hormone is by sleep loss.

Growth-hormone-releasing hormone

(GHRH, somatoliberin) is the hypothalamic peptide hormone that specifically stimulates synthesis and release of growth hormone (GH, somatotropin) by somatotrope cells of the anterior pituitary gland. GHRH is an important regulator of cellular functions in many cells and organs. The ability of GHRH analogs to increase and preserve insulin secretion by beta-cells in isolated pancreatic islets. The hypothalamic growth hormone-releasing hormone is one of the “humoral factors” that is critical for growth hormone secretion. GHRH undergoes rapid enzymatic degradation in blood.

PACAP

Pituitary adenylate cyclase-activating polypeptide (PACAP) is a 38-amino acid peptide. PACAP belongs to the vasoactive intestinal polypeptide (VIP)-glucagon-growth hormone releasing factor-secretin family. PACAP is widely distributed in the brain and peripheral organs, notably in the endocrine pancreas, gonads, and respiratory and urogenital tracts. The diverse functions of PACAP include regulation of proliferation, differentiation, and apoptosis in some cell populations. In addition, PACAP regulates metabolism and the cardiovascular, endocrine, and immune systems, although the physiological event(s) that coordinates PACAP responses remains to be identified. PACAP is as effective as GRF in releasing GH from cultured pituitary cells.

Galanin

The functional role of galanin remains largely unknown; however, galanin is predominantly involved in the modulation and inhibition of action potentials in neurons. Galanin has been implicated in many biologically diverse functions, including nociception, waking and sleep regulation, cognition, feeding, regulation of mood, regulation of blood pressure, it also has roles in development as well as acting as a trophic factor. A study (Association of galanin and major depressive disorder in the Chinese Han population. [Yong-Jun Wang, Hui Li, Yu-Tao Yang, Chang-Le Tie, Feng Li, Zhi-Qing David Xu, Chuan-Yue Wang] it also has other effects.
VIP - Vasoactive intestinal polypeptide
Vasoactive intestinal polypeptide (VIP), a 28-amino-acid polypeptide secreted by cells throughout the intestinal tract. It stimulates the secretion of electrolytes and water by the intestinal mucosa. Studies have indicated that VIP is capable of acting as a neurotransmitter, inducing a relaxation effect in some tissues. On a molar basis, VIP is 50-100 times more potent than acetylcholine as a vasodilator. VIP release in the body is stimulated by high frequency (10-20 Hz) nerve stimulation and by cholinergic agonists, serotonin, dopaminergic agonists, prostaglandins (PGE, PGD), and nerve growth factor. endogenously released or exogenous VIP can significantly increase the heart rate and has a more potent effect on heart rate than does norepinephrine. The leading hypothesis of VIP function points to the neurons using VIP to communicate with specific postsynaptic targets to regulate circadian rhythm.

Declarative memory

Declarative memory is the memory for conscious events. There are two types of declarative memory: episodic and semantic. Episodic memory is for remembering experiences whereas semantic memory is remembering specific facts.

Temporal memory

Temporal memory consists of remembering when a specific memory has occurred. In study participants were placed in 4 groups; two control groups either given caffeine or a placebo and two groups that were sleep deprived for 36 hours either given caffeine or a placebo. The task used to measure temporal memory consisted of discriminating between recent and less recent face presentations. A set of twelve unfamiliar faces were presented sequentially every 10 seconds. A self-ordered pointing task was used afterward for 5 minutes to prevent rehearsal and to keep tired participants occupied. This required them to mark any new items seen (either nouns or abstract shapes) presented on 12 sheets. A second set was presented, followed by another self-ordered pointing task, and then a random sequence of 48 faces either containing previously presented faces or new ones were shown to the participant. They were asked if they recognized the faces and whether they were from the first or second set. Results indicate that sleep deprivation does not significantly affect recognition of faces, but does produce a significant impairment of temporal memory (discriminating which face belonged to which set). Caffeine was found to have a greater effect on the sleep-deprived group as compared to the placebo group deprived of sleep but still performed worse than both control groups. Sleep deprivation was also found to increase beliefs about being correct, especially if they were wrong. Brain imaging studies of those sleep-deprived found that the greatest reduction in metabolic rate is in the prefrontal cortex.

Cognitive performance

Cerebral activation during performance on three cognitive tasks (verbal learning, arithmetic, and divided attention) was compared after both normal sleep and 35 hours of total sleep deprivation (TSD) in a study by Drummond and Brown. Use of fMRI measured these differences in the brain. In the verbal learning task, fMRI indicated the regions involved in both verbal learning and memorization. The results found that both TSD and a normal night of sleep showed a significant response in the prefrontal cortex and following TSD displayed a response of additional areas which included other prefrontal areas, bilateral inferior parietal lobule and superior parietal lobes. Increases in sleepiness also correlated with activation of two ventral prefrontal regions and a correlation between a greater activation in bilateral parietal lobes (which include language areas) and lower levels of impairment on free recall were also found following TSD. In the arithmetic task normal sleep showed the expected activation in the bilateral prefrontal and parietal working memory regions but following TSD only showed activation in the left superior parietal lobe and the left premotor cortex in response, with no new areas to compensate (as was found in verbal learning).

Increased sleepiness was correlated with activation in a ventral prefrontal region, but only one region. The divided attention task combined both verbal learning and the arithmetic task. fMRI indicated that cerebral response after TSD is similar to that of the verbal learning task (specifically the right prefrontal cortex, bilateral parietal lobes, and cingulate gyrus showing the strongest response). The implication of this finding is that additional brain regions activated after both verbal learning and divided attention tasks following TSD represent a cerebral compensatory response to lacking sleep.

For example, there is a decline in the response of the left temporal lobes during both tasks which are involved in different learning tasks during a rested state but the involvement of the left inferior parietal lobe in short-term verbal memory storage following TSD suggests that this region might compensate. No new areas for the arithmetic task may suggest that it relies heavily on working memory so compensation is not possible, in comparison to tasks such as verbal learning which rely less on working memory.

Implicit face memory

Faces are an important part of one's social life. To be able to recognize, respond and act towards a person requires unconscious memory encoding and retrieval processes. Facial stimuli are processed in the fusiform gyrus (occipitotemporal brain area) and this processing is an implicit function representing a typical form of implicit memory. REM sleep has been seen to be more beneficial to implicit visuospatial memory processes, rather than slow-wave sleep which is crucial for explicit memory consolidation. REM sleep is known for its visual experiences, which may often include detailed depictions of the human countenance. A recognition task was used to gauge familiarity with a previously shown sequence of faces after a subsequent period of REM sleep. It was seen that the fusiform gyrus was active during training, the REM sleep period, and the recognition task as well. It is hypothesized that brain mechanisms during REM sleep, as well as pure repetition priming, can account for the implicit recognition of the previously shown faces.

Dreaming

For centuries people have pondered the meaning of dreams. While there has always been a great interest in the interpretation of human dreams, it wasn’t until the end of the nineteenth century that Sigmund Freud and Carl Jung put forth some of the most widely-known modern theories of dreaming.

Since then, technological advancements have allowed for the development of other theories. One prominent neurobiological theory of dreaming is the "activation-synthesis hypothesis," which states that dreams don't actually mean anything: they are merely electrical brain impulses that pull random thoughts and imagery from our memories. Humans, the theory goes, construct dream stories after they wake up, in a natural attempt to make sense of it all.

Cristina Marzano and her colleagues at the University of Rome have succeeded, for the first time, in explaining how humans remember their dreams. The scientists predicted the likelihood of a successful dream recall based on a signature pattern of brain waves. In order to do this, the Italian research team invited 65 students to spend two consecutive nights in their research laboratory.

This finding is the increased frontal theta activity the researchers observed looked like the successful encoding and retrieval of autobiographical memories seen while awake. That is, it is the same electrical oscillations in the frontal cortex that make the recollection of episodic memories possible. Thus, these findings suggest that the neurophysiological mechanisms that people employ while dreaming (and recalling dreams) are the same as when they construct and retrieve memories while awake.

In another recent study conducted by the same research team, the authors used the latest MRI techniques to investigate the relationship between dreaming and the role of deep-brain structures. In their study, the researchers found that vivid, bizarre and emotionally intense dreams (the dreams that people usually remember) are linked to parts of the amygdala and hippocampus. While the amygdala plays a primary role in the processing and memory of emotional reactions, the hippocampus has been implicated in important memory functions, such as the consolidation of information from short-term to long-term memory.

The proposed link between dreams and emotions is highlighted in another study published by Matthew Walker and colleagues at the Sleep and Neuroimaging Lab at UC Berkeley, who found that a reduction in REM sleep (or less "dreaming") influences the ability to understand complex emotions in daily life – an essential feature of human social functioning. Scientists have recently identified where dreaming is likely to occur in the brain. A very rare clinical condition known as "Charcot-Wilbrand Syndrome" has been known to cause (among other neurological symptoms) loss of the ability to dream. However, it was not until a few years ago that a patient reported having lost her ability to dream while having virtually no other permanent neurological symptoms. The patient suffered a lesion in a part of the brain known as the right inferior lingual gyrus (located in the visual cortex). Thus, now it is known that dreams are generated in, or transmitted through this particular area of the brain, which is associated with visual processing, emotion, and visual memories.

Dreams seem to help to process emotions by encoding and constructing memories of them. What is seen and experienced in dreams might not necessarily be real, but the emotions attached to these experiences certainly are. The dream stories essentially try to strip the emotion out of a certain experience by creating a memory of it. This way, the emotion itself is no longer active. This mechanism fulfills an important role because when emotions are not processed, especially negative ones, this increases personal worry and anxiety. Severe REM sleep-deprivation is increasingly correlated with the development of mental disorders. In short, dreams help regulate traffic on that fragile bridge which connects experiences with emotions and memories.

Sleep is important in the aging process as many chemical, biological and psychological processes take place during the resting period. Good sleep is a primary factor for healthy aging.

1. Sleep Helps to Form Memories

2. Sleep Helps Solidify Learning

3. Sleep Helps Clean Up the Brain

4. Sleep Helps Reduce Risk of Depression

5. Sleep Can Aid Test Performance

6. Sleep May Boost Athletic Performance

7. Well-Rested People Take Fewer Sick Days

8. Sleeping Well Helps Avoid Weight Gain

5 How to strengthen body and mind

Body and mind are a closed circle of action and reaction. It is impossible to see one without the other. Everything has an interrelated effect. The body is in need of moving but coordination of movement is a matter of mind and neural transmission. Movements are complex neurological events. Neurons do not only transmit information to muscles but also to related tissues as blood, bones, joints, and tendons. Each has a function in movements and all are based on electric impulses.

The body is an “instrument” of development and evolvement. Every age period has specific movement series. To analyze these series organization is important.

- Purpose
- Development
- Awareness
- Functionality
- Practical
- Applicability
- Usefulness

The first task of the body is to resist gravity and air pressure. These two external forces are the main powers working on the body all life. To mention a few moves which are completely influenced by both: standing up from the bed in the morning, raising from a chair and walking the stairs. These are basic movements.

For study purpose we split movements into groups (sample list);

- Practical movements. Daily patterns with a repetition mode.
- Functional Movements. These are used to perform a task.
- Exercise movements. Movements with specific health goals
- Ingrained movements. Programmed movements outside the conscious structure
- Social Movements. Studied movements with a social-oriented purpose (sample; folk dance)
- Rhythm movements, Automatic movements as a reaction to music and sound
- Reaction movements. These are made in alarm or dangerous situations

In general, all movements are RE-action movements based on experience and situations. During childhood, the goal is to learn “perfect” movements. While growing up movements change due to many external influences such as:

- Cultural shaping (in many societies there are “humble movements”)
- Educational enhancements (sample – the marching in a row)
- Exercise-related (sport depended)
- Environmental bounded (sample: group behavior of friends)

Every person has individualized movements, these are called ingrained movements. They slowly become part of the personality due to the physical structure, certain thoughts on how to move, image copying and social connection, often the person is not even aware of it. The way of walking is a typical sample of this. Experts can recognize a person on the way of walking. The criminal analyst uses this for distinguishing and evidence.

The biological problem of Ingrained movements is found in wear and tear of unnecessary places in the body. Often whole structures (movement mechanisms with at least one joint inside it) become less functional. If one structure is dysfunctional it affects others. When the individual is over 30 / 40 it is not possible to take away the dysfunctionality but use the bypass model to restructure a movement pattern.

To strengthen body and mind there are physical and mental exercises. Depending on the person it should be considered as options such:

- Physical movements not related to sport
- Exercises with a sport relation
- Concentration training
- Mind exercises

All combine part body and part mind as an instrument of the movement.

Movement is a way to accomplish an action. This action must be coordinated. Body and mind take part for a certain percentage. Depending on the action the percentage of involvement differs. From a practical side it is important to ratio the level of involvement as in samples:

- Waking up. Conscious movements around 10-20 %
- Dressing and preparing for the day. Conscious 30 – 40%
- Taking transportation and on the way. Conscious 50-60 %
- Work (depending on what kind of work). Conscious 70-90%
- Lovelife expected conscious 90 -100%
- Study expected conscious 80-100%

The first step is movement awareness. As from the table above it is clear that most of the movements are made without full consciousness. Depending on the safety of the environment is this safe or unsafe. This is the main reason why at most workplaces new safety regulations are installed every 3 – 5 years. It is proven that the conscious behavior of people is changing with the passing time.

To create awareness there are tools. One of them is the movie recording. The first step is a selection of relatively simple movements, preferable repetitional. A movement is recorded as a movie and analyzed. Analyzing a movement is different from critical observation. The movement is taken apart in steps and awareness is created by confrontation within each step. Each part of the movement is followed slowly with complete awareness. Muscles, joints and neurological processes come along and exposed. While repeating the movement the used muscles and the neural system is stimulated or requested to move in opposing direction or stimulated to a faster contraction of certain muscles. Control is vitally important, that is why all movements are relatively simple.

A simple but effective training is catching while falling. A soft object with a certain weight is dropped to the floor and the test person has to catch it before hitting the floor. Sometimes it needs speed and other times all can be done in a relaxed mood. Speed variation is one topic to stimulate neural control and transmission. NEUREX is a strong example of this action/reaction training.

Neural stimulation exercises NEUREX. Aging comes with muscular degeneration. Size and function deteriorate slowly but steady. Most people let it come as they are not aware that it is possible to slow the process. Muscles are commanded by the brain. Degeneration of the muscles starts in the brain. Neural connections break down because the movements are not used properly.

Neurex is developed to stop neural breakdown/degeneration. Specific power and (re)action training to stimulate the brain, neural transmission, and muscle action. How? In short, the program starts with weight training to stimulate the action potential of the red fibers. After warm-up, the next level starts.

With a specified weight, the movement goes from complete relaxation to maximum tension in parts of a second. The muscle is forced to react to "impact" (for instance at a weight drop). The exercise starts with a complete relaxing position with supported weights. The parts with weight get help from an external supporting source, mainly a personal trainer or therapist. Suddenly the support is taken away and the muscles have to act. Due to the sudden weight gain, the body responds. The focus is on the complete and fast contraction of the muscles as a direct reaction to the action. A neural/muscular respond is demanded to prevent injury.

This sudden change from inaction (relax) to full reaction has a direct effect on the brain. All parts are set in full alarm status and neural stimulation gets to a maximum. Using this method helps to improve lost abilities and increase existing.

It is a cheap and well-balanced method easy to use and professional, trained guidance is needed. If not, serious injuries can occur. Do not try these exercises based on this article even for an experienced physio or trainer. These exercises are developed for specific revalidation and Age Control.

In regard to neuromuscular training, the literature has established that high-speed explosive movements (Häkkinen, Komi & Alén 1985; Komi et al. 1982), or at least the attempt to perform high-speed movements (Behm & Sale 1993), are required. Additionally, researchers studying physical performance and aging have recognized that the primary factor dictating power production is movement speed (De Vito et al. 1998; Ferretti et al. 1994; Petrella et al. 2004).

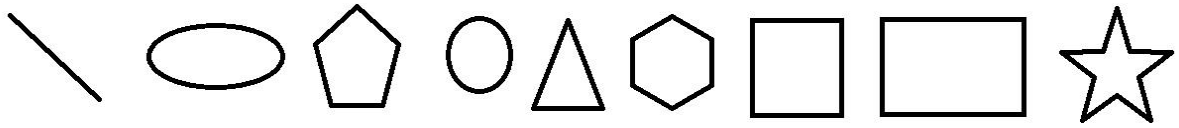
Over the past 15 years, the concept of high-speed training to increase power has been applied to older persons. The first presentation examining the positive impact of moderately high-speed training on power output in older persons was presented at the American College of Sports Medicine annual meeting in 1993 (Flipse et al. 1993). This preliminary investigation was soon followed by others that demonstrated the positive impact of high-speed training on both power and functional performance (Signorile et al. 1995b; Signorile et al. 1995a). Since then researchers have reported the successful use of high-speed training to increase both power (Earles, Judge & Gunnarsson 2001; Fielding et al. 2002; Miszko et al. 2003; Signorile et al. 2002) and functional performance (Carmel et al. 2000; Miszko & Cress 2002; Sayers et al. 2003; Orr et al. 2006; Petrella et al. 2007).

Fall training, falling to the ground by accident or due to force, is a standard part of many Asian Martial Arts. In the Western style of falling too often is chosen for a sport-oriented approach which can endanger different parts of the body. One of the main problems in the Western style of falling are the wrists and ankles. Both weak parts get to much pressure on the impact of falling. The Asian style of falling is more natural cycle directed. The circle is the best and safest way to fall/move. Moving with "corners" delivery point of impact and direct risk factors. Professional approach with Judo and Jiu-Jitsu techniques are advised as proven safe.

The circle is an important part of the exercise and a chemical and physical re-occurring fact. Most chemical reactions follow an ellipse/circle like movement. Looking at Traditional Chinese Medicines and Ayurveda (Indian medicine) the circle is a constant returning movement. The Yin / Yang symbol is well-known. In chemistry, the "planet construction" is taken as the foundation of atom building. A center with Proton/neutron and around it in ellipse the electron circling. Movements that continue to return.

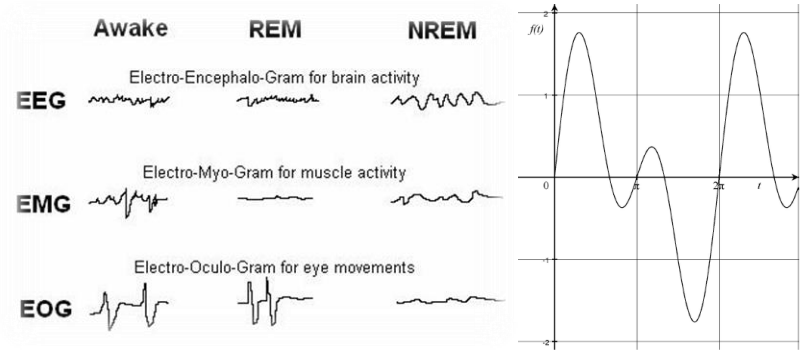
Muscles have a "positive" and "negative" side. The agonist and antagonist. Both have opposing functions. One is stretching the muscle while the other is bending it. Both are based on the same chemical exchange of electrons for contraction and relaxation. Every movement can be analyzed with a mathematical symbol as a straight line, circle, triangle, ellipse and in some cases the hexagon or pentagon.

These mathematical symbols have an exact meaning in life. Movements follow these "figures" for a reason. Nature has created patterns which have efficiency and use a minimum on energy. Following these mathematical patterns, it is possible to minimize damage on joints and muscles and create maximal functioning.

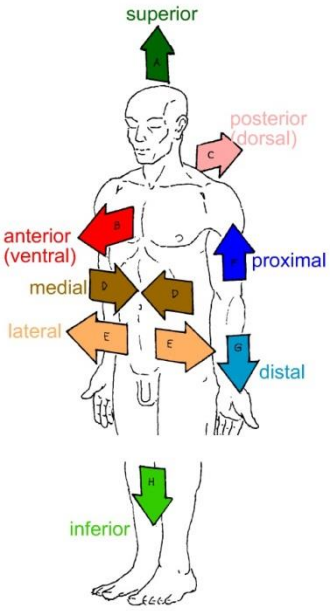


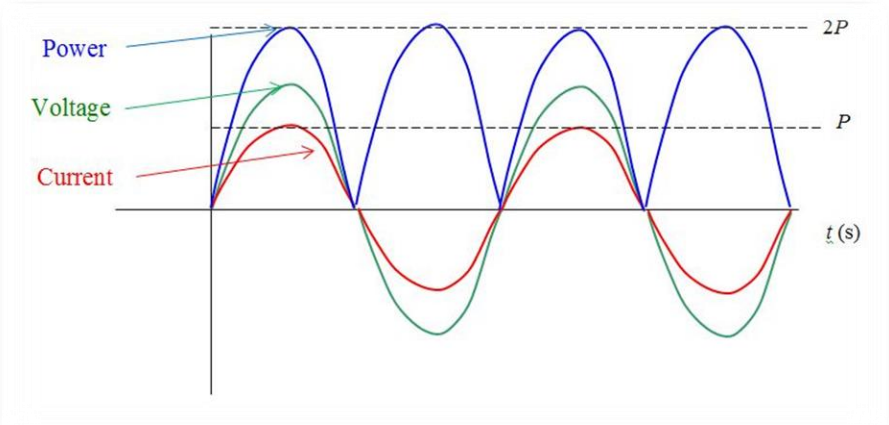
Not surprisingly are these figures also found in chemical connections. This implies the practical functioning of the body as a direct result of chemical action.

But the mind follows mathematical figures which are different of these of the muscles. The mind follows waves and valley/pike patterns.



The electrical impulses measured show a pattern that can be compared.





During the aging process, the patterns do not change, they are universal. But the application of each pattern, the size and direction changes.

The enclosed picture shows the “planes” of the body. To explain a movement of a muscle or otherwise, it is important to be clear about the direction. This is exactly the same in chemistry and electricity. The current/ power/movement has a direction. A distorted direction gives a distorted movement. Like in any current the message does not come through clearly.

Muscles and movements have a direction and a “ Range of movement” (ROM). Habits and exercise do influence this ROM. Most people copy movements with a wrong ROM. The muscles and movement ability becomes distorted and the pattern disrupted. Hereby it is possible to recognize the following;

- Wrong ROM delivers distorted muscular function
- The wrong muscular function gives bad neural feedback
- Processed feedback send for correction but runs into a blockade
- Muscular blockage (injury) gives rerouting neural transmission
- If no correction rerouting becomes permanent
- The wrong movement becomes standard

This does sound wrong but it has proven in many practical situations that a wrong move as standard demands adaption of the body. When the adaption is made the right movement suddenly becomes a “wrong move”. By adaption, the body has changed a pattern from wrong to “right”. This is one reason why in many gyms worldwide people do the most awful exercises with no apparent danger or negative result. Unless they move one step too far, they increase weight, speed or another segment which crosses the physical threshold. If that happens the body collapse and injuries occur often into a direct chronical evolving situation.

With each movement the 3 founding powers must be taken into consideration;

- Gravity
- Air pressure
- Electric transmission

All training should have a function. Any exercise is a waste of time if the goal is not clear. A goal is a random selection of reasons why a person should do a movement. Performance, crossing borders,

setting records are the goal of less than 1 % of the world population. All others focus on daily activities, work, proper lifestyle and so on. Due to this, every movement should be taken into consideration as practical, functional, possible to apply an individual. Not a single movement should be taken for granted neither standardized. This said it is impossible to offer every person individualized training/exercise facilities with equipment. Standardization is a commercial must. It is not possible for commercial companies to manufacture products that fit every individual. Here the expertise of the person or assistant (physiotherapist, personal trainer, doctor or otherwise specialized person) comes in place. Technical application knowledge and the individual adaption to it need "strange eyes" for the best results.

Starting physical activities need guidelines that are general but flexible to apply on a personal level. What are the "rules" for strengthening body and mind to reach a high age:

- Move every day. Vary intensity but there is no need for long-term intensive exercise. The moderate intention is enough
- Continuity is needed, It is useless to move one day and do not another day. There is no compensation possibility. Life has no compensation rules.
- The right mindset while busy moving. Having a positive will and attitude toward the activity is important. When it is considered a duty it never works.
- Regular food intake. Use the 80% rule at all time.
- Use liquid but do not follow standard rules in this, some need more others less.
- Have a regular digestive control (go to the toilet when needed)
- Enjoy social contacts and do things together.
- Combine muscular with neural exercises
- Use brains (this has a double sided meaning, explanation follows)

These general rules are easy to apply when given to the individual.

Brain training is not only doing test, puzzles, and learning. To keep a mind young it is important to challenge it on a physical level. Most people exercise with a specific foot/hand as leading this gives a one-sided brain segment development. Changing the leading hand/foot for the unusual other side promotes the brain to reroute many of its neural transmissions and develop new connections.

"Forcing" the brain to change is making it more connective with other parts. Each neural transmission has to follow a path. Like a footpath when it is not used, the grass and nature cover it until unseen. By changing positions often both routes are kept open. This method is used for the recreational purpose and not always recommended for competition.

On brain level: the right hemisphere is connected to the left hemisphere by a bridge. This bridge is not always used at full potential. By changing positions the bridge function is "forced" to open and transmit. This opening has many positive sides such as improving artistic skills, creativity, reaction and mathematical development. It is worth trying for all ages.

One often ignored but important reason why people are able to grow old healthy is **discipline** and more or less harmony in life. Discipline is important to grow a regular life pattern in which developing repetition in behavior, control of lifestyle and mind are the most important factors. A controlled regular life gives the

body and mind an opportunity to relax and gives a maximum of muscular and emotional tension when needed and wanted.

Here is a sample of a seemingly boring but disciplined lifestyle to grow really old;

6 AM wake up. Early morning waking has a positive effect on the hormone system as both sex hormones (testosterone and estrogen are at a peak.
6.30 AM breakfast. Enough carbohydrates to give the body a good startup.
7.00 AM go for a walk or start with physical movements, stimulation of the neural and blood circulation is a must
8.00 AM going to work or spend on activities
9.00 AM snack break and drink. Snacks are not (preferably not) sugar loaded.
9.14 AM continue with work
11.00 – 12.00 AM small meal and continue with work when the work is a sitting job have a short walk around to stimulate bloodstream
13.00 – 13.30 PM short rest break and a walk
15.00 PM drink and a small meal. After that short walk and movement
!7.00 PM drink and a small meal, if the possible end of work and a long walk or another physical movement
19.00 PM small meal with some drink, not too much liquid. If possible, again some walk around or even exercise
21.00 PM a small snack such as fruit or other easy to digest items
22.00 – 23.00 PM time to see the bed and spend between 6 and 8 hours of sleep.

80% rule

When eating, never eat more than 80% of what is needed. Always leave over a little hunger. In the beginning, it is annoying but some it becomes a habit. Why is it important? Metabolism is stimulated by filling but never by overfilling. Like training, it is only possible to go to the 100% on competition days. Training and all other activities take place between 60 – 80% of the maximum. This rule counts for eating in the same way. 100% is only possible on special occasions.

In the schedule are a few regular items to put the focus on;

- Small meals. Using the 80% rule is important. Eat but always keep space enough for more. Never eat till full.
- Regular movement is a need. Preferably in open air for better breathing
- Drink enough. Every person has a personal level of satisfaction in liquid. The general rules of drinking 2 – 3 liter of water is often too much but in some cases too less. (Check sweat level)
- Eat with regular intervals. Timing is between 2 – 3 hour between meals. 4 hours is allowed but not desired. Our digestive system is better off with small amounts and continues work than the large amount and high working load.

Why Power Declines With Age

The reduction in power after 50 of is expected, due to the changes in both the musculoskeletal and neuromuscular systems. Researchers have proven that sarcopenia, or a drop in the cross-sectional area of muscle, after this age (Frontera et al. 2000; Lexell 1993). The losses are remarkable in the faster-contracting type II fibers and that the loss of faster-contracting (type II) motor units (muscle

fibers and their associated nerves) mirror the drop in the muscle cross-sectional area (Aniansson et al. 1986; Lexell & Downham 1992). In addition to these changes, reduced motor neuron conduction velocities (Metter et al. 1998), decreased motor nerve myelination (fatty insulation) (Hinman et al. 2006; Jankelowitz, McNulty & Burke 2007), reduced neuromuscular (nerve to muscle) transmission (Cardasis & LaFontaine 1987; Herscovich & Gershon 1987) and decreased levels of excitation-contraction coupling (Delbono, Renaganathan & Messi 1997) have all been reported with aging. Combined, these factors reduce force production and contractile speed, thereby reducing power production in aging muscle.

In more simple terms; muscles lose power due to a decline of motor neurons which fire the muscles to action = contraction. A decline of electric transmission, nerves cells begin to function less fast, give a slower reaction by contraction and this effects in a decreasing capacity of lifting weights. When a personal experience that weights become “too heavy” to control, they often leave it that was, promoting unconsciously a decline.

The discipline is not only in the regularity of the lifestyle but also returns in the food combinations and most of the time in all other aspects of the personality. A good sample is a neat house and clean body. Older people understand the need to take care of proper hygiene and clean clothing. To keep things as clean as possible improves a clean appearance.

Having a clean body and environment has a measurable effect on a person’s attitude and mood. Feeling clean gives a person a positive morality and mood. Sample; Imagine coming into a dirty laboratory with the task to do some sensitive experiment. The first reaction is to clean all dirty things as it is clear that the dirt will influence all other work. Dirt has a disturbing effect it is polluting and changing the outcome of every experiment or action in life.

Another effect of this dirty laboratory is in the mood of all people working there. Knowing to clean up before starting the work is upsetting as it delays all planning. This is exactly what is happening to dirty people. They waste their valuable time and slowly drawn into their own polluted environment without being able to clean up. Dirt always lead to diseases.

A longing for hygiene also improves a wish to keep the environment clean. To clean anything needs action. Action demands energy and this again stimulates physical work. When a body is at work, muscles are used and this all leads to a conservation of the existing body. But often that is not the case and a decline starts to take place. What is not used, will disappear.
The word sarcopenia refers to a deficiency of relative skeletal mass. Muscle mass decreases with age (e. g. atrophy of the small muscles of the hand is encountered in 50% of the elderly) and is associated with impaired functional performance, increased physical disability and increased risks of falls. Physical inactivity has been proposed as a mechanism underlying muscle loss and physiological changes in elderly people. Protein synthesis in skeletal muscle is decreased as a result of a reduction in anabolic factors or an increase in catabolic factors. This muscle metabolism decrease reduces the amount of stored glycogen (protein synthesis in skeletal muscle is decreased) which causes the body to increase amino acid metabolism. To consume carbohydrates before or during exercise to improve energy level puts this information into practice. It enhances the chances for better physical performance by elderly individuals.

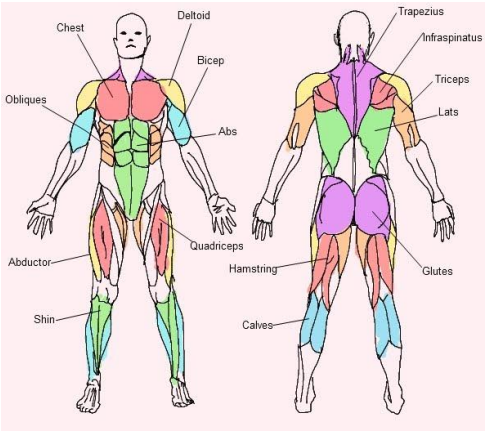
Physical fitness need to be build up through the following pathways;

- Muscular power (resistance training)
- Cardiovascular fitness
- Neural stimulation (may also be electric)
- Visual / hearing / muscular – reaction and coordination
- Weight control also connected with blood sugar improvement
- General safety program

Within some of these pathways (not all) it is possible to apply two different methods although one is applied more than the other:

- Isometric exercise - there is no movement and not working on a joint range of motion and flexibility. This method is used for specific targets.
- Progressive resistance training is the more used method of strengthening hereby the individual makes use of free weights, elastic exercise bands, or use adjustable (cable) weight/resistance machines.

A definition of proper exercise form is relatively slow movement speed and full movement range. All training repetitions were performed in approximately six seconds, with two seconds for each lifting movement (concentric muscle action) and four seconds for each lowering movement (eccentric muscle action).



The muscles are divided into major and smaller groups. For exercise purpose, it is good to combine larger and smaller groups in one training. A general overview of muscles is:

Legs ;
The leg is the part of the lower limb that lies between the knee and the ankle, the thigh is between the hip and knee and the term "lower limb" is used to describe the colloquial leg. The leg from the knee to the ankle is called the cnemis (née'is) or crus. The calf is the back portion and the shin is the front.

- Quadriceps, (location see chart)

The Quadriceps are worked through exercises such as Squats, Lunges, Barbell Hack Squats, and any other Squat variations.

- Hamstrings (location see chart)

The hamstrings are the huge muscle group on the back of your thighs.

- Calves (location see chart)

The calf area: the gastrocs, the soleus, and the tibialis anterior. This is a small group but part of the large.

Chest (location see chart)
The part of the body between the neck and the abdomen, enclosed by the ribs and the breastbone; the thorax. The chest is important but it should only receive proper attention, not more not less

Back (location see chart)
The rear part of the human body especially from the neck to the end of the spine. The back is a HUGE major muscle group — one of the biggest.

Weight training exercises like Deadlifts develop thickness in the back while Rows work on both width and thickness. Pull Up and Chin Up variations work on making the back more resilient.

Shoulders (location see chart) The area around the glenohumeral joint, the large ball-and-socket joint where the humerus joins the scapula. The smooth, rounded head of the humerus rests against the socket in the scapula. The joint is covered by a tough, flexible protective capsule and is heavily reinforced by ligaments that stretch across the joint. The ends of the bones where they meet at the joint are covered with a layer of cartilage that reduces friction and absorbs shock. A thin membrane, the synovial membrane, lines the socket and lubricates the joint with synovia. Further cushioning and lubrication is provided by fluid-filled sacs called bursae. Disorders of the shoulder include bursitis and dislocation. The group consists of many smaller groups such as front deltoids, side deltoids, and rear deltoids that make up the shoulder muscle.

Trapezius
Extrinsic (thoracoappendicular) muscle of shoulder; origin, medial third of superior nuchal line, external occipital protuberance, ligamentum nuchae, spinous processes of seventh cervical and the thoracic vertebrae and corresponding supraspinous ligaments; insertion, lateral third of posterior surface of clavicle, anterior side of acromion, and upper and medial border of the spine of the scapula; action, when scapulae are fixed, portions of muscle can act independently: cervical portion elevates scapula, thoracic portion contributes to depression of scapula; upper and lowermost portions act simultaneously to rotate glenoid fossa superiorly; when the entire muscle and especially middle part contracts, the scapulae retract; draws head to one side or backward; nerve supply, motor by accessory, sensory by cervical plexus.
The trapezius or ‘traps' for short is the huge upper back muscle that makes a triangle shape with the point in the middle of your upper back.

Smaller muscle groups are:
Triceps
The major extensor muscle of the elbow, and the only muscle on the back of the upper arm. Arises partly from the scapula below the shoulder joint but the main bulk from the back of the humerus. Forms a broad tendon which passes behind the elbow joint (separated from it by a small bursa) to be inserted on the back of the olecranon process of the ulna.

Biceps
A muscle with two heads or points of origin.
a. The large muscle at the front of the upper arm that flexes the forearm. Also called biceps brachii.
b. The large muscle at the back of the thigh that flexes the knee joint. Also called biceps femoris.

Forearms
The segment of the upper limb between the elbow and the wrist. Some exercises are pinwheel curls, hammer curls, and different types of wrist curls for the forearms. The forearms are a very important muscle group that can limit strength in other exercises.

Abs
The muscles between the thorax and the pelvis supporting the abdominal wall. The lateral parts of the wall are formed by the transverse abdominal, the internal oblique, and the external oblique. Anteriorly, on each side, a segmented muscle, the rectus abdominal, spans the distance between the inferior thoracic

wall and the pelvis. Other muscles supporting the posterior aspect of the wall are the quadratus lumborum, the psoas major, and the iliacus.

Cardiovascular Fitness for Seniors

For cardiovascular fitness, a walk outside, on a treadmill or pedaling a recumbent bike is a start. Warm up the muscles and joints sufficiently before the activity. Monitor any discomfort in the hip and knee joint. This can be perceived as injury. Proceed with monitored aerobic activity at the beginning of training. Encourage to move often during the day, instead of sitting for long periods of time.

•Intensity by heart rate: Moderate (e.g., 40%-60% heart rate reserve [HRR]) to vigorous (e.g., 60%-90% HRR) intensity aerobic exercise is recommended for most adults, and light (e.g., 30%-40% HRR) to moderate intensity aerobic exercise can be beneficial in individuals who are deconditioned.
•Intensity by perceived exertion: Assess appropriateness of heart rate ranges using a scale of 0-10 for the level of physical exertion, 3-4 for light intensity, 5-6 for moderate intensity and 7-8 for vigorous intensity.
•Time: For moderate intensity, physical activities, accumulate at least 30 or up to 60 (for greater benefit) min/day in bouts of at least 10 minutes each to total 150-300 min/week, or at least 20-30 min/day of more vigorous intensity, physical activities to total 75-100 min/week or an equivalent combination of moderate and vigorous intensity, physical activity. Lower ranges are for adults who have not participated in any exercise program, or for frail individuals.
•Type: Any modality that does not impose excessive orthopedic stress - walking is the most common type of activity. Aquatic exercise and stationary cycle exercise may be advantageous for those with limited tolerance for weight-bearing activity.

Flexibility for Seniors

Flexibility is a key component in an exercise program, especially for older inactive adults, and a necessity at the end of each workout. Tight muscles reduce the body's range of motion, it can affect balance, reduces fluidity to the joints, and reduces the ability to perform daily tasks. Slow easy stretches are important due to lack of elasticity in the muscles. Stretches can and should be performed daily unless complaints of too much discomfort. Progressing to deeper stretches will begin to reduce discomfort until the muscles are accustomed to the stretching.

•Frequency: min. 2 days/week
•Intensity: Stretch to the point of feeling tightness or slight discomfort.
•Time: Hold the stretch for 30-60 seconds.
•Type: Any physical activities that maintain or increase flexibility using slow movements that terminate in sustained stretches for each major muscle group using static stretches rather than rapid ballistic movements. Improving day-to-day function in older adults reduces healthcare, provides independence and allows for a better quality of life.

Exercise has a positive and often improving effect on health. Some of these positive targets are:
Improves physiologic parameters
(V°O2 max, cardiac output, decreased submaximal rate-pressure product)
Improves blood pressure
Improves lipid profile
Decreases incidence
Improves glycemic control

Decreases hemoglobin A1C levels
Improves insulin sensitivity
Decreases bone density loss in postmenopausal women
Decreases hip and vertebral fractures
Decreases risk of falling
Improves the quality of sleep
Improves cognitive function
Decreases rates of depression improve Beck depression scores.
Improves short-term memory
Decreases the risk of obesity
Improves symptoms in peripheral vascular occlusive disease

The use of high-speed training is facing some challenges:

- What are the equipment/environment choices?
- What are the optimal loads that maximize power development and ADL performance?
- What are the correct periodized training and testing cycles?

Equipment/Environment Choices. Free-weights, stack-loaded machines, pneumatic machines, tubes, bands and even sandbags have all been successfully used in high-speed training research studies. But both inertia and momentum must be considered. Inertia is resistance to motion changes, and momentum is mass in motion (defined as mass times velocity). While these terms are often confused with each another, their absolute definitions are not as important as their consequences during high-speed resistance training.

Once an individual accelerates a weight to a high velocity, the potential for injury at the end range of motion is increased as the weight continues to move and the limb stops. If free weights or plate machines are used, the movement should begin to decelerate the weight before the end of the range of motion. Other feasible options are medicine balls and light plyometric work. Aquatic exercises are excellent options since resistance (drag) increases exponentially with movement speed.

Optimal Loading. Studies have shown that power can be increased in older persons using loads ranging from 20% to 80% of maximum (de Vos et al. 2005; Fielding et al. 2002; Jozsi et al. 1999; Petrella et al. 2007). This can be clarified by understanding that load-velocity relationships during lifting can be changed depending on the goal. For example, researchers have shown that balance and gait speed (*Gait analysis is the systematic study of animal locomotion, more specific as a study of human motion, using the eye and the brain of observers, augmented by instrumentation for measuring body movements, body mechanics, and the activity of the muscles. Gait analysis is used to assess, plan, and treat individuals with conditions affecting their ability to walk. It is also commonly used in sports biomechanics to help athletes run more efficiently and to identify posture-related or movement-related problems in people with injuries*.) are more positively affected by loads in the range of 40% of maximum, while chair stands and stair-climbing performance are more affected by loads of approximately 80% of maximum (Cuoco et al. 2004). Additionally, optimal loads may be affected by the nature of the joints being trained. Joints associated with longer bones (e.g., the knee or elbow) are more susceptible to higher training speed than those associated with shorter ones (e.g., the ankle or wrist) (Signorile et al. 2002). The bottom line is that power training can be matched to the diagnosed needs of the individual and the biomechanical capacity of the targeted joints to produce speed.

Periodization must be considered when training for power. This process begins with training cycles that target hypertrophy and strength. Power training should not be attempted until the individual has strengthened the muscles using a hypertrophy, or tissue adaptation, phase. This phase is designed to "toughen" the tissues in preparation for the added stresses of high-speed training.

The periodization design should incorporate work and recovery periods to maximize gains. This allows for increased overload throughout the training period through intermittent periods of recovery (lower-intensity training). Using ADL- specific training during these low-intensity recovery cycles "translates" increases in power to improvements in both ADL (Activities of daily living (ADLs or ADL) is a term used in healthcare to refer to people's daily self-care activities.) performance and fall prevention. Practicing ADL movements—such as gait and ladder drills, object movement drills, and drills concentrating on static and dynamic balance—allows the use of increased neuromuscular capacity during motor patterns that are meaningful to daily living (Signorile 2005).

ADL-based training has been shown to be more effective than strength training in improving ADL performance in a number of recent studies (de Vreede et al. 2004; de Vreede et al. 2005). There should be sufficient taper at the end of each recovery period to evaluate the client's progress and modify the program for the next training cycle.

Chinese fitness dancing

In the People's Republic of China, square dancing or plaza dancing (simplified Chinese: 广场舞; traditional Chinese: 廣場舞; pinyin: guǎngchǎng wǔ; literally: "public square dance"), is an exercise routine performed to music in squares, plazas or parks of the nation's cities. It is popular with middle-aged and retired women who have been referred to as "dancing grannies" in the English-language media. Due to its low cost and ease of participation, it has been estimated to have over 100 million practitioners, according to CCTV, the country's official television network.

The practice has roots in both ancient and modern Chinese history. Dancing for exercise has been recorded as developed millennia ago in Emperor Yao's China, and during the Song Dynasty, the public spaces of cities were noted for their use in performance. Most of the women who square dance came of age during the Cultural Revolution, when folk dances such as yangge were widely performed, often as propaganda. Some have confirmed that this nostalgia is one of their reasons for taking part, although the benefits of the exercise and socialization opportunities also play a role.

Square dancers dance to a variety of music, mostly Chinese popular songs, both contemporary and historic. The hobby began in the mid-1990s, as middle-aged women began doing it to keep themselves occupied.

Dancers organize themselves into rank and file. The front rank comprises the most proficient dancers, the best being in the center. Each rank back from the one in front contains a dancer who is less proficient. All the dancers face forward. This allows dancers to learn from those in the rows ahead. The back rank is often populated with beginners just learning the moves, while the front rows are well-coordinated.

Square dancing is socially engaging, active and regular. All these features are needed for a healthy approach to life. Most participants have fun doing it and have the benefits of social interaction at an age

when most needed. The overall health benefits are unknown as there is no medical research on it but due to the basic ingredients, it must be considered a healthy way of moving and participating which should be encouraged.

TIPS

Wear Appropriate Footwear and Clothing
Consider shoes as feet's safety equipment. Wear shoes based on chosen activity. For example, if going to walk, wear walking shoes rather than running/tennis shoes. Opt for well-fitted, comfortable shoes that offer non-skid soles and with heel support. Shoes should be in good shape and of good quality; the tread should be ample, not worn. Like shoes, clothing also prevents injury; clothing should be loose and comfortable enough to allow fluid movement.

Know When to Stop
Exercise should never be painful. If there is a developing pain or pressure in the chest or anywhere else in the body, that could be a sign to immediately stop exercising and contact a healthcare provider. Also, be aware of dizziness, weakness, and shortness of breath. Pay attention to the heart. If the heart skips or beats uncomfortably fast, talk to the doctor immediately.

Use portable devices
The phone has many options. Year by year they increase. Step counters, stopwatches and a lot of wearables can be connected to the phone. Fitness watches provide heart and blood pressure measuring, some blood glucose while others also give calorie counts. Store this information on an external drive or computer and share it with a treating physician or healthcare provider. The more information, the better and direct help can be arranged.

The mind under development

While aging lots of events pass by. When turning 50 most people have suffered the loss of friends, family and others they had a connection with. The experience that lasts a lifetime. All must get a place in life. The danger of negative experiences is depression or worse. People with a positive mind grow old, from research and experience with interviewing it is found that none of the elderly over 90 had a negative mind. The individuals who had a negative feeling about life were searching for a permanent solution (euthanasia) but still had a positive mind. Prevention of negativism is important as part of the healthcare.

Tai Chi (Chuan)

The definition of Tai Chi as a concept is the "Ridgepole" where the original meaning was taken from the I Ching (Book of Changes). The Ridgepole supports the roof timbers.

- The Empty Circle is an expression of the emptiness that gives purpose.
- Yin and Yang is the natural energy divided into extremities, separate but complementary.

Tai Chi Chuan is about 1,000 years old. It supposed to come from the Buddhist Monastery built for the Indian Monk Batuo in 495 A.D.This style is Shaolin Quan (Shaolin boxing); it incorporates stretching, meditation, breath control, philosophy, strategy and self/ defense. The Shaolin Temple (Shaolinzi) acted as a kind of a university that people came from all over China not just for its Buddism but also for its

martial arts. Sometimes they came to study, some to teach and some to give up all their worldly desires to become a monk or a nun.

The Government destroyed the Henan Shaolin Temple during the Qing Dynasty 1644-1912 A.D. The monks who survived fled for their lives, spreading their skills all over China; the triads started life as anti-Qing fighters. Some modern kung fu styles come from that turbulent time, such as Wing Chun and Hungga Kuen. This story is a simplified abbreviation of the reality which consists of thousands of different stories and versions. Which one is true will always be in the dark.

What is a style?
Just as there are different hairstyles created by different hairdressers, there are different styles of martial arts; some stay in fashion, some do not! A style is a way that someone uses to express experiences, transfer knowledge and visualize it by movements.

Tai chi is often described as "meditation in motion," but it might well be called "medication in motion." In this low-impact, slow-motion exercise, and without pausing go through a series of motions. Breathing deeply and naturally, focusing attention on bodily sensations. The movements are usually circular and never forced, the muscles are relaxed rather than tensed, the joints are not fully extended or bent, and connective tissues are not stretched.

Benefits of Taichi;

- better mood, with lower levels of depression, stress, and anxiety
- greater aerobic capacity and muscle strength
- more energy and stamina
- enhanced flexibility, balance, and agility
- lower blood pressure and improved heart health
- reduced Inflammation
- fewer falls
- better sleep quality and an enhanced immune system

Qigong / Chi Kung
Chi Kung is an ancient Chinese form of movement exercise that promotes the flow of Chi (vital energy) through the body. It translates as ‘energy work’ in English and comprises exercises for stretching and mobilizing the body and joints, breathing techniques, slow movement exercises, static postures, special walking methods and meditation.

Chi is the body’s vital energy which Chi Kung builds up to establish a physiological and psychological harmony. Most of the theory behind Chi Kung is common to Chinese Medicine with which it has a traditional link. Chi Kung is also associated with Taoist and Buddhist philosophies and practices, particularly Taoist.

Chi Kung generally does not have complex ‘forms’. Chi Kung movements are simple. Each action aims to move Chi in a specific way. The movements often take their inspiration from the movement of animals and nature and can look quite beautiful. Sometimes the movements follow energy channels in the body and sometimes they orient around internal organs or parts of the body. The aim in all the movements is to increase the flow of Chi through the mind and body.

The health benefits are
1. Well-being and improved health. Qigong emphasizes the whole body, whole system health.
2. Clear and tranquil mind. When the mind is at peace, the whole universe seems at peace.
3. Deeper, more restorative sleep.
4. Increased energy, including sexual vitality and fertility.
5. Comfortable warmth. Qigong is great for cold hands and feet. Circulation improves, and the body generates more internal warmth when it is cold.
6. Clear skin. The skin, like the intestines, is an organ of elimination. According to Chinese medicine, as qigong improves, the body eliminates toxins, and the skin becomes clear.
7. Happy attitude. There is an old Tibetan saying, "You can tell a Yogi by his or her laugh."
8. More efficient metabolism. Digestion improves, and hair and nails grow more quickly.
9. Greater physiological control. This means that aspects of the body that were imbalanced or out of control begin to normalize, for example, breathing rate, heart rate, blood pressure, hormone levels, and states of chronic inflammation or depletion.
10. Spiritual effects. Advancement in qigong is often accompanied by a variety of spiritual experiences. For example, synchronicity, meaningful coincidences, become more common. When the qi is abundant, clear, and flowing

What is Yoga?

Yoga was developed up to 5,000 years ago in India as a comprehensive system for wellbeing on all levels: physical, mental, emotional and spiritual. While Yoga is often equated with Hatha Yoga, the well-known system of postures and breathing techniques, Hatha Yoga is only a part of the overall discipline of Yoga. Today, many millions of people use various aspects of Yoga to help raise their quality of life in such diverse areas as fitness, stress relief, wellness, vitality, mental clarity, healing, peace of mind and spiritual growth.

Yoga is a system, not of beliefs, but of techniques and guidance for enriched living. Among Yoga's many source texts, the two best known are the Yoga Sutras and the Bhagavad Gita. Both explain the nature of—and obstacles to—higher awareness and fulfillment, as well as a variety of methods for attaining those goals.

As in any field, some aspects of Yoga are too subtle to be learned from books or lectures; they must be acquired through experience. Hence Yoga's time-honored emphasis on the student-teacher relationship, in which the teacher helps the student develop a practice that brings deeper understanding through personal experience.

Since the individual experience of Yoga is quite personal and may differ for each practitioner, there are a wide variety of approaches to its practice. Yoga has in recent times branched out in many new directions, some of which are quite different from its traditional emphases. All approaches to Yoga, however, are intended to promote some aspect(s) of well-being.

As a result, today's practitioners have more options than ever as they seek to gain the most from the vibrant, ever-expanding field of Yoga.

Equipment required? No. You don't need any equipment because you'll rely on your own body weight for resistance. But you'll probably want to use a yoga mat to keep you from sliding around in standing poses, and to cushion you while in seated and lying positions. Other, optional equipment includes a yoga ball for balance, a yoga block or two, and straps to help you reach for your feet or link your hands behind your back.

Examples of different yoga forms include:
• Hatha. The form most often associated with yoga, it combines a series of basic movements with breathing.
• Vinyasa. A series of poses that flow smoothly into one another.
• Power. A faster, higher-intensity practice that builds muscle.
• Ashtanga. A series of poses, combined with a special breathing technique.
• Bikram. Also known as "hot yoga," it's a series of 26 challenging poses performed in a room heated to a high temperature.
• Iyengar. A type of yoga that uses props like blocks, straps, and chairs to help to move the body into the proper alignment.

Intensity Level: Varies with Type
The intensity of the yoga workout depends on which form of yoga you choose. Techniques like hatha and Iyengar yoga are gentle and slow. Bikram and power yoga are faster and more challenging.

Areas It Targets
Core: There is yoga poses to target just about every core muscle.
Arms: With yoga, the weight is that of the body. Arm strength is built at maximum in a natural way. Some poses, like the plank, spread the weight equally between arms and legs.
Legs: Yoga poses work all sides of the legs, including quadriceps, hips, and thighs.
Glutes: Yoga squats, bridges, and warrior poses involve deep knee bends, which gives a sculpted rear.
Back: Moves like a downward-facing dog, child's pose, and cat/cow give the back muscles a good stretch.

Type of exercise
Flexibility: Yes. Yoga poses stretch of the muscles and increases the range of motion. With regular practice, they'll improve flexibility.
Aerobic: No. Yoga isn't considered aerobic exercise, but the more athletic varieties, like power yoga, will make a person sweat. And even though yoga is not aerobic, some research finds it can be just as good as aerobic exercise for improving health.
Strength: Yes. It takes a lot of strength to hold the body in a balanced pose. Regular practice strengthens the muscles of the arms, back, legs, and core.
Sport: No. Yoga is not competitive. Focus on personal practice and don't compare to other people in the class.
Low-Impact: Yes. Although yoga gives a full-body workout, it won't put any impact on the joints.

Volunteer work
The first reaction of many elderly is to consider themselves a topic of volunteer work and not to participate in it. But the fact is that being active keeps a person young.
Staying in direct connection with a younger generation keeps once the body and mind younger. The reason is the electrical and emotional transmission of energy between individuals and group participation.

When two individuals are in a close connection there is the transmission of energy and emotional interaction which on itself also stimulates energy production. Emotions are a good source of energy if given and receiving in a positive environment. Working with the young keeps young is a saying that is often true.

Other volunteer work is also possible when the interaction with other people is of social and positive nature.

Conclusion; to stay healthy takes efforts and social connections. Efforts must be made on the physical and mental level at all times in life. It is a constant drive of positive directed energy which can be divided into over time, does not extreme intensively but moderate and low in stress. Take life as it is, live it as it comes. This is not an easy to do suggestion but one from the experience of people who all did pass the 100-year border.

6 Influence of environment

Research has proven that it is possible to distinguish two main category people in the world:

- City population
- Countryside population

The populations with the highest numbers of centenarian are all based in rural areas. Due to the urbanization, the highest amount of elderly over 60 is found in cities around the world. To understand the reason why people in rural areas are able to grow older than in the city it is important to compare the differences in the environment.

In the countryside, there are different reasons to name a few such as;

- ✓ A lower speed of life
- ✓ An open environment with more possibilities to move
- ✓ A natural surrounding
- ✓ A closer connection with this nature (interaction)
- ✓ Regular clean food
- ✓ Less pollution (air/water) in general
- ✓ Higher social interaction, a need for cooperation (name knowns name)
- ✓ Lower traffic stress (this strongly depend on where you live)
- ✓ Ability to create a completely independent energy and food life

On the other hand, there are negative parts to consider:

- ✓ More narrow choice of education
- ✓ Less different forms of communication
- ✓ Lower (public) transport opportunities
- ✓ Minimal work possibilities and often lower paid
- ✓ More difficult to get good affordable housing

Living in a city has also advantages and disadvantages such as;

Advantages	**Disadvantages**
Good interactive connectivity (internet access)	People easy overuse this facility
High and all available traffic opportunities	Often traffic jams
Good network public transport	High irritation level when not functioning as expected
All educational possibilities	Large groups and negative attitude in class
High and well-covered healthcare facilities	Waiting lists as all wish the best service
High population	Crowded places
Living incognito	Loneliness
Lower shopping prices	Higher housing prices
A wide variety of food products	A lot of people with digestive problems
	Air pollution

The environment has a direct connection with mood and health. The interaction between the environment and person starts in the sub-conscious and also has a clear presence in the continued awareness. This presence has a direct relation with mood by interacting with the hormonal system

(mainly histamine, serotonin and melatonin). when compare the environmental pressure in % a clear difference can be found. To do this different method of calculation are needed to compare.

1. Air pollution
2. Sound pollution
3. Human pressure (stress levels)

AIR POLLUTION :

The AQI level is based on the level of 5 atmospheric pollutants, namely sulfur dioxide (SO2), nitrogen dioxide (NO2), suspended particulates (PM10), carbon monoxide (CO), and ozone (O3) measured at the monitoring stations throughout each city.

AQI	Air Pollution Level	Mark	Health Implications
0 - 50	Excellent	**1**	No health implications
51 - 100	Good	**2**	No health implications
101-150	Slightly Polluted	**3**	Slight irritations may occur, individuals with breathing or heart problems should reduce outdoor exercise.
151-200	Lightly Polluted	**4**	Slight irritations may occur, individuals with breathing or heart problems should reduce outdoor exercise.
201-250	Moderately Polluted	**5**	Healthy people are noticeably affected. People with breathing or heart problems experience reduced endurance in activities. These individuals and elders should remain indoors and restrict activities.
251-300	Heavily Polluted	**6**	Healthy people are noticeably affected. People with breathing or heart problems will experience reduced endurance in activities. These individuals and elders should remain indoors and restrict activities.

300+	Severely Polluted	**7**	Healthy people experience reduced endurance in activities. There may be strong irritations and symptoms and trigger other illnesses. Elders and the sick should remain indoors and avoid exercise. Healthy individuals should avoid outdoor activities.

Soil pollution

Soil Pollution is another important factor that influences life in different ways. What is considered soil pollution and what is the effect?

- Groundwater pollution is one of the most dangerous and hidden factors that influences all aspects of life. If the soil above the water is polluted it enters consumption system one way or the other.
    - It affects drinking water
    - Food growing in and on the soil is polluted by obtaining the water
    - Animals living in places where the groundwater enters the larger water system get polluted
- People play, walk and work on the soil and get polluted with the content without being aware of it
- In some cases, there is radiation which effects health directly
- Changing the soil structure. A long-term effect of soil contamination can give a permanent change of soil nutrients and even a total structural change making it no longer suitable for food products.
- Gas. Sometimes gas is settled inside or under the topsoil and slowly spoils into the environment. There is a different kind of gasses and not all are toxic. But when the soil has a toxic content it can affect the health of people living nearby.
- Toxic Dust. When pollution gets to the surface of the soil it is possible that particles are transported by the wind or rain into the air, making it air pollution.

Soil pollution has multiple effects on health and is one of the 3 most important dangers to future health. Explaining the ways to measure this form of pollution is out of the context of this book.

Most important is that people should be aware of food grown on soil and that regularly test on the content of our soil is needed and there is a need to find other ways to grow healthy foods. Currently, efforts worldwide are taken to start new controlled production lines such as ;

- City farming, where the food is grown in food towers with multiple floor buildings
- Home growth, food growing in the private environment of the house

Sound pollution

A decibel is a standard for the measurement of noise. The zero on a decibel scale is at the threshold of hearing, the lowest sound pressure that can be heard, on the scale acc. On the basis of measurement, noise pollution can be divided into the following the type

Source of sound	Noise level	**Mark**	Effect
Whisper	20db	**1**	
Sounds of normal conversation	20 – 40 db	**2**	safe for the ear
Tape recorders or an orchestra	70 db	**3**	safe for the ear
Sounds of heavy traffic	90 db	**4**	Constant hearing of sound, greater than 80 db, cause temporary hearing

			loss and if they are not treated immediately, causes permanent impairment
Sounds of pneumatic drills and other machines	100 db	**5**	Constant hearing causes temporary hearing loss and if they are not treated immediately, causes permanent impairment
Sounds of aircraft engine	100 – 200 db	**6**	The higher noise level of 160 db causes total deafness, rupturing eardrums, damaging the inner ear. It also causes high blood pressure, ulcer in stomach, palpitation, nervous problems, irritation, anger, and affects pregnant women's embryo.
Sounds of rockets during taking off	200 db	**7**	It is dangerously causing total deafness by rupturing the eardrums and damaging the inner ear. It also causes high blood pressure, ulcer in stomach, palpitation, nervous problems, irritation, anger and affects pregnant women's embryo

Human pressure (stress levels)

To measure stress levels it is important to find a system. For this book, it is decided to go for a combination of easy to check and refer. Due to the number of available data, it is possible to understand and compare data.

First blood pressure levels must be measured.

The top number (systolic) in mm Hg		**And/or**	**The bottom number (diastolic) in mm Hg**	**Category***
*Ranges may be lower for children and teenagers.				
Below 120	**1**	and	Below 80	Normal blood pressure
120-129	**2**	and	Below 80	Elevated blood pressure

The top number (systolic) in mm Hg		And/or	The bottom number (diastolic) in mm Hg	Category*
130-139	**3**	or	80-89	Stage 1 high blood pressure (hypertension)
140 or higher	**4**	or	90 or higher	Stage 2 high blood pressure (hypertension)

Heart rate

The heart rate measures the number of times the heart beats per minute. After the age of 10 years, the heart rate of a person should be between 60 and 100 beats per minute while they are resting. A heart speeds up during exercise. There is a recommended maximum heart rate that varies depending on the age of the individual. It is not only the speed of the heart rate that is important. The rhythm of the heartbeat is crucial, and an irregular heartbeat can be a sign of a serious health condition.

Fear or being surprised automatically releases adrenaline, a hormone, to make the heart rate faster. This prepares the body to use more oxygen and energy to escape or confront potential danger. The pulse is often confused with the heart rate but refers instead to how many times per minute the arteries expand and contract in response to the pumping action of the heart. Taking the pulse is a direct measure of heart rate.

Age	Target HR Zone 50-85%	Average Maximum Heart Rate, 100%
20 years	100-170 beats per minute (bpm)	200 bpm
30 years	95-162 bpm	190 bpm
35 years	93-157 bpm	185 bpm
40 years	90-153 bpm	180 bpm
45 years	88-149 bpm	175 bpm
50 years	85-145 bpm	170 bpm
55 years	83-140 bpm	165 bpm
60 years	80-136 bpm	160 bpm
65 years	78-132 bpm	155 bpm
70 years	75-128 bpm	150 bpm

The stress calculation diagram for blood pressure is ;

	75 – 95	95 – 115	115 - 125	125 – 135	135 – 145	145 – 155	155 – 165	165 – 175	175 - 185	185 – 195	195 - 200
20 y	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**3**	**4**	**4**	**5**
30 y	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**3**	**4**	**5**	**5**
35 y	**1**	**1**	**2**	**2**	**2**	**2**	**3**	**4**	**5**	**5**	**5**
40 y	**1**	**1**	**2**	**2**	**2**	**3**	**4**	**5**	**5**	**5**	**5**
45 y	**1**	**1**	**2**	**2**	**3**	**3**	**4**	**5**	**5**	**5**	**5**
50 y	**1**	**1**	**2**	**2**	**3**	**3**	**4**	**5**	**5**	**5**	**5**
55 y	**1**	**1**	**2**	**2**	**4**	**4**	**5**	**5**	**5**	**5**	**5**
60 y	**1**	**1**	**2**	**3**	**4**	**4**	**5**	**5**	**5**	**5**	**5**
65 y	**1**	**1**	**2**	**3**	**4**	**5**	**5**	**5**	**5**	**5**	**5**
70 y	**1**	**1**	**2**	**3**	**5**	**5**	**5**	**5**	**5**	**5**	**5**

Addition to this calculation. Plus 1 for the countryside and 2 for the city.

Calculation of the possible stress level as part of the environment can be measured by taking your referred number (your personal measuring level) and add them together. A higher number refers to the personal level of stress.

1 - 3	**No stress at all**	**Completely safe but also dangerous due to complete lack of activity**
4 – 5	**Minimum stress level**	**No apparent stress, safe for health**
6 – 7	**Medium stress level**	**The standard stress level for working people in a city**
8 – 9	**High-stress level**	**Health risk and advise needed to change**
10 and higher	**Top level**	**Imminent danger**

To calculate a personal level of stress the points of the different tables must be plusses. The final result gives an indication of the height of stress in the body. It is important to understand that this is only a part of the stress calculation as the major part (inter-human relationships) is not included in this calculation.

Conclusion on environmental stress pressure; the pressure consists of many different items which do increase with the changing society. The external pressure of environment shows an increase in cities more than on countryside depending on location (airport controlled countryside has higher noise pressure). With an increase of different pressure levels and not changing the education of mental

aspects coping with these changes, it is likely to have a constant negative influence on the aging process. The conclusion is that healthy aging with external environmental pressure is less likely to happen.

This conclusion leads to the fact that much more attention should be paid to the environmental role in relation to the aging process. The current environment is and always has been an important factor in health and wellbeing. Cleaning the environment is costly but deserves full attention for the sake of future generations and their ability to age healthily.

indicates that transportation and housing, community support and health services, and outdoor spaces and buildings are statistically significant in creating an age-friendly environment. The results indicate that built environments such as accessible public transportations and housing, affordable and accessible health care services, and elderly friendly outdoor spaces and buildings have to be put into place before social environment in building an age-friendly environment. Environments include the home, community and broader society, and all the factors within them such as the built environment, people and their relationships, attitudes and values, health and social policies, the systems that support them and the services that they implement. Being able to live in environments that support and maintain your intrinsic capacity and functional ability is key to Healthy Ageing.

Environmental Pollution

There are numerous types of pollution from indoor and outdoor sources. Indoor pollution examples include formaldehyde, mold, carbon monoxide and tobacco smoke. Examples of outdoor pollution include benzene, sulfur monoxide, nitrogen dioxide, ozone and hydrochloric acid from industrial operations. These pollutants commonly enter the human body system through the skin, eyes, ears, nose and/or mouth. Each of these substances represents a significant threat to human health, causing anything from acute sudden illness to long-term chronic diseases and even death.

While physical sources, such as noise and light, of pollution, are important, people most often notice the damage of chemical pollution on animals and plant life. These chemicals can react with tissues in the body and change the structure and function of the organ, causing abnormal growth and development of the individual, or bind with the genetic material of cells and cause cancer.

Atmospheric Pollution
Examples of atmospheric pollutants include nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), and chlorofluorocarbons (CFCs). The first two pollutants combine with water to form acids, which not only irritate the lungs but also contribute to the long-term destruction of the environment due to the generation of acid rain. Carbon monoxide, generated by the incomplete combustion of hydrocarbons, displaces and prevents oxygen from binding to hemoglobin and causes asphyxiation. It binds to metallic pollutants and causes them to be more mobile in air and water. CFCs and other halogenated hydrocarbons react with light to form highly reactive radicals, which destroy ozone in the upper atmosphere. These reactions reduce the protective effects of ozone against ultraviolet radiation.

Respiratory System
The respiratory system is comprised of organs that function to breath in oxygen and take away carbon dioxide. Pollution that includes tiny particles such as dust and debris smaller than 2.5 micrometers in diameter can be inhaled deep into the lungs. Once a toxin is inhaled it can cause immediate damage to

the lungs and even circulate into the bloodstream. Existing health conditions such as asthma may also be exacerbated by exposure to respiratory irritants such as ozone and sulfur monoxide. Continued exposure to respiratory pollutants can result in chronic bronchitis, tissue damage and cancer.

Water Pollution

Industrial, agricultural, and domestic wastes can contribute to the pollution of water, pollutants can damage human and animal health. Three important classes of water pollutants are heavy metals, inorganic pollutants, and organic pollutants. Heavy metals include transition metals such as cadmium, mercury, and lead, all of which can contribute to brain damage. Inorganic pollutants like hydrochloric acid, sodium chloride, and sodium carbonate change the acidity, salinity, or alkalinity of the water, making it undrinkable or unsuitable for the support of animal and plant life. Organic pollutants include pesticides such as chlorpyrifos and paraquat, and their byproducts, such as dioxin. All of these substances are lethal to animals and can be readily absorbed through the skin.

Circulatory System

The circulatory system includes the heart, blood and blood vessels. Blood plays a vital role in transporting nutrients, evacuating wastes, regulating body temperature and immune response. When toxic pollution enters the bloodstream, the results can be devastating. Benzene is a common pollutant from oil and gas production and in even small amounts has been linked to cancer of the blood called Leukemia. Research has linked carbon monoxide, oxides of nitrogen, sulfur dioxide, lead and ozone to abnormal heart rhythms, arterial constriction, abnormal inflammatory responses and heart disease.

Pesticides

Pesticides are used to control the growth of insects, weeds, and fungi. The use increases crop yields and controls diseases such as malaria and encephalitis. The spraying of crops and the water runoff from irrigation transports these harmful chemicals to the habitats of nontarget animals. Chemicals build up in the tissues of animals, and humans consume the animals with increased potency of the pesticides which is manifested as health problems and in some cases death. The most significant pesticide of the twentieth century was DDT, which was highly effective as an insecticide but did not break down in the environment and led to the death of birds, fish, and some humans.

Nervous System

The nervous system serves as the body control system and is made up of the brain, spinal cord, and nerves. When pollutants enter the human body they can cause abnormal nervous system actions such as activation of unnecessary immune responses. According to the National Institute of Health, air pollution has been associated with stroke, Alzheimer's disease, Parkinson's disease and other brain disorders.

New Pollutants: Toxic Mold

Recently many people have complained of illnesses associated with the presence of toxic mold in their homes and workplaces. These molds, which thrive in damp surroundings, are members of the fungi kingdom and produce chemicals called mycotoxins that can produce a variety of health problems. Additionally, molds produce strong allergic reactions in some individuals. According to the Centers for Disease Control and Prevention (CDC), little strong evidence exists that can tie all of the health problems seen in damp or flooded areas to molds.

Reproduction

Pollution is most dangerous during pregnancy and early childhood. During pregnancy critical, rapid cell growth occurs in the fetus. This period of cell growth can be adversely impacted when exposed to pollution such as high levels of carbon monoxide and ozone. Air pollutants have been linked to low birth weight and congenital heart defects. A recent Stanford University School of Medicine study determined that vehicle air pollutants were also linked to malformations of the brain and spine.

The Pollutant Standard Index (PSI) is a numerical value and indicator of pollutants that are normally used to facilitate risk assessment. It is a numeric value between zero to 500. PSI is a guideline for reporting air quality which was first introduced by Thom and Ott in 1974. Hence, it would provide a method of comparing the relative contribution of each pollutant to total risk. The calculation of PSI is based on the concentration of five major air pollutants including particulate matters (PMs), sulfur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide (CO), and ozone (O3) in the air. Particle pollutants are major parts of air pollutants which are more known as PM varied in size ranging mostly from 2.5 to 10 μm (PM2.5 to PM10).

The size of particle pollutants is directly associated with the onset and progression of the lungs and heart diseases. Particles of smaller size reach the lower respiratory tract and thus have greater potential for causing the lungs and heart diseases. Moreover, numerous scientific data have demonstrated that fine particle pollutants cause premature death in people with heart and/or lung disease including cardiac dysrhythmias, nonfatal heart attacks, aggravated asthma, and decreased lung functions. Depending on the level of exposure, particulate pollutants may cause mild to severe illnesses. Wheezing, cough, dry mouth, and limitation in activities due to breathing problems are the most prevalent clinical symptoms of respiratory disease resulted from air pollution.

Long-term exposure to current ambient PM concentrations may lead to a marked reduction in life expectancy. The increase in cardiopulmonary and lung cancer mortality are the main reasons for the reduction in life expectancy. Reduced lung functions in children and adults leading to asthmatic bronchitis and chronic obstructive pulmonary disease (COPD) are also serious diseases which induce lower quality of life and reduced life expectancy. Strong evidence on the effect of long-term exposure to PM on cardiovascular and cardiopulmonary mortality come from cohort studies.

Some of the best known and researched particles/pollutants and their function are:

Carbon Dioxide (CO2)
Carbon dioxide (CO2) is not a pollutant that would harm the health but it is a proven greenhouse gas. It has an ability to absorb infrared radiation that is escaping from the surface of the earth causing the atmosphere to warm up. Excessive emission of CO2 along with other greenhouse gases is thought to contribute to the undesirable climate change.

Carbon Monoxide (CO)
Carbon monoxide, or CO, is a colorless, odorless and tasteless gas that is formed when carbon in fuel is not burned completely. At much higher levels of exposure not commonly found in ambient air, CO can be poisonous, and even healthy individuals can be affected. Exposure to elevated levels of CO result in:
visual impairment;
reduced work capacity;
reduced manual dexterity;
poor learning ability;

difficulty in performing complex tasks.
The health threat from levels of CO sometimes found in the ambient air is most serious for those who suffer from cardiovascular disease such as angina pectoris. Larger amounts can be deadly as CO is a very strong binder of hemoglobin, much stronger than O2 and CO2.

Ground-level ozone
O3 is a colorless gas which is the major constituent of the atmosphere. It is found both at the ground level and in the upper regions of the atmosphere which is called the troposphere. Ground-level ozone (GLO) is produced as a result of a chemical reaction between oxides of nitrogen and VOCs emitted from natural sources and/or due to human activities. GLO is believed to have a plausible association with increased risk of respiratory diseases, particularly asthma.

As a powerful oxidant, O3 accepts electrons from other molecules. There is a high level of polyunsaturated fatty acids in the surface fluid lining of the respiratory tract and cell membranes that underlie the lining fluid. The double bonds available in these fatty acids are unstable. O3 attacks unpaired electron to form ozonides and progress through an unstable zwitterion or trioxolane (depending on the presence of water). These ultimately recombine or decompose to lipohydroperoxides, aldehydes, and hydrogen peroxide. These pathways are thought to initiate propagation of lipid radicals and auto-oxidation of cell membranes and macromolecules. It also increases the risk of DNA damage in epidermal keratinocytes, which leads to impaired cellular function.

O3 induces a variety of toxic effects in humans and experimental animals at concentrations that occur in many urban areas. These effects include morphologic, functional, immunologic, and biochemical alterations. Because of its low water solubility, a substantial portion of inhaled O3 penetrates deep into the lungs but its reactivity is scrubbed by the nasopharynx of resting rats and humans in around 17% and 40%, respectively. On the ecological aspect, O3 can reduce carbon assimilation in trees leading to deforestation which may affect global food security in long-term exposure.

Sulfur Dioxide (SO2)
High concentrations of SO2 can result in the following health problems:
Short-term exposure
Adults and children with asthma who are active outdoors experience temporary breathing impairment. Individuals with asthma experience breathing difficulties with moderate activity and exhibit symptoms such as wheezing, chest tightness, or shortness of breath.
Long-term exposure (along with high levels of PM)
Aggravation of existing cardiovascular disease
Respiratory illness
Alterations in the lungs' defenses
The subgroups of the population that is affected under these conditions include individuals with heart or lung disease, as well as the elderly and children.

Nitrogen oxide
Nitrogen oxides are important ambient air pollutants which increase the risk of respiratory infections. They are mainly emitted from motor engines and thus are traffic-related air pollutants. NO is considered to be deep lung irritants that can induce pulmonary edema if been inhaled at high levels Exposures at 2.0–5.0 ppm have been shown to affect T-lymphocytes, particularly CD8+ cells and natural killer cells that play an important role in host defenses against viruses. Although these levels seem to be high,

epidemiologic studies demonstrate the effects of NO2 on respiratory infection rates in children. Coughing and wheezing are the most common complication of nitrogen oxides toxicity, but the eyes, nose or throat irritations, headache, dyspnea, chest pain, diaphoresis, fever, bronchospasm, and pulmonary edema also occur.

Lead

Pb or plumb is a toxic heavy metal that is widely used in different industries. It is emitted from motor engines, particularly with those using petrol containing Pb tetraethyl. Smelters and battery plants, as well as irrigation water wells and wastewaters, are other emission sources of the Pb into the environment. Evaluation of the blood Pb level in traffic police officers shows that environmental pollution can be considered as a source of Pb exposure. Fetuses and children are highly susceptible to even low doses of Pb. Pb accumulates in the body in blood, bone, and soft tissue. Because it is not readily excreted, Pb can affect the kidneys, liver, nervous system, and the other organs.

Pb absorption by the lungs depends on the particle size and concentration. Around 90% of Pb particles in the ambient air that is inhaled are small enough to be retained. Retained Pb absorption through alveoli is absorbed and induces toxicity. Pb is a powerful neurotoxicant, especially for infants and children as the high-risk groups. Mental retardation, learning disabilities, impairment of memory, hyperactivity, and antisocial behaviors are of adverse effects of Pb in childhood.

Pb disrupts the normal function of intracellular second messenger systems through the inhibition of N-methyl-D-aspartate receptors. Pb replaces calcium as a second messenger resulting in protein modification through various cellular processes including protein kinase activation or deactivation. Abdominal pain, anemia, aggression, constipation, headaches, irritability, loss of concentration and memory, reduced sensations, and sleep disorders are the most common symptoms of Pb poisoning. Exposure to Pb is manifested with numerous problems, such as high blood pressure, infertility, digestive and renal dysfunctions, and muscle and joint pain.

COPD & Asthma

Asthma is a disease that may be caused by air pollution. The following air pollutants are common triggers of asthma: ground-level ozone, sulfur dioxide, fine particulate matter and nitrogen oxide. Another important trigger for asthma attacks is environmental or secondhand tobacco smoke.

Smog

A major health problem in the developed countries is a form of air pollution produced by the reaction of sunlight with hydrocarbons, nitrogen compounds, ozone and other gases primarily released in automobile exhaust. Smog is common in large urban areas, especially during hot, sunny weather, where it appears as a brownish haze that irritates the eyes and lungs. The elderly and children, as well as individuals with pre-existing heart or lung diseases, are particularly at risk from breathing smog. Various gases present in smog, e.g. nitric oxides, sulfur dioxide and ozone are oxidants and reported to induce organ and cellular damage via generation of free radical species.

Nitric oxide rapidly reacts with molecular oxygen to generate reactive peroxynitrite, which oxidizes DNA, proteins, and lipids. Sulfur dioxide reacts with water to generate sulfite (hydrated sulfur dioxide) which generate sulfite (·SO3 -) and sulfate (·SO4 -) anion radicals catalyzed by human myeloperoxidases.

Various government agencies are involved in monitoring and enforcing clean air act. These agencies are involved in identifications of various molecular and cellular mechanisms of action of pollutants/toxicants. While these agencies do an excellent work, enforcing and carrying out these tasks takes enormous amounts of time, money and sometimes is subject to political interference.

Climate change impacts on public health and welfare
The risks to public health and the environment from climate change are substantial and far-reaching. Scientists warn that carbon pollution and resulting climate change are expected to lead to more intense hurricanes and storms, heavier and more frequent flooding, increased drought, and more severe wildfires - events that can cause deaths, injuries, and billions of dollars of damage to property and the nation's infrastructure.

Carbon dioxide and other greenhouse gas pollution lead to more frequent and intense heat waves that increase mortality, especially among the poor and elderly. Other effects of greenhouse gas pollution noted in the scientific literature include ocean acidification, sea level rise, and increased storm surge, harm to agriculture and forests, species extinctions and ecosystem damage. Climate change impacts in certain regions of the world (potentially leading, for example, to food scarcity, conflicts or mass migration) may exacerbate problems that raise humanitarian, trade and national security issues.

Noise Pollution
Excessive exposure to noise pollution provoke feelings of annoyance, disrupt sleep and cause cognitive impairment and boost blood pressure. Noise is a stressor that affects health, and it exacerbates stress-related medical conditions, including hypertension, ulcers, coronary disease, colitis, and headaches. Excessive exposure to noise pollution results in children being born with birth defects or a low birth weight. Short-term physical health effects of noise pollution include elevated heart rate, breathing rate, and blood pressure, along with inhibition of the digestive processes.

How Pollution Harms Your Skin
(Suggestions & advise of dermatologists)

A landmark study in the Journal of Investigative Dermatology compared women living in urban and rural environments over 24 years and found that those exposed to increased pollution had more dark spots and wrinkling. "The sun isn't the only villain, now that it is known how damaging pollution really is," says David Bank, M.D., assistant clinical professor of dermatology at Columbia-Presbyterian Hospital in New York City. Microscopic specks of smoke, soot, acid and other pollutants are released into the atmosphere from sources like fires, construction sites, cars and power plants.

When that pollution comes into contact with your skin, it doesn't just sit on the surface. These particles' tiny size allows them to infiltrate deeper layers of the epidermis, causing inflammation and dehydration and at the cellular-level reaction that leads to lost elasticity and firmness. "Pollution breaks down collagen and the lipid layer in the skin, which impairs skin barrier functions," says Zoe Draelos, M.D., consulting professor of dermatology at Duke University in Durham, North Carolina, and author of the Journal of Cosmetic Dermatology. Some of the following advice is used to prevent problems.

Clean It Off

"Washing the face thoroughly every day is a critical piece of reducing the burden that pollution puts on the skin," says Erin Gilbert, M.D., assistant professor of dermatology at State University of New York Downstate Medical Center in Brooklyn. In the morning, wash in order to prep skin for radiance-boosting products. Use a mild cleanser. "Only people with really oily skin need anything stronger," says Elizabeth Tanzi, M.D., associate professor of dermatology at George Washington University Medical Center in Washington, D.C. At night, there is a need to go deeper to remove the film of potentially harmful pollutants, not to mention makeup and everyday dirt and sweat. The goal is to get everything off without too much scrubbing, drying or irritation, which can exacerbate skin conditions like acne. Dr. Bank recommends using the same face wash from the a.m., but with an electronic brush. The brush is proven to more effectively remove impurities—especially sticky particles like soot—than washing by hand. "Think of a pollutant as a smoldering cigarette butt that's stuck in the skin, continuing to emit toxic chemicals," Dr. Bank says. "Simple washing may not be enough to remove it, but exfoliating can get those cells out of there." If it is not possible to use a brush or the skin is too sensitive, add a gentle scrub to the nightly routine. "Limit use to every other night if either irritates," says Dr. Tanzi. As a final step, soak a cotton pad with toner, then wipe it across the skin. "It's especially worth doing when living in a big city," Dr. Day says. "It lifts off any debris that may be left behind."

Neutralize It

When pollution gets into the skin, it creates free radicals, "They literally poke holes in the collagen, which is what gives skin its firmness," Dr. Draelos explains. All destruction shows up as hyperpigmentation and fine lines. Free radicals can increase inflammation, which makes acne and rosacea worse. "They can cause DNA damage and cell mutation, which can lead to cancer," Dr. Draelos says. The answer is to take antioxidants. "Research shows that antioxidants provide one of the best treatments for preventing or reducing free-radical damage," says David McDaniel, M.D., an adjunct assistant professor at Old Dominion University in Norfolk, Virginia. To help protect skin, layer on a serum with antioxidants after cleansing in the morning, and do the same at night to bolster its repair process. Eat antioxidant-rich foods such as blueberries, leafy greens, and beans.

Create a Barrier

Man-made pollution not only damages skin directly but contributes to the erosion of the ozone layer, which helps shield from the sun's harmful rays. "It is known that UV rays are stronger," Dr. Day says. "That doesn't just mean a chance of more sunburns. These UV rays become accelerants: If there is hyperpigmentation or inflammation, they'll make it worse." Apply an SPF 30 daily to protect; the latest formulas contain antioxidants, boosting their pollution-fighting powers. "Utilize sunscreen, antioxidants and proper cleansing, and you won't end up with skin that's older than its years—or a higher risk for skin cancer," Dr. Day says.

7 Looks and preferences

What do we consider “looks and preferences”? The definition for this topic;

Looks; all externally visible display of a person and personality by its way of dressing and physical expressions.

Preferences: personal choices connected with interpersonal relationships, looks, culture, expression and all other display of personal choices and wishes.

Every person is shaped by external influences. The individual is a reflection of its environment for at least 50 – 80%. Free choice and free will are limited to a small 50 – 20 % of all activities. This margin is still high as most people have an even smaller margin than 5 – 10%. They are merely a reflection of society and have limited personal freedom for social recognition. This is considered the norm.

Free will and free choice are rare. Every person takes part and must fit into a specific social/economic group in society. Each group has specific unwritten rules for clothing, behavior, and customs. Within this group rules, there is limited space for free interpretation. This raises an important question: is free will and free choices needed to grow old? The answer to this question is important for many people who have an idealistic vision of society.

Looks are very important in life. The story that pretty, good-looking people have an easier life than others is true. The question is why is this true? Has it been always like that at every level of society?

For a better understanding, it is important to divide the segments between countryside and city as done with other topics before. People in the countryside have different norms and values related to clothing and certain behavior from people in the cities. In cities all over the world control of clothing had a direct correlation with social class and economic status. In the countryside, only the specific people who were calculated to the upper social class did distinguish themselves from the rest of the population by a certain form of isolation. This isolation took place through their way of housing, living, and behavior. Most interesting is the fact that these “better” classes hardly ever did reach an old age in the West. This is contrary with Asia were royal and related classes did so. The indulgence of a luxurious life did harm them.

The most important part of aging in the past was personal and social hygiene. This has not been changed. Lack of proper hygiene is a source of disease which limits the physical resistance of an individual. The knowledge on hygiene (reasons of when, where, why and how) came from the medical discoveries. These discoveries gave the aging process a strong boost. They are partly responsible for a plus 30-year increase of our age.

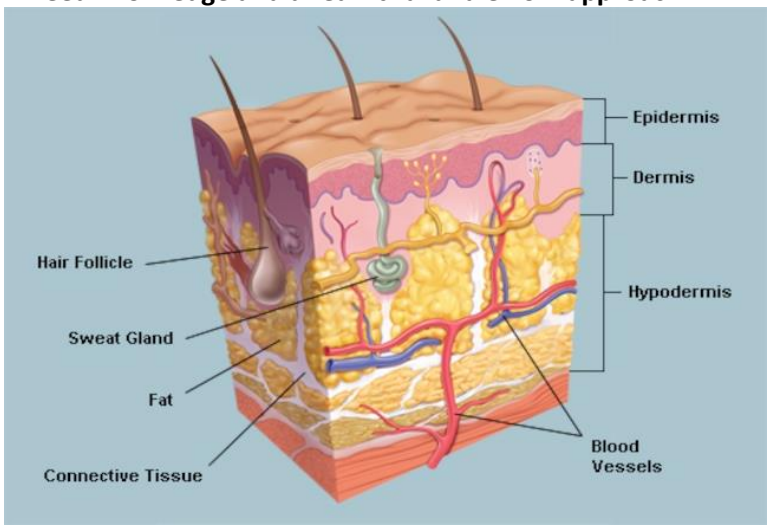
With an increase in hygiene, the looks and preferences did change. Science brought the bathroom and toilet indoors. A bathroom was introduced and a toilet constructed. People were thought how to take care of themselves. The need of cleaning and maintaining the skin, hair and body odor became apparent. Imagine the people from the past had to use all kind of smelly products to cover the personal body odor but perfumes, as we know, did not exist. In historical stories, we find different mentioning of “hard to bear body smell” in houses, ships, and parties. The mixture of “odors” must have been awful

when people of “standing” came together in meetings. To understand the influence of looks and preferences on aging it is good to look at a number of major issues.

Skin: the skin is the border between the environment and internal health. The skin is the first parts that show the signs of aging. All large and medium companies in cosmetics and cosmetic surgeries focus on this as a priority. Sales of skin care products increase year by year. Male and female alike have found the skin as a major issue for the personal reflection of health and beauty. Understanding how to take care of the skin and its functional biochemistry is a need for the professional.

Hygiene has improved the ability to clean the skin of dangerous bacteria and influence of virus among dirt and pollution. To keep the skin in a clean and good condition is a need. People in the past did not see a need nor there was always an opportunity to do it. Cleaning is needed but this is also a danger. Many people “overclean” and mistreat the skin. To keep the skin a healthy barrier one should respect its biological needs and chemistry. Washing with soap too often wipes out the defense system and take away the fatty cover needed to catch intruders.

Treatment of the skin need knowledge and a real “trial and error” approach:



- Beauty is only skin-deep. The skin is built in different layers which have different functions and react in different ways on the environment and internal physical events. Sometimes skin can show a conflict between internal and external influences. Most of these conflicts show up as colorations of the skin, irritation, flaking, discoloration, vesicles or other visible changes. Every change of the skin is a message but not every one of them needs to be taken seriously as many come and go within 48 hours. In TCM and Ayurveda, there are many books written about skin analyzing and anamneses.
- The skin changes partly because the aging body produces less collagen (a tough, fibrous tissue that makes skin strong) and elastin (which makes skin flexible). As a result, the skin tears more easily.
- The fat layer under the skin thins. This layer acts as a cushion for the skin, helping to protect and support it. The fat layer helps to conserve body heat. When the layer thins, wrinkles are more likely to develop, and tolerance for cold decreases.
- The number of nerve endings in the skin decreases. As a result, people become less sensitive to pain, temperature, and pressure, and injuries may be more likely.

- The number of sweat glands and blood vessels decreases, and blood flow in the deep layers of the skin decreases. As a result, the body is less able to move heat from inside the body through blood vessels to the surface of the body. Less heat leaves the body, and the body cannot cool itself as well. The risk of heat-related disorders, such as heatstroke, is increased. Also, when blood flow is decreased, the skin tends to heal more slowly.
- The number of pigment-producing cells (melanocytes) decreases. As a result, the skin has less protection against ultraviolet (UV) radiation, such as that from sunlight. Large, brown spots (age spots) develop on skin that has been exposed to sunlight, perhaps because the skin is less able to remove waste products.
- The skin is less able to form vitamin D when it is exposed to sunlight. Thus, the risk of vitamin D deficiency increases.
- The skin begins to show “age spots” at a certain age. These spots a coloration of the skin, often brownish, and are unevenly divided over the skin at places exposed to sunlight. Most women do “hate” these spots as they are a clear sign of aging.
- During aging, the skin loses flexibility due to a degradation of elastin and loss of muscle mass. Exercise and massage of the skin to keep in good condition is important. Special techniques are available to apply, not every move is effective. The use of masks and chemical treatment (Botox) are unlikely to be healthy and are not advised for a healthy aging process. Some artificial injection or other technologies have been proven dangerous and harmful to the entire body not only the skin. Beauty has also a limitation.
- Skin is separated in exposed and not exposed to the sunlight. The section that is exposed to the environment needs to be treated with protective elements (creams and oils) in a supportive way. The skin parts that hardly ever come in touch with direct environment elements. This skin is venerable and cleaning must be limited to the needed amount. This skin must be treated with oil like substances of natural resources. Climate is important due to its direct influence.
- Skin intrusions such as tattoo, piercing or other ways of decoration are a damage to the original skin tone and may have a negative influence on health. All ink or metals used for these decorations enter the bloodstream and leave toxic elements. Even a minimal amount might be toxic for the individual body. Regular blood checks are advised. More research on this should be made.

Everyday treatment to take care of the skin is often done following commercial directions. These directions are not always safe. The use of high doses cleaning products damage the natural skin cover and bacterial balance. Hair removal of different parts of the body has become standard. Shaven parts must have extra care as they are sensitive and hair roots easily can get infected causing secondary issues in and under the skin. It is advised to follow next suggestions of care:

- Clean the skin in a natural way. Do not use strong soap(like) products that take away all fats of the skin. In a current society where people shower daily, soap is hardly ever needed. Use soap products only when the skin is dirty otherwise the use of water is enough. Water is a solution with products inside to keep the water clean, these ingredients take a lot of fats from the skin and some people can get irritated. In other words, the water we use is already a cleaning agent.
- Dry the skin in a natural way. Use towels which have been cleaned. Do not use heaters or blowers as they open the pores and give way to unwanted foreign objects to enter.
- Treat the skin after cleaning by proper creams or powders and give it time to recover. If possible let the skin be in contact with “open” air for at least 10-15 minutes after a shower/bath. Creams and oils must be of a good source and contain simple ingredients which do not bleach, stretches

or color it. Aggressive chemical ingredients have a destructive influence on the skin. Wrinkles, scars or dry out is the result.

- Treat the skin with a healthy dose of sunlight, do not burn it. Sunlight is needed for vitamin production. The short sun is good and productive. Age and duration are important calculation factors. Some people cover their skin most of their life and have a sensitive pigment. These persons should be real careful with the sun.
- Do not cover the skin with clothing which disables the pores to “breath”. Clothing must give way to the pores to exhale sweat and inhale air when needed.
- Depending on the profession and way of life, hair at some parts of the body is needed. Removal of hair can be useful and important for hygiene, for instance on the private parts, but always keep in mind that when the situation changes, habits must do also. Meaning that when hair is needed to protect your body you should leave it to grow. Remove only when possible and comfortable.
- The skin comes in multiple ways. There are many skin types with even as many subcategories. If possible get a specialist (beauty specialist or others with the right qualifications) check the skin. During aging, every person grows skin “impurities” which vary from color changes to pustules, warts, pimples or otherwise. Any of these can develop in a melanoma. It is important to discover any change before something serious is happening.

Our skin is a complicated and very important organ. It must be treated with care and respect as it is the border barrier with the outside world.

The effect of aging is seen on the skin from a certain age. The beauty industry tries to promote their product to use from the age of 20/21 which is, considered the current knowledge of aging, a very young age. The visual effects of aging can be seen at different ages and individuals but also is different between races and climates. But WHAT are the signs of aging in male and female?

Signs of aging:

Male	Female
The face is getting fatter	Small wrinkles appear
The increase in body fat	Loss of skin flexibility
Decrease of activity	Less energy
Changing the dress code	Adjustment of dress and accessories
Change in taste	
Change of hair color	
Change of morals	
Spotted hands (and other parts of the body)	
Changing eyesight	
Wrinkling of elbows and knees	
Losing hair on eyelashes and eyebrows	
Losing some smile abilities	
Bone and joint functions change (feel different)	
Hearing becomes more difficult	
Smell is changing, some become better other lose abilities	
Neurological functions decrease in speed	
Cognitive abilities decrease (memories)	

Slowing digestive system	
Kidney and urine tract misfunctioning	
Change in reproductive organs	
The decrease in blood production	
Immune system	
Change in sexual preferences	Decrease of libido
Uncertainty about libido	Loss of interest in pure sexual affairs
Lasting fertility	Stop to fertility

The list can "be continued" as the changes partly differ per person on an individual level. It is clear that male and female do have a different way of physical aging. Also on a psychological level experience it in a completely different way. The change is culturally dependent.

With a changing look and preferences, there is adaption. Every individual adapt differently to a changing situation. One of the most positive things about aging should be the "quiet mind principle". This principle suggests that while aging the emotional stress factors are better solved, more carefully weighted and timing between observation and reaction has widened.

With aging the adaption, visualization and realization of goals/target should change. While society is changing these three factors also change. Male and female want to look as young as possible and dress and behave accordingly with an equally changing demand on looks and personal preferences. These factors underwent a strong change in recent decades. Male and female are no longer focused on single partners and age differences are no barrier to sexual oriented relationships.

Knowing what is changing during the aging process is important and science wants to know what is possible to avoid the negative effects of the process on our look and skin. Marketing of thousands of "superior" products make it hard to find the right product. For research purpose this selection of products is divided into the following schedule;

It is possible to distinguish the following skin types-

Normal skin	The easiest detection is the size of the pores. This is a genetic issue and cannot be influenced by any treatment. At a normal skin, the pores are visible with the eye just by looking in the mirror. When washing the skin with water it recovers fast and gives a flexible tension when stretching it between the fingers. Taken between the fingers the skin has around 1 cm in size.
Oily skin	Enlarged pores, also visible from a distance. When washing it with water there is a need for at least warm water to get the skin smooth. Before washing the skin gives a little or more light reflection when shining on it. The way it reflects the light tells the severity of the oil on the skin. After washing the skin feels a little tight and often thigh. Often this is a thicker skin type sizing 1,5 cm between the fingers
Dry skin	Pores are hardly or not easily visible from any distance. When washing the skin it feels very tight and it takes some time to become more flexible. Dry skin is often a thin skin. Measured between the fingers less than 1 cm and for extreme thin less than 0,5 cm.

Combination	Most people have a combined skin mix of above mentioned with a variation over the body

After establishing the skin type a skin condition should be made, here are the most used ways:

Hyperpigmentation	Many forms of hyperpigmentation are caused by an excess production of melanin, can be caused by sun damage, inflammation, or other skin injuries, darker skin tones are more prone to hyperpigmentation, especially with excess sun exposure. Melanin itself is a polymer that comes in two types -- a red-yellow form known as pheomelanin and a black-brown form known as eumelanin.
Skin texture	This is the way the skin feels, it is a person perception
Skin coloration (redness)	The color of skin which is complexly determined. Skin color depends on many factors including reddening caused by inflammation, the hemoglobin level in the blood, and the darkening caused by increased deposition of the pigment melanin.
Sensitivity	a skin condition in which skin is prone to itching and irritation experienced as a subjective sensation
Scaring	a mark remaining after the healing of a wound, such as one caused by injury, illness, smallpox vaccination, or surgery. Beneath the skin is subcutaneous tissue, composed of fibroblasts, which after injury are stimulated to grow into granulation tissue, connecting the edges of the wound together. Scar tissue is formed by dense masses of granulation tissue. In some cases, scar tissue grows excessively, forming smooth, hard growths called keloids. Keloids can be much larger than the original wound. They're most commonly found on the chest, shoulders, earlobes, and cheeks. However, keloids can affect any part of the body. Although keloids aren't harmful to your health, they may create cosmetic concerns
Fine lines & Wrinkles	A wrinkle, also known as a rhytide, is a fold, ridge or crease in the skin. Wrinkles occur due to habitual sleeping positions, loss of body mass, or temporarily, as the result of prolonged immersion in water. Age wrinkling in the skin is developed by habitual facial expressions, aging, sun damage, smoking, poor hydration, and various other factors. Each time you use a facial muscle, a groove forms beneath the surface of the skin. And as skin ages, it loses its flexibility and is no longer able to jump back in place. These grooves then become permanent features on your face.
Furrows	Deeper lines or furrows are classified as dynamic or static. Dynamic lines appear with movement i.e. the activity of facial muscles. Static lines are unchanged with muscle movement. Eventually, dynamic lines become static. Crow's feet around the eyes are due to smiling and activity of the eyelid muscles (orbicularis oculi). Worry lines on the forehead are due to contraction of the frontalis muscle when raising the eyebrows. Frown lines between the eyebrows are due to contraction of corrugator supercilii muscles and procerus muscle when concentrating or angry

Sags and bags	Skin laxity or drooping is caused by several factors: A reduction of the fat cells under the skin (subcutaneous tissue). Loss of collagen and elastin fibers in the dermis reducing cutaneous strength and elasticity. Gravity, which allows the lax tissue to sag.
Skin color (racial feature)	Skin color is polygenic, determined by a number of genes. These genes include TYR (tyrosinase), MATP (a membrane-associated transport protein) and P (the pink-eyed dilution protein). There may be 20 or so other genes that affect skin color.

Products available in the market, these products are used for nearly all parts of the body. There are some exceptions which must be treated differently due to its sensitivity.

- Armpits
- Neck
- Around the eyes
- Sexual zones (this include the breast of females)
- Inside the buttock

Another important problem for female occur. Women's Menstruation's effects range from breakouts, sensitivity and water retention. Many women have to deal with major fluctuations of the skin and the body during menstruation. Some women have acne breakouts before the period. Often there are cravings for sweet and mood swings of anger or feelings of lethargy. The skin's sensitivity is heightened at this time.

Product	Effect
Scrub / Exfoliating	Exfoliating scrubs and brushes serve the same basic purpose. Exfoliation removes the upper layers of dry, dead skin cells. Both scrubs and brushes are mechanical, as opposed to chemical exfoliators. After exfoliation, the skin looks refreshed and feels softer. The skin absorbs moisture more easily. Granule size and texture play a part in how scrubs work: Fine granules are suited for sensitive skin; large ones are best on drier skin. Body scrubs employ manual exfoliators (microbeads, sugar or salts) or chemical ones (AHAs, glycolic acids, and fruit enzymes) to eliminate dead cells.
Moisturizer	Moisturizers prevent and treat dry skin, can protect sensitive skin, improve skin tone and texture, and mask imperfections.
Serum	The serum is a face care product that is a thick liquid. It consists of vitamins and other ingredients that are designed to address problem areas of the facial skin. It contains antioxidants, and its molecular structure is very small, allowing it to reach deep inside our skin and remedy our skin issues such as dark spots, redness, wrinkles, acne, dark circles, etc. These liquid skin care products

	also contain moisturizers. The main reason serums are used by people is because they can penetrate deep under the skin to reach the layer of skin called dermis. Serums heal our skin from the inside.
Day cream	These creams contain UV protection and often environmental protective elements
Night cream	Moisturizing, relaxing and collagen/elastin promoting agents for a smoother skin and relaxation of facial muscles
Cleanser	Cleaning the skin thoroughly and most of all thoroughly are needed at the use of make-up or related products. Nearly all have a negative influence on the skins natural shape and moisturizing should be applied
Lotion	Lotion can be used for cleaning or moisturizing it strongly depend on the content.
Micellar water	Expensive cleanser.
Toner	The coloring of the skin often used to cover minor between different skin types as mentioned before
Mask	These products are made to moisturize, relax the skin and facial muscles but often have more functions such as strong cleaner of skin inequalities and dirt.
Oil	Some skin type cannot be cleaned by cleaners with alcoholic or other content with a drying effect. Glycerine and other oils are used for this purpose.

The sale of moisturizers is huge. To understand them better it is important to know more about it. Enclosed the collected information. Moisturizers are not only used on the face but can be used all over the body. Most of the test are done to the facial skin. With the application, when it is for personal use, of a product it is best to test on different parts of the body and if possible on the most sensitive.

The Natural Moisturizing Factor (NMF), a natural mixture of amino acids, lactates, urea and electrolytes, which help the stratum corneum retain water is known. Many moisturizers contain some combination of humectants, emollients, and other ingredients. Most moisturizers are water-based as they are easier to apply and tend to not leave a visible residue after application.

The moisturizing treatment involves a 4-step process:
- Repairing the skin barrier
- Increasing water content
- Reducing TEWL
- Restoring the lipid barriers' ability to attract, hold and redistribute water

Ingredients of moisturizers are approximate:

Salicylic acid
Many skin care products contain salicylic acid. Studies have shown that salicylic acid is less irritating than skin care products containing alpha-hydroxy acids but has similar results in improving skin texture and color. But there is also a warning on allergic reactions to the product.

Hydroquinone
Skin care products containing hydroquinone are often called bleaching creams or lightening agents. These skin care products are used to lighten hyperpigmentation, such as age spots and dark spots related to pregnancy or hormone therapy (also called melasma). If a person is allergic to hydroquinones, it is possible to use products containing kojic acid or niacinamide (vitamin B3) instead. Pregnant women cannot use hydroquinone.

Kojic Acid
Kojic acid is a more recent remedy for treating pigment problems and age spots, it has a similar effect to hydroquinone. Kojic acid is made from a fungus.

Retinol
Retinol is made from vitamin A, and it's in many non-prescription skin care products. Retinol's stronger counterpart is tretinoin, which is the active ingredient in Retin-A and Renova, available by prescription only. Retinol may improve mottled pigmentation, fine lines and wrinkles, skin texture, and skin tone and color. Pregnant women or nursing mothers cannot use retinol.

Vitamin C
Vitamin C helps to minimize fine lines, scars, and wrinkles. It's the only antioxidant that is proven to boost production of collagen, which is a key part of the skin's structure. Vitamin C in its most commonly found forms is highly unstable when exposed to oxygen, making it useless. Choose one in a tube or a pump. Many vitamin C preparations do not penetrate the skin enough to make a difference.

Hyaluronic Acid
Skin care products containing hyaluronic acid are often used with vitamin C products to assist in effective penetration. This molecule can hold 1,000 times its own weight in water, making it the ultimate hydrator. It also helps draw active ingredients deeper into the skin and may be called a cyclic acid. Hyaluronic acid occurs naturally in young skin, other tissues, and joint fluid. Hyaluronic acid is known to cushion and lubricate. Aging decreases the amount of hyaluronic acid gradually. Diet and smoking can also affect the body's level over time. It is most frequently used to treat wrinkled skin although it doesn't replace anything the body has naturally lost.

Sodium hyaluronate: Closely related to hyaluronic acid, this water-binding ingredient works to moisturize the skin. Like hyaluronic acid, it can hold more than 1,000 times its own weight in water.

Copper Peptide
Copper peptide seems to promote the production of collagen and elastin in the skin. It also acts as an antioxidant and promotes the production of glycosaminoglycans. Copper peptides have been shown to remove damaged collagen and elastin from the skin and scar tissue. The actual effects are different per person.

Alpha-Lipoic Acid

Alpha-lipoic acid diminishes fine lines, gives skin a healthy glow, and boosts levels of other antioxidants, such as vitamin C. Alpha-lipoic acid can enter all parts of a skin cell and can provide more protection than other antioxidants against so-called free radicals that can damage skin.

DMAE (Dimethylaminoethanol)
The brain makes DMAE. DMAE in skin care products shows minimal effects at best when applied on the skin for the reduction of fine lines and wrinkles

Glycerin: In addition to providing hydration, glycerin forms a barrier on the skin's surface. This property allows it to glide on smoothly, but it can clog pores in high concentrations.

Shea butter: Widely used as a moisturizing ingredient, shea butter is believed to have anti-inflammatory properties.

Vitamin E: In addition to its antioxidant properties, nourishing vitamin E is a good moisturizer because it's oil-soluble.

Traditionally, moisturization was believed to inhibit transepidermal water loss (TEWL) by occlusion. The water originates in the deeper epidermal layers and moves upward to hydrate cells in the stratum corneum, eventually being lost to evaporation. Occlusive moisturization, then, prevents the dehydration of the stratum corneum.

Much more is now known about the epidermis, and in particular, the stratum corneum. The “bricks and mortar” model suggests that its role is as an active membrane. Loss of intercellular lipids, i.e., the ceramides, cholesterol and fatty acids that form the bilayers, damages the water-barrier function. The stratum corneum then calls into action repair mechanisms. Dry skin is noted when the moisture content is less than 10%, and there is a loss of continuity of the stratum corneum.

Occlusives
Occlusives are substances that physically block TEWL in the stratum corneum. Petrolatum in a minimum concentration of 5% is the most effective occlusive followed by lanolin, mineral oil, and silicones such as dimethicone. Petrolatum is widely used as a classic moisturizer. Lanolin, a complex structure of esters, diesters, and hydroxy esters of high molecular weight, lanolin alcohols, and lanolin acids, is also widely used and quite effective.

Humectants
Humectants attract water when applied to the skin and theoretically improve hydration of the stratum corneum. However, the water that is drawn to the skin is trans-epidermal water, not atmospheric water. Continued evaporation from the skin can actually exacerbate dryness. Humectants include glycerin, sorbitol, urea, alpha hydroxy acids (i.e., lactic acid) and other sugars. NMF is made up of a mix of low molecular weight soluble hygroscopic substances including lactic acid, pyrrolidone-carboxylic acid, and amino acids. This naturally mixing compound is thought to be a major player, keeping the horny layer hydrated and flexible.

Manufacturers’ attempts to include the above humectants into moisturizers do not always produce a beneficial effect. High concentrations of propylene glycol and urea can be irritating. Pure mixtures of

amino acids are useless as moisturizers. Pure solutions of glycerin are ineffective and propylene glycol by itself is irritating. In addition to their humectant properties, urea and lactic acid are keratolytic. Urea is a humectant in lower concentrations (10%), but in higher concentrations (20-30%) it is mildly keratolytic by disrupting hydrogen bonds or epidermal proteins. Alpha hydroxy acids, such as lactic acid or glycolic acid, appear to increase the cohesion of the stratum corneum cells, thereby reducing roughness and scaling.

Class Action	Mechanism of Ingredients	Example	Indication	Indication Side Effects
I. Occlusive	Physically block TWEL	Petrolatum Lanolin Mineral Oil Silicones Zinc Oxide	Xerosis – Atopic Dermatitis Prevention of Irritant Contact Dermatitis	Messy, Cosmetically Unacceptable, Folliculitis, (Mineral Oil) Comedogenic Contact Dermatitis,(Lanolin)
II. Humectants	Attract water to stratum corneum (transepidermal)	Glycerin Sorbital Urea Alpha hydroxy acids Sugars	Xerosis Ichthyosis Skin Rejuvenation?	Irritation (Urea, Lactic Acid)
III. Emollients	Smooth Skin by filling spaces between skin flakes, with droplets of oil	Cholesterol Squalene Fatty Acids	Decrease skin roughness	Not always effective
IV. Protein Rejuvenators	Claim rejuvenate skin by replenishing essential proteins in skin	Collagen Keratin Elastin	Skin Rejuvenation?	Unlikely to work Protein too large to cross epidermis Contact reactions

Emollients
Emollients are used to soften and smooth the scales of the skin, which help reduce rough, flaky skin. They are also occlusive agents: substances that provide a layer of protection that helps prevent moisture (water) loss from the skin.

Mechanisms of action

- Occlusives: These work by forming a thin film on the surface of the skin to prevent loss of moisture.
- Humectants: These attract water vapor from the air to moisturize the skin.
- Restoration of deficient materials: These are more complex and try to restore natural moisturizing factors on the skin, such as amino-lipids.

- Antipruritic action (anti-itching): down regulate cytokines and cooling effect from evaporation of water for water-based moisturizer.
- Antimitotic (mitotic inhibitor): Slow the process of mitosis (cell division) on the epidermis by mineral oil, which could be helpful for people who have psoriasis disease.
- UV protection: moisturizers also contain sunscreen which will protect your skin from UV light.
- Inhibit proinflammatory prostanoids production: blocking cyclooxygenase activity which causes soothing and lower skin inflammation.
- Wound healing: hyaluronic acid, the Antimicrobial effect by an act against microbe surface

Emollients smooth skin by filling spaces between skin flakes with droplets of oil, and are not usually occlusive unless applied heavily. When combined with an emulsifier, they may help hold oil and water in the stratum corneum. Vitamin E is a common additive, which appears to have no effect, except as an emollient. Likewise, other vitamins, e.g., A and D, are also added with questionable effect. Examples of emollients include mineral oil, lanolin, fatty acids, cholesterol, squalene, and structural lipids.

Long chain saturated fatty acids and fatty alcohols are commonly used in topical pharmaceuticals and cosmetic formulations. They exert their benefits through effects on the skin barrier and on permeability. Examples include stearic, linoleic, linolenic, oleic, and lauric, which can be found in palm oil, coconut oil, and wool fat. Fatty acids and fatty alcohols can change the properties of intracellular lipids or the stratum corneum. Medium chain saturated hydrocarbons or longer chain unsaturated hydrocarbons are the most effective. Essential fatty acids (i.e., linoleic and alpha-linoleic acids) influence skin physiology and pathology via their effects on skin barrier functions, eicosanoid production, membrane fluidity, and cell signaling.

Structural lipids, i.e., intracellular lipids comprising multilamellar, which are located between stratum cornea cells, are felt to play a considerable role in the water-holding potential of the stratum corneum. Ceramide is a major component of the inner cellular lipids and plays a major role in generating multi lamellae architecture. Several pseudo ceramides have been synthesized (the natural form is still too expensive) and clinically shown to be effective in preventing and improving dry skin.

Moisturizers containing collagen and other proteins, i.e., keratin and elastin, claim to rejuvenate the skin by replenishing its essential proteins. This is unlikely to occur since these protein molecules are too large to penetrate the dermis. Protein additives may provide temporary relief of dry skin by filling irregularities in the stratum corneum. Like emollients, when they dry they shrink slightly, leaving a protein film that appears to smooth the skin and stretch out some of the fine wrinkles.

Indications for emollients include dry skin, i.e., xerosis or as a result of metabolic conditions, such as renal insufficiency and diabetes; atopic dermatitis; ichthyosis vulgaris; irritant contact dermatitis and prevention; nummular dermatitis; psoriasis; skin protection, i.e., frequent hand washing; and dermatoheliosis.

Differences between male and female skin
The skin on a man compared to a woman is significantly different. The ability to grow a hair fast, for instance, a mustache or beard, is a very obvious distinction. In structural difference, other samples are skin thickness, collagen density, loss of collagen as we age, texture and hydration.

Skin Thickness

Skin varies with location (climate/environment), age and gender of the individual. Androgens (i.e. testosterone), causes an increase in skin thickness this accounts for the fact that a man's skin is about 25 percent thicker than of a woman. A man's skin thins gradually with age, while the thickness of a woman's skin remains constant until about the age of fifty. After menopause, her skin thins significantly, which continues while aging.

Collagen and elastin Density
Men have a higher collagen and elastin density than women; this is the ratio of collagen to the thickness of the skin. Researchers believe that the higher collagen density accounts for why women appear to age faster than men of the same age. When considering intrinsic (genetically-programmed) aging of the skin, it is suggested that women are about 10-15 years older than men of the same age. Men are most affected by sagging skin combined with puffy eyes and dark circles that make them look tired.

Loss of Collagen
Men and women lose around one percent of their collagen per year after 30. For women, this goes significantly faster in the first five years after menopause then slows down to a loss of two percent per year.

Texture
The male skin texture rougher, and the Stratum Corneum is thicker. There is a difference in the composition of sebum and its production. After puberty, sebum production is greater in males than in females, which is attributed to androgen secretions and accounts for why males have longer lasting acne. The cells in a man's sebaceous glands have more positive receptors for androgens, which explains why they produce more sebum. Men have more active sebaceous glands, and therefore more pores, than women. Both their sebaceous glands and their pores are larger than those of women. Sebum production is double that of women, male skin is oilier and shinier than female skin. As a result, its pH is lower than that of female skin and is prone to impurities and acne.

Hydration
Puberty stimulates the appearance of facial hair in men and sweat secretions. Males have more Lactic Acid in their sweat, which accounts for a lower pH (.05 lower) when compared to female sweat. Men sweat at least twice as much as women and are more prone to sweating, which is stimulated by an increase in body temperature. However, male skin appears to be better hydrated than women's. Perhaps the excess sweating and production of Lactic Acid, a known natural humectant for the skin.

Preferences

Preferences could be conceived as an attitude toward a set of properties of context, memory, and affect – a gage of how much uncertainty one is willing to tolerate. Human preferences are a complicated combination of wishes, desires, needs, and acceptations. To understand this reasoning the next quotes are of interest:

"Sometimes one likes foolish people for their folly, better than wise people for their wisdom."
— Elizabeth Gaskell, Wives and Daughters

“There are some who want to get married and others who don't. I have never had an impulse to go to the altar. I am a difficult person to lead.”
— Greta Garbo, Greta, and Cecil

“To know what you prefer instead of humbly saying Amen to what the world tells you ought to prefer is to have kept your soul alive.”
— Robert Louis Stevenson, An Inland Voyage

“If I follow the inclination of my nature, it is this: beggar-woman and single, far rather than queen and married.”
— Elizabeth I, Collected Works

“I much prefer the sharpest criticism of a single intelligent man to the thoughtless approval of the masses.”
— Johannes Kepler

“To eat in a monastery refectory is an exercise in humility; daily, one is reminded to put communal necessity before individual preference. While consumer culture speaks only to preferences, treating even whims as needs to be granted (and the sooner the better), monastics sense that this pandering to delusions of self-importance weakens the true self, and diminishes our ability to distinguish desires from needs. It's a price they're not willing to pay.”
— Kathleen Norris, The Cloister Walk

“People who like this sort of thing will find this the sort of thing they like.
— Abraham Lincoln

“Perfect is a Preference, Not! a possibility.”
— Devin Murphy

“A referred brand is a preferred brand, and a preferred brand is a referred brand”
— Bernard Kelvin Clive

It is clear that preferences are personal issues and rarely suit the general public. This is the main reason why all people must compromise during their life. In a social gathering, the individual opinion and rarities can be a danger to the group. Group and personal preferences can vary considerably. But to age well one should be willing and in acceptance of the fact that in social situations the personal preferences play the second role.

Explanations of human cooperation and social preferences
Cooperation among unrelated individuals, who do not share direct genetic interests in offspring, is uncommon in nature but ubiquitous in human societies. The capacity to cooperate in large groups with non-relatives has enabled humans to develop markets and trade networks, wage war, build public works and create social institutions. Human cooperation is regulated by social norms that establish standards for how people should behave in particular situations, and strengthened by punitive sanctions against those that violate social norms. Cooperation is also supported by prosocial emotions, such as compassion and guilt, and altruistic social preferences, including a concern for the welfare of others and a preference for equity, which mediate conflicts between self-interest and altruism.

Derived human capacities for group-level cooperation, and the evolution of altruistic social preferences, have been linked to both the emergence of human interdependence and the coevolution of genetic and cultural adaptations. Humans rely on culturally transmitted information to a much greater extent than other animals do, and this is clearly a key to our success as a species.

Food preferences: The ability to perceive flavors begins in utero with the development and early functioning of the gustatory and olfactory systems. Because both amniotic fluid and breast milk contain molecules derived from the mother's diet, learning about flavors in foods begins in the womb and during early infancy. This early experience serves as the foundation for the continuing development of food preferences across the lifespan and is shaped by the interplay of biological, social, and environmental factors. Shortly after birth, young infants show characteristic taste preferences: sweet and umami elicit positive responses; bitter and sour elicit negative responses.

These taste preferences may reflect a biological drive towards foods that are calorie- and protein-dense and an aversion to foods that are poisonous or toxic. Early likes and dislikes are influenced by these innate preferences but are also modifiable. Repeated exposure to novel or disliked foods that occur in a positive, supportive environment may promote the acceptance of and eventually a preference for those foods. Alternatively, children who are pressured to eat certain foods may show a decreased preference for those foods later on. With increasing age, the influence of a number of factors, such as peers and food availability, continue to mold food preferences and eating behaviors.

Each individual's unique preferences and aversions are based on predisposed biological tendencies but are further cultivated and modified through experiential learning. Available data suggest that young children are biologically primed to prefer and consume foods that are sweet, salty, and savory, as well as flavors paired with energy density. Fortunately, preferences are malleable and are shaped in response to a number of social and environmental factors. Preferences are a strong driver of dietary intake in both children and adults

Female mate preferences
Females place a high preference for a mate that is physically attractive. The more physically attractive a man is, the higher the fitness level, and the better the genes supposed to be. Women are attracted to more masculine traits (e.g. strong jawline, a more muscular body. These preferences count for equal age couples. When age differences grow, female preferences change into the economic stability of the male over physical attraction. Female prefer a singular partnership.

Male mate preferences
Males have different preferences than females and are, most of the time, not seeking a singular partnership. Male preferences are;

- Body shape and size

Waist Hip Ratio (WHR), that is the relationship between waist circumference and hip circumference, as it has been suggested as a marker of age, reproductive status, and health. It was found that women with a WHR of 0.7 were rated the most attractive, youthful, fertile and healthy when compared to other WHR's. Women with large breasts and small hips are rated as more attractive than women with small breasts and small hips.

- Skin condition

Skin condition has been found to be an honest indicator of sex hormones which may indicate levels of fertility. Skin tone has also been found to be an indicator of youthfulness as well as research showing the first links between estradiol and female facial redness, in which as a woman reaches the peak of her ovulatory cycle her facial redness increases.

- Neoteny

Males show a preference for neotenous or youthful looking features in women, such as; big eyes, a small nose, and full lips. These features act as a signal of fertility as they are caused by high estrogen and low testosterone.

Item Preferences

Item preferences play an important role in maintaining the happiness of individuals, especially in materialistic cultures. Providing individuals with the items they crave can be an easy route to enhancing their happiness.

8 Changes in adult life

The adult life can be separated into 3 different groups:

- Age 25 – 35 is the early adulthood
- Age 35 – 65 is currently called the middle adulthood
- Age over 65 is the late adulthood

These groups refer to a physical and mental development of the individual. Aging is a multi-level event affecting every part of the body and soul. Every physiological effect has an emotional connection and the other way around. This unbreakable chain or reaction is the life DNA of the individual.

Tasks	Physical	Mental/Emotional	Family/Love	Career/Finances
Stability	Aging signs appear	The stress of having more people depend on you	Settle down	Continue to develop Career
Self-realization	Hair coloring	Worried about family/children	Grow a family	'Climb the corporate ladder'
Increase self-esteem	Hair may disappear	Focus from “me” to “we”	Some will experience divorce	Pay down/off student loans
Balance in “have’s” and wants	Weight gain	Stable family	Establish own family traditions	Begin to invest in retirement
Increase income and savings	Child wish or not	Reach security	Develop “we” feeling	Responsible for a mortgage

The early adulthood is an era where the body is strong and shows minimal signs of aging. They are young enough to enjoy physical activities without worrying about pain remedies that coincide when the body ages. Often the majority of hands-on parenting happens when adults are in their thirties. The thirties are also a time when most adults become established in their chosen careers and climb the corporate ladder.

With careers and families, the thirties can be a decade with more stability and routine. For some adults in their thirties, the increase of structure can be stifling. Most adults appreciate the increase of security the thirties has to offer.

Some adults embrace their thirties as a reprieve from the twenties. Other adults in their thirties find this decade just as challenging or more challenging due to the extra pressures of being an established adult. The extra pressures come from being married with children- or the pressure of finding a lifelong mate if that has not happened. In spite of the added responsibilities of marriage, family, and career the thirties can be a time when adults come into their own “world” and rhythm.

Most 30 + year olds, who are parents, are in the intense years of raising a family. It is necessary for all parents to look after their own physical, emotional and mental well-being while in the middle of raising a family. Lots of 30+-year-olds who are also parents have less free time and less social space than they had in their twenties. When being a 30+ single parent time is more compromised raising a family, for them a

most difficult period in life starts. Finding other 30+-year-old friends and family is a source of support and understanding. Most 30+ year old find new friends through their children's activities.

Theories of aging have been around since the dawn of men. Some are worth mentioning.

Theory of Jung
Carl Jung, a Swiss psychiatrist, and psychotherapist who founded analytical psychology
Youth: (puberty until 35 – 40) Maturing sexuality, growing consciousness, and a realization that the carefree days of childhood are gone forever. People strive to gain independence, find a mate, and raise a family.
Middle Life: (40-60) The realization that a person does live forever creates tension. If the individual desperately tries to cling to youth, the person fails in the process of self-realization. Jung believed that in midlife, one confronts one's shadow. Religiosity may increase during this period, according to Jung.
Old Age: (60 and over) Consciousness is reduced. Jung thought that death is the ultimate goal of life. By realizing this, people will not face death with fear, but with a hope for rebirth.

Daniel Levinson's theory
Daniel Levinson, Psychologist and one of the founders of the field of Positive Adult Development

This theory is a set of psychosocial 'seasons' through which adults must pass as they move through early adulthood and midlife. Each of these seasons is created by the challenges of building or maintaining a life structure, by the social norms that apply to particular age groups, particularly in relation to relationships and career. The process that underlies all these stages is individuation - a movement towards balance and wholeness over time. The key stages that he discerned in early adulthood and midlife were as follows:

Early Adult Transition (Ages 16–24)
Forming a Life Structure (Ages 24–28)
Settling down (Ages 29–34)
Becoming One's Own Man (Ages 35–40)
Midlife Transition (the Early forties)
Restabilization, into Late Adulthood (Age 45 and on)

The 'biopsychosocial' approach to adult development states that in order to understand human development in its fullness, biological, psychological and social levels of analysis must be included. There are a variety of biopsychosocial meta-models, but all entail a commitment to the following four premises:

- Human development happens at the same time as biological, psychological and social levels throughout life, and a full descriptive account of development must include all three levels.
- Development at each of these three levels reciprocally influences the other two levels; therefore nature (biology) and nurture (social environment) are in constant complex interaction when considering how and why psychological development occurs.
- Biological, psychological and social descriptions and explanations are all as valid as each other, and no level has causal primacy over the other two.
- Any aspect of human development is best described and explained in relation to the whole person and their social context, as well as to their biological and cognitive-affective parts.

This must be called a holistic or contextualist viewpoint and can be contrasted with the reductionist approach to development, which tends to focus solely on biological or mechanistic explanations. But it is impossible to see one without the other.

Physical changes in adulthood
Physical development in midlife and beyond include changes at the biological level (senescence), larger organ and musculoskeletal levels. Sensory changes and degeneration begin to be common in midlife. Degeneration can include the break down of muscle, bones, and joints, leading to physical ailments such as sarcopenia or arthritis.

Adult neurogenesis and neuroplasticity
New neurons are constantly formed from stem cells in parts of the adult brain throughout adulthood, a process called adult neurogenesis. The hippocampus is the area of the brain that is most active in neurogenesis. Research shows that thousands of new neurons are produced in the hippocampus every day. The brain constantly changes and rewires itself throughout adulthood, a process known as neuroplasticity. Evidence suggests that the brain changes in response to diet, exercise, social environment, stress and toxin intake. These same external factors also influence genetic expression throughout adult life - a phenomenon known as genetic plasticity. This fact is only recently accepted and took science over 20 years to do so. Before this, the gene was considered a fixed fact and impossible to be changed. People were born and died with unchanged genetic code. Something impossible to believe and hold on to but was done for decennia.

Cognitive changes in adulthood
Dementia is characterized by persistent, multiple cognitive deficits in the domains including, but not limited to, memory, language, and visuospatial skills and can result from central nervous system dysfunction. Two forms of dementia exist: degenerative and nondegenerative. The progression of nondegenerative dementias, like head trauma and brain infections, can be slowed or halted but degenerative forms of dementia, like Parkinson's disease, Alzheimer's disease, and Huntington's are irreversible and incurable.

Optimizing health and mental well-being in adulthood
Exercising four to six times a week for thirty to sixty minutes has physical and cognitive effects such as lowering blood sugar and increasing neural plasticity (NEUREX). Physical activity reduces the loss of function by 10% each decade after the age of 60 and active individuals drop their rate of decline in half. Cardio activities like walking promote endurance while strength, flexibility, and balance can all be improved through Tai Chi, yoga, and water aerobics.

Diets containing foods with fiber, greens, and other specified personalized products are important for good health while minimizing foods with high sodium or animal fat content. A well-balanced diet can increase resistance to disease and improve management of chronic health problems thus making nutrition an important factor for health and well-being in adulthood.

Mental stimulation and optimism are vital to health and well-being. Adults who participate in intellectually stimulating activities every day are more likely to maintain their cognitive faculties and are less likely to show a decline in memory abilities. Mental exercise activities such as crossword puzzles, spatial reasoning tasks, and other mentally stimulating activities can help adults increase their brain

fitness. This was already proven by former generations of elderly who seemed to have had less suffering from the different diseases. Additionally, researchers have found that optimism, community engagement, physical activity and emotional support can help older adults maintain their resiliency as they continue through their lifespan. Both grandmothers of Arnaud van der Veere did reach the age of 94 and were happy, humoristic, life enjoying ladies who were always open for the help to others. Two complete different lifestyles (countryside and city, healthy air and heavy smoker) but on the character aspects equal human beings. Both parents did reach the age of 84 with the same mentality.

Cognitive, physical, and social losses, as well as gains, are to be expected throughout the lifespan. Older adults typically self-reporting having a higher sense of well-being than their younger counterparts because of their emotional self-regulation. Researchers use Selective Optimization with Compensation Theory (SOC model, successful aging encompasses the selection of functional domains on which to focus one's resources, optimizing developmental potential (maximization of gains) and compensating for losses—thus ensuring the maintenance of functioning and a minimization of losses. to explain how adults compensate for changes to their mental and physical abilities, as well as their social realities. Older adults can use both internal and external resources to help cope with these changes.

Socioemotional Development in Late Adulthood (model)

Erikson's Final Stage

Integrity versus despair -- reflecting on the past and either piecing together a positive view (integrity) or concluding that one's life has not been well spent (despair)

Life review -- looking back at one's life experiences, evaluating them, interpreting and reinterpreting their significance

Activity Theory

Activity theory -- the more active and involved that older adults are, the more likely they are to be satisfied with their lives

Successful aging is associated with being active, energetic, and productive

Good experience with aging relates to continuing early adult roles or finding substitutes that keep them active and involved

Socioemotional Selectivity Theory

Socioemotional selectivity theory -- older adults become more selective about their social networks

Spend more time with familiar individuals with whom they have rewarding relationships

Challenges the stereotype that older adults are in emotional despair and isolation

Selective Optimization with Compensation Theory

Selective optimization with compensation theory -- successful aging is linked with three main factors: selection, optimization, and compensation

selection -- older adults have a reduced capacity and loss of functioning

optimization -- it is possible to maintain performance in some areas through practice and use of new technologies

compensation -- becomes relevant when life tasks require a level of capacity beyond the current circumstances

Effective when people pursue successful outcomes

Personality / Big Five Factors

Stereotyping of Older Adults

Ageism -- prejudice against others because of their age

Increased numbers living longer and healthier serve to debunk the stereotypes

Policy Issues -- health care costs, caring for patients with chronic disease, eldercare

Eldercare

Eldercare -- physical and emotional caretaking of older members of the family

Traditionally done by middle-aged women in the family

With so many women in the workforce, concern arises regarding who will be the caregivers

Technology

Lifestyle Diversity

Lifestyles of older adults are changing

Married older adults are happier and live longer than those who are single

There are social, financial, and physical consequences of divorce for older adults

Divorce weakens kinship ties

Negative social sanctions for elders who remarry

Cohabitation

Increasing numbers of older people

Goals are primarily for companionship

Not marrying allows for retention of personal assets

Older Adult Parents and Their Adult Children

Adult children are an important part of the social network

Gender plays an important role -- adult daughters are more likely to be involved than adult sons

Adult children coordinate and monitor services

Friendship

People choose close friends over new friends as they grow older

Friends are associated with contentment

Friends may be more important than family in predicting mental health

Social Convoy Model

Social convoy model -- individuals go through life embedded in a social network of individuals from whom they give and receive social support

Social support enhances coping skills

Being lonely and socially isolated is a significant health risk

Altruism and Volunteerism

Older adults "give" more frequently than they "take"

Volunteering as an older adult is associated with a number of positive outcomes

higher satisfaction

less depression and anxiety

Ethnicity

Minority elderly are over-represented among the poor

Double jeopardy -- they face both ageism and racism

History of less education, underemployment, poor housing conditions, shorter life expectancy than Whites

Strong coping mechanisms (e.g., church membership, family support for elders)

Gender

Double jeopardy for older women who face ageism and sexism

Poverty increased for elderly females

Minority females face triple jeopardy -- ageism, sexism, and racism

Culture

These factors predict the status of older adults in a culture

Have valuable knowledge

Control key family/community resources

Permitted to engage in useful functions

Role changes involve more responsibility and authority

Participation in extended family

Respect for older adults may be greater in collectivist cultures

Successful Aging

Even with the disease, improvements in medicine mean older adults can still lead active constructive lives. Being active is especially important

The loss of loved ones and ensuing grief and bereavement are inevitable parts of life. Positive coping strategies are used when faced with emotional crises, as well as when coping with everyday mental and physical losses. The adult development comes with both gains and losses, and it is important to be aware and plan ahead for these changes in order to age successfully.

Personality in adulthood

Personality change and stability occur in adulthood. For example, self-confidence, warmth, self-control, and emotional stability increase with age, whereas neuroticism and openness to experience tend to decline with age. Growing older has a direct influence on personal preferences. Samples which are influenced by aging:

- Interest in transportation. Cars go from fancy to practical for most people.
- Taste in art.
- Holiday destinations
- Activities (sports, clubs, entertainment and otherwise)
- Style of clothing and dressing
- Behavior
- Mood
- Character
- Interpersonal relationships, from picky to happy to be around

Two types of statistics are used to classify personality change over the lifespan.

- Rank-order change refers to a change in an individual's personality trait relative to other individuals.
- Mean-level change refers to an absolute change in the individual's level of a certain trait over time.

Intelligence in adulthood

According to the lifespan approach, intelligence is a multidimensional and multidirectional construct characterized by plasticity and individual variability. Intellectual development throughout the lifespan is characterized by a decline (increasing failure rate) as well as stability and improvement. Mechanics of intelligence, the basic architecture of information processing, decreases with age. Pragmatic intelligence, knowledge acquired through culture and experience, remains relatively stable with age. In this reference, we speak of the crystalized = fixed long-term intelligence and liquid intelligence which is based on idea development and creativity.

Developmental trends in intelligence

Primary mental abilities are independent groups of factors that contribute to intelligent behavior and include word fluency, verbal comprehension, spatial visualization, number facility, associative memory,

reasoning, and perceptual speed. Primary mental abilities decline around the age of 60 and may interfere with life functioning. Secondary mental abilities include crystallized intelligence (knowledge acquired through experience) and fluid intelligence (abilities of flexible and abstract thinking). Fluid intelligence declines steadily in adulthood while crystallized intelligence increases and remains fairly stable with age until very late in life.

Relationships
A combination of friendships and family are the support system for many individuals and an integral part of their lives from young adulthood to old age.

Family
Ties to family become increasingly important in old age. Family relationships tend to be some of the most enduring bonds created within a person's lifetime. As adults age, their children often develop a sense of filial obligation, in which they feel obligated to care for their parents. This is particularly prominent in Asian cultures. Marital satisfaction remains high in older couples, often increasing shortly after retirement. This can be attributed to increased maturity and reduced conflict within the relationship. However, when health problems arise, the relationship can become strained. Most people will experience the loss of a family member by death within their lifetime. This life event is usually accompanied by some form of bereavement, or grief.

Friends
Friendships are often the support system for many individuals and a fundamental aspect of life from young adulthood to old age. Social friendships are important to emotional fulfillment, behavioral adjustment, and cognitive function. Research has shown that emotional closeness in relationships greatly increases with age even though the number of social relationships and the development of new relationships decline.

In young adulthood, friendships are grounded in similar aged peers and goals. In older adulthood, friendships have been found to be much deeper and longer lasting but also harder to evolve or even to establish. While small in number, the quality of relationships is generally thought to be much stronger for older adults. On the other side when friends fall out due to disease or passing over the elderly becomes less connected and more prone to loneliness. Socializing factors are needed in this group.

Retirement
Retirement, or the point in which a person stops employment entirely, is often a time of psychological distress or a time of high quality and enhanced subjective well-being for individuals. Most individuals choose to retire between the ages of 50 to 70. Depending on the profession there may be some dangers to a complete withdraw from work activities.

Currently, most 40+ are deeply involved and highly active in work-related activities and have nearly or no hobbies. When retiring they lose their goals and daily engagements which create a "black hole" effect. Disengage of all daily activities develops a high-stress level as suddenly an individual goes from 12+ hours a day of work to nothing to do. This decrease of activity increases cortisol and adrenaline levels makes a person irritable and moody. More than often people suffer from heart failure or likewise health troubles and if not taken seriously the person dies soon after. In most cases within 2 – 3 years after retirement.

Responses to Loss or Change

There are different ways of coping with loss and change. If there is a personal adjustment to different situations during the first 50 years, it is very likely to cope with what is coming during the next 50 years. On the other hand, if the person did resist change throughout life, this will continue and experience negative effects that may include the following:

· Physical complaints: There`s a clear relationship between mental and physical well-being. Those who have undergone losses are more likely to experience both minor and major illnesses. The mind rules the body.

· Denial: Some people cope by refusing to acknowledge that change has occurred. They may have an "ignore it and it will go away" philosophy. Another way is to create an illusion live as an escape of reality. Some researchers predict this as a forestage of Alzheimer

· Guilt: People may feel that they could have prevented a loss by acting in a different way. These people end up in a never-ending cycle of action and reaction thinking. The same events over and over.

· Loneliness: Isolating oneself may be a way of mourning the loss of familiar people and a former lifestyle. But it also could show an ability on a social scale which formerly was strongly depended on the former partner(s).

· Sense of helplessness: People may feel that they are at the mercy of their health problems, living arrangement, income limitations, or negative events. This often is followed by depressive thoughts.

· Overly critical, suspicious behavior: Some people become overly critical, suspicious, and/or paranoid. They do not trust easily and may feel that they are being taken advantage of.

· Rigidity/stubbornness: Those who feel out of control may try to regain control by taking on an attitude of "my way or no way." This behavior is often seen in people with higher positions.

· Selective memory: Some people may cope by remembering either the best or the worst about events and people in their life. They may distort the reality of how the events happened or who the people were. They hold on to a fantasy instead of a reality.

· Regression: Going back to old behaviors or ways of coping may be ways to deal with painful events. Collecting items is often a step seen as part of this behavior.

· Reminiscence: Dwelling on how things used to be and how they have changed. Wishing for things to be as they were when they were younger. This leads to dis-attachment to reality. "Everything was better back in these days"

· Rage: When people feel that they have little control over the present or have regrets about the past, they may react in anger. They may lash out at family members-sometimes being most critical of those who are most supportive since they know that these people will still love them in spite of their anger.

· Depression and anxiety: Although not something that most people want to discuss these is very real reactions to loss and uncertainty for anyone at any age. It is important to help someone know that these feelings are normal and to get help if the feelings interfere with daily living beyond a few days of feeling

sad. People living in a bad personal environment or one not chosen by oneself has a higher tendency to fall victim to this.

· Grief. Grief is a normal reaction to the loss of people, former lifestyles, relationships, health, vision, hearing, ability level, mobility, or independence. But grief is also a trap which can lead to many more or less serious disorders in a person. In some cases, it leads to suicide to join the diseased person.

Grief and Grief Stages
Different people experience grief and loss in different ways. Groundbreaking research on death and dying by Elizabeth Kubler Ross identified stages of grief that are now recognized as normal for any type of loss or change. The grieving process does not take place in steps but in cycles. People move in and out of the following stages at their own pace.

· Shock. In this stage of grief, the individual describes a sense of numbness and not being oneself. They do not believe that there is an actual loss, it is not realized and often denied.

· Denial. In this stage, a person is unwilling or unable to accept the loss. The person does not want to talk about the loss and often does not realize that the loss has occurred.

· Emotional release. During the stage of emotional relief, someone may cry, become enraged, or be overly critical or sarcastic. In this stage, a person`s usual behavior and emotions may be magnified.

· Depression, loneliness, and sense of isolation. In this stage, the individual may withdraw, sleep more than usual, overeat or not eat enough.

· Physical symptoms. A person may experience headaches, stomach ailments, 'heartburn` sensation, fatigue, or a general sense of not feeling well.

· Panic. In this stage, a person may feel fear and a lack of control over her situation and environment.

· Guilt related to the loss. The person considers itself the cause of the change or loss. A person may also experience 'survivor guilt` because of being spared from death or illness and is less "deserving" than a loved one who has died or gotten sick.

· Hostility. Part of the emotional reaction may be hostile behavior, starting arguments, verbal attacks, and "acting out."

· Inability to resume usual activities. A normal stage of grief is a difficulty in "moving on" after the loss.

· Glimpse of hope. Gradually, those who`ve experienced losses begin to have better days and assume more normal activities.

· Acceptance. In this stage, the person is able to accept that the loss has occurred or the change has happened and that things will not be the same. The person begins to live the new life after the change although the memory of the old life or the person who is gone remains. Problems happen when a person is 'stuck` and is unable to work through the grief or denies that there are problems.

Nearly every person will go through some or all stages as mentioned above at least once in life. This is a part of “growing up” as personality and the aging process. The value of the experience is an enrichment of character to most but a disaster to some. Like a “computer” can crash it is possible the hard drive is damaged forever or can be recovered/replaced. When things take the normal course in life – as most of the time – there is a continuation and progress of the age. But sometimes it is going the wrong way.

Possible Causes of Difficult Behaviors and How to Cope.
Individuals respond to changes and losses in different ways as mentioned before. The following are some of the responses of the elderly to be aware of and only by observation, communication and persuasion changes can be made. For non-medical professionals, it is often hard to argue with licensed / registered medical persons. In these cases, fact gathering and confrontation is the best way to convince. A less friendly but often effective way is to put all responsibilities on the shoulders of the medical responsible person and make clear that all events are recorded and registered for later use. This methods does not make friends but is sometimes the only effective way to persuade.

Look for the cause of the behavior, including major changes and losses:

Pain, undiagnosed physical illness such as constipation, urinary tract infections, dehydration, etc
Watch for signs of pain or illness and seek medical care. The problem patient and caretakers will face is a disbelieve and often not appropriate care by employees in the healthcare services due to misunderstanding.

Medication side effects. Most medical products are described for too long periods. The body adjusts to all medication as it does to supplementation and food. Using the same drugs is often counter-effective. Doses need to be adjusted or completely stopped. Change of medication can avoid side effects in the long term. It is important for each individual to register every change in health, the emotion or mental state during the use of specific medication.

Lack of proper nutrition – Taste changes. Things that used to taste nice lost attraction. Older people limit themselves more and more. There are several reasons for this. The difficulty in this is that some people get a lack of proper nutrients due to behavior and personal limitations. Additional foods, smaller meals or increase of liquid meals with additional supplementation are suggested alternatives.

Uncomfortable environment – Is it too cold, hot, bright, loud, etc.? Sense and sensitivity are changing. Light can be or too bright or to less. Heat and warm come closer and temperature becomes an uncertainty, especially when women enter menopause or in general when there is significant weight loss. The sound is another problem. The sense of sound is changing and often different tone levels do not reach the sensitive parts in the ear anymore. Hearing loss is a general problem. When the senses deteriorate most people start to doubt the sense of life.

Fatigue. Loss of energy is often a combination of factors. Nutrition, personal loss, lack of goals and purpose of life. There are many reasons for draining energy levels. It is important to find which reasons.

Lack of activity. Much elderly loss the sense of activity. This is a vital problem as the activity is moving and this keeps the “motor” running. A minimum of 30 – 60 minutes per day of minimum activity is needed for effective health control.

Feelings of powerlessness and loss of control. The technical developments are in a race through time and space. Many elderly are losing sight of these developments. Often they get confronted with innovations or novelties they do not understand or control.

Confusion or memory Loss. Maintain a calm environment and reassure the person.
Use memory aids. Be consistent. Keep household furnishings and objects in the same place
Do things the same way at the same time each day. When changes must be made,
prepare and support the elder and do everything step by step in a guided controlled way.

9 Physical shape and condition

The body changes in every phase of life. It reacts to activity, nutrition, environment, emotions and so many more actions. The body is an effective action/reaction mechanism, it is a fast response unit capable of adjusting to nearly every situation. The human mind is made for adaption on the highest possible level.

But there is partly lose control by most individuals after 50. The body of the city-dweller increases in fat% even with a proper lifestyle. Nutrition and environment are important and intrusive factors. Here is an oversight of the different organs and glands with their change during an increase of age.

Organ or System	Physiologic Change
Body composition	↓ Lean body mass ↓ Muscle mass ↓ Creatinine production ↓ Skeletal mass ↓ Total body liquid
General cells	↑ DNA damage and ↓DNA repair capacity ↓ Oxidative capacity Accelerated cell senescence ↑ Fibrosis Lipofuscin accumulation
Central Nervous System	↓ Number of dopamine receptors ↑ Alpha-adrenergic responses ↑ Muscarinic parasympathetic responses
Ears	Loss of high-frequency hearing ↑Hair growth
Endocrine system	↑ Insulin resistance and glucose intolerance Menopause, ↓ estrogen, and progesterone secretion ↓ Testosterone secretion ↓ Growth hormone secretion ↑ Bone mineral loss ↑ Secretion of ADH (arginine vasopressin/antidiuretic hormone) in response to osmolar stimuli
Eyes	↓ Lens flexibility ↑ Time for pupillary reflexes (constriction, dilation) ↑ Incidence of cataracts
Digestive tract	↓ Splanchnic blood flow ↑ Transit time
Heart	↓ Intrinsic heart rate and maximal heart rate

Organ or System	Physiologic Change
	Blunted baroreflex (less increase in heart rate in response to a decrease in BP) ↓ Diastolic relaxation ↑ Atrioventricular conduction time ↑ Atrial and ventricular ectopy
Immune system	↓ T-cell function ↓ B-cell function
Joints	Degeneration of cartilaginous tissues Fibrosis ↑ Glycosylation and cross-linking of collagen Loss of tissue elasticity
Kidneys	↓ Renal blood flow ↓ Renal mass ↓ Glomerular filtration ↓ Renal tubular secretion and reabsorption ↓ Ability to excrete a free-water load
Liver	↓ Hepatic mass ↓ Hepatic blood flow ↓ Activity of CYP 450 enzyme system
Nose	↓ Smell ↑Hair growth ↑Saliva increase
Peripheral nervous system	↓ Baroreflex responses ↓Beta-adrenergic responsiveness and number of receptors ↓ Signal transduction ↓ Muscarinic parasympathetic responses Preserved alpha-adrenergic responses
Pulmonary system / Respiratory system	↓ Vital capacity ↓ Lung elasticity (compliance) ↑ Residual volume ↓FEV_1 ↑ V/Q mismatch
Vasculature	↓ Endothelin-dependent vasodilation ↑ Peripheral resistance

↓=decreased; ↑= increased;

Adapted from the Institute of Medicine: Pharmacokinetics and Drug Interactions in the Elderly Workshop. Washington DC, National Academy Press, 1997, pp. 8–9.

Aging cells

As cells age, they function less well. Eventually, old cells die as a normal part of the body's functioning. Old cells sometimes die because they are programmed to do so. The genes of cells program a process that, when triggered, results in the death of the cell. This programmed death, called apoptosis, is a kind of cell suicide. The aging of a cell is one trigger. Old cells must die to make room for new cells. Other triggers include an excess number of cells and possibly irreparable damage to a cell.

Old cells also die because they can divide only a limited number of times (remember Hayflick limit). This limit is programmed by genes. When a cell can no longer divide, it grows larger, exists for a while, then dies. The mechanism that limits cell division involves a structure called a telomere. Telomeres are used to move the cell's genetic material in preparation for cell division. Every time a cell divides, the telomeres shorten a bit. Eventually, the telomeres become so short that the cell can no longer divide.

An interesting point of knowledge
Disorders and disease, not aging, are usually responsible for the most loss of function.

Aging organs
How organs function depends on how the cells within them function. Older cells functionless. In some organs, cells die but are not replaced, and the number of cells decreases. The number of cells in the testes, ovaries, liver, and kidneys decreases significantly as the body ages. When the number of cells becomes too low, an organ cannot function normally. Not all organs lose a large number of cells. The brain is an example. Healthy older people do not lose many brain cells. Substantial losses occur mainly in people who have had a stroke or who have a disorder that causes the progressive loss of nerve cells (neurodegenerative disorders), such as Alzheimer disease or Parkinson disease.

A decline in one organ's function, whether due to a disorder or to aging itself, can affect the function of another. For example, if atherosclerosis narrows blood vessels to the kidneys, the kidneys function less because blood flow to them is decreased. This is considered the domino effect.

The eyes, followed by the ears, begin to change early in mid-life. Nearsighted and limitation in hearing are a slow but steady change of which nearly everybody is confronted. These signs are often only discovered in routine controls. But this has an interesting side effect. Nearsightedness or myopia is a refractive defect of the eye lens through which the image is formed in front of the retina, not on it. This defect can have people seeing closer objects clearly while distant ones are blurred. Farsighted is simply the opposite. When aging the retina is stiffening and the light enters it in a different way. Nearsighted people slowly get a better sight and glasses gradually lose strength. On the other side, may need reading glasses which takes away the advantage made.

Most internal functions decline with aging. However, even with this decline, most functions remain adequate because most organs start with considerably more functional capacity than the body needs (functional reserve). For example, if half the liver is destroyed, the remaining tissue is more than enough to maintain normal function.

Even though most functions remain adequate, the decline in function means that older people are less able to handle various stresses, including strenuous physical activity, extreme temperature changes in the environment, and disorders. This decline also means that older people experience side effects from drugs. Some organs malfunction under stress while others continue to function at the same level. These organs include the heart and blood vessels, the urinary organs (such as the kidneys), and the brain.

Bones and Joints

Bones become less dense. Loss of bone density is osteoporosis. With osteoporosis, bones become weaker and more likely to break. In women, loss of bone density speeds up after menopause because less estrogen is produced. Estrogen helps prevent too much bone from being broken down during the body's normal process of forming, breaking down, and re-forming bone.

Bones become less dense partly because the calcium/magnesium balance is changing (which gives bones strength). The amount of calcium/magnesium decreases because the body absorbs less calcium from foods. Levels of vitamin D, which helps the body use calcium, decrease slightly. Certain bones are weakened more than others. Those most affected include the end of the thighbone (femur) at the hip, the ends of the arm bones (radius and ulna) at the wrist, and the bones of the spine (vertebrae).

Changes in vertebrae at the top of the spine cause the head to tip forward, compressing the throat. As a result, swallowing is more difficult, and choking is more likely. The vertebrae become less dense and the cushions of tissue (intervertebral fibrocartilage or also called disks) between them lose fluid and become thinner, making the spine shorter. Older people become shorter. The main reason for this is mentioned before. Gravity and air pressure are constant powers working on the body and give no time to relax the joints neither the vertebrate.

Ligaments, which bind joints together, and tendons, which bind muscle to bone, become less elastic, making joints feel tight or stiff. These tissues also weaken. Ligaments tear more easily, and when they tear, they heal slowly. These changes occur because the cells that maintain ligaments and tendons become less active.

The research did prove that power training, such as weight training or better-called resistance training, focused on bone density can stop and even rewind this process dramatically. Special resistance exercises applied in the right angles and time promote a fast bone recovery and renewed bone marrow increase. Bone marrow is a highly underestimated part of our physic which has an important influence on the aging process. People with a weak marrow have less blood, are weaker also in muscular capacities, have bridle bones and in general are less healthy and weaker. But it is also less know what it is and does.

Bone marrow is the soft, flexible connective tissue within bone cavities. A component of the lymphatic system, bone marrow functions primarily to produce blood cells and to store fat. Bone marrow is highly vascular, meaning that it is richly supplied with a large number of blood vessels. There are two categories of bone marrow tissue: red marrow and yellow marrow. From birth to early adolescence, the majority of our bone marrow is red marrow. As we grow and mature, increasing amounts of red marrow are replaced by yellow marrow. On average, bone marrow can generate hundreds of billions of new blood cells every day.

Bone Marrow Structure

Bone marrow is separated into a vascular section and non-vascular sections. The vascular section contains blood vessels that supply the bone with nutrients and transport blood stem cells and mature blood cells away from the bone and into circulation. The non-vascular sections of the bone marrow are where hematopoiesis or blood cell formation occurs. This area contains immature blood cells, fat cells, white blood cells (macrophages and plasma cells), and thin, branching fibers of reticular connective

tissue. While all blood cells are derived from bone marrow, some white blood cells mature in other organs such as the spleen, lymph nodes, and thymus gland. Most hematopoietic stem cells are found in the bone marrow which gives it a need to keep in good condition while working on a healthy aging process.

Bone Marrow Function

The major function of bone marrow is to generate blood cells. Bone marrow contains two main types of stem cells. Hematopoietic stem cells, found in red marrow, are responsible for the production of blood cells. Bone marrow mesenchymal stem cells (multipotent stromal cells) produce the non-blood cell components of marrow, including fat, cartilage, fibrous connective tissue (found in tendons and ligaments), stromal cells that support blood formation, and bone cells.

- Red Marrow

In adults, red marrow is confined mostly to skeletal system bones of the skull, pelvis, spine, ribs, sternum, shoulder blades, and near the point of attachment of the long bones of the arms and legs. Not only does red marrow produce blood cells, but it also helps to remove old cells from circulation. Other organs, such as the spleen and liver, also filter aged and damaged blood cells from the blood. Red marrow contains hematopoietic stem cells that produce two other types of stem cells: myeloid stem cells and lymphoid stem cells. These cells develop into red blood cells, white blood cells, or platelets.

- Yellow Marrow

Yellow marrow consists primarily of fat cells. It has poor vascular supply and is composed of hematopoietic tissue that has become inactive. Yellow marrow is found in spongy bones and in the shaft of long bones. When blood supply is extremely low, yellow marrow can be converted to red marrow in order to produce more blood cells

Red bone marrow contains hematopoietic stem cells that produce two other types of stem cells: myeloid stem cells and lymphoid stem cells. These cells develop into red blood cells, white blood cells, or platelets.

Myeloid Stem Cells - develop into red blood cells, platelets, mast cells, or myeloblast cells. Myeloblast cells develop into granulocyte and monocyte white blood cells.

- Red Blood Cells - also called erythrocytes, these cells transport oxygen to body cells and deliver carbon dioxide to the lungs.

- Platelets - also called thrombocytes, these cells develop from megakaryocytes (huge cells) that break into fragments to form platelets. They aid in the blood clotting process and tissue healing.

- Myeloblast Granulocytes (white blood cells) - develop from myeloblast cells and include neutrophils, eosinophils, and basophils. These immune cells defend the body against foreign invaders (bacteria, viruses, and other pathogens) and become active during allergic reactions.

- Monocytes - these large white blood cells migrate from blood to tissues and develop into macrophages and dendritic cells. Macrophages remove foreign substances, dead or damaged cells, and cancer cells from the body by phagocytosis. Dendritic cells aid in the development of antigen immunity by presenting antigenic information to lymphocytes. They initiate primary immune responses and are commonly found in the skin, respiratory tract, and gastrointestinal tract.

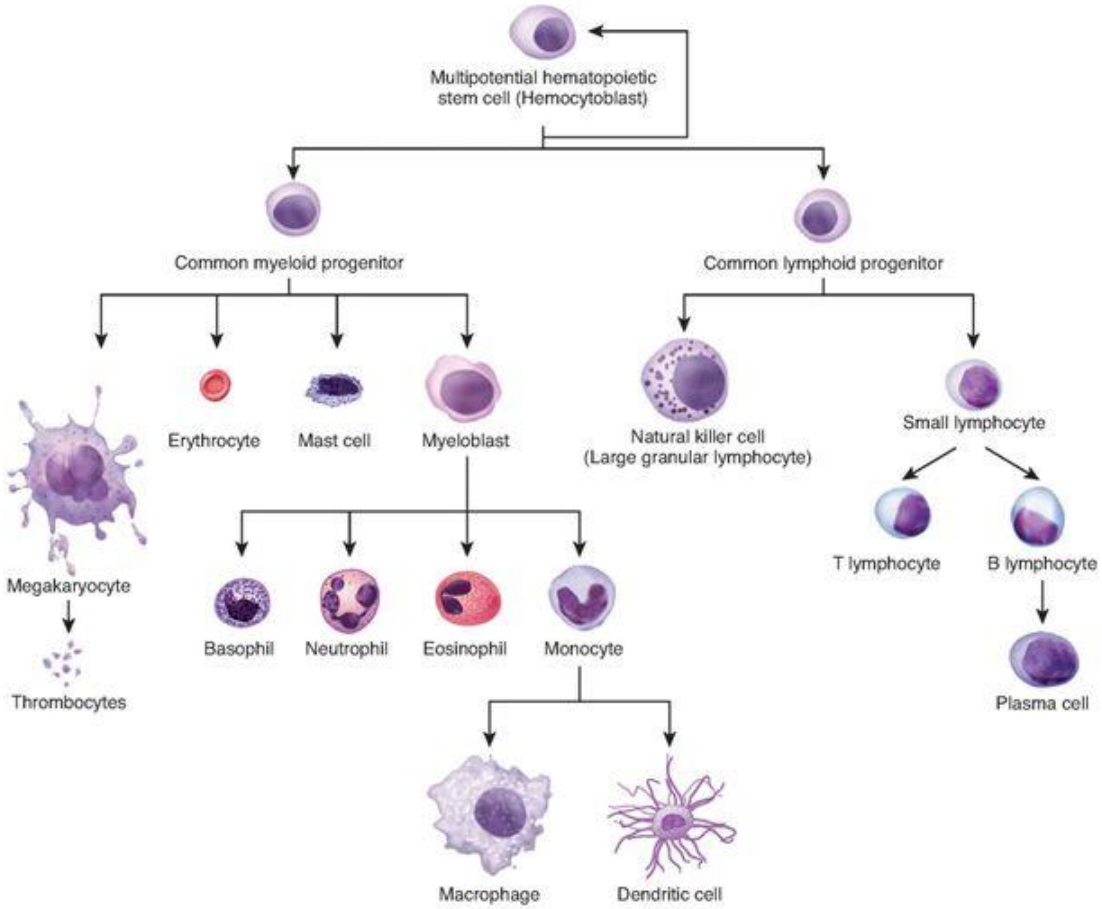
- Mast Cells - these white blood cell granulocytes develop independently from myeloblast cells. They are found throughout body tissues, particularly in the skin and lining of the digestive system. Mast cells mediate immune responses by releasing chemicals, such as histamine, stored in granules. They aid in wound healing, blood vessel generation, and are associated with allergic diseases (asthma, eczema, hay fever, etc.)

Lymphoid Stem Cells - develop into lymphoblast cells, which produce other types of white blood cells called lymphocytes. Lymphocytes include natural killer cells, B lymphocytes, and T lymphocytes.

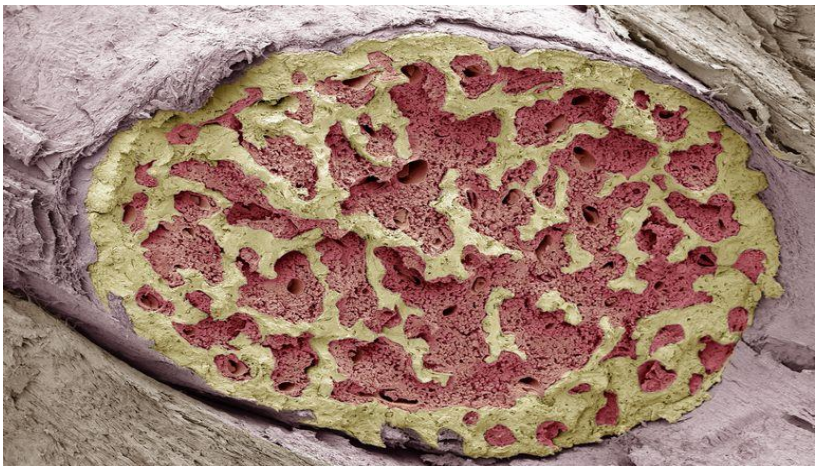
- Natural Killer Cells - these cytotoxic cells contain enzymes that cause apoptosis (cellular self-destruction) in infected and diseased cells. They are components in the body's innate immune response protecting against pathogens and tumor development.

- B Cell Lymphocytes - these cells are important for adaptive immunity and long lasting protection against pathogens. They recognize molecular signals from pathogens and produce antibodies against specific antigens.

- T Cell Lymphocytes - these cells are active in cell-mediated immunity. They help to identify and destroy damaged, cancerous, and infected cells.



This image shows the formation, development, and differentiation of blood cells. OpenStax, Anatomy & Physiology/Wikimedia Commons/CC-BY 4.0



Muscles and Body Fat

The amount of muscle tissue (muscle mass) and muscle strength starts to decrease beginning around age 30 and continuing throughout life. Some of the decreases are caused by decreasing levels of growth hormone and testosterone, which stimulate muscle development. Muscles cannot contract as quickly because more fast-contracting (fast-twitch) muscle fibers are lost than slow-contracting (slow-twitch) muscle fibers. Aging's effects reduce muscle mass and strength by around 10 to 15% during an adult's lifetime. More severe muscle loss (called sarcopenia, which literally means loss of flesh) results from disease or extreme inactivity, not from aging alone.

Most older people retain enough muscle mass and strength for all necessary tasks. Many older people remain strong athletes. They compete in sports and enjoy the vigorous physical activity. However, even the fittest notice some decline as they age.

Regular exercise to strengthen muscles (resistance training) can partially overcome or significantly delay loss of muscle mass and strength. In the muscle-strengthening exercise, muscles contract against resistance provided by gravity (as in sit-ups or push-ups), weights, or rubber bands. If this type of exercise is done regularly, even people who have never exercised can increase muscle mass and strength. Conversely, physical inactivity, especially bed rest during an illness, can greatly accelerate the loss. During periods of inactivity, older people lose muscle mass and strength much more quickly than younger people do. For example, to make up for the muscle mass lost during each day of strict bed rest, people may need to exercise for up to 2 weeks.

By age 75, the percentage of body fat typically doubles compared with what it was during young adulthood. Too much body fat can increase the risk of health problems, such as diabetes. The distribution of fat also changes, changing the shape of the torso. A healthy diet and regular exercise can help older people minimize increases in body fat.

Eyes
As people age, the following occurs:

- The lens stiffens, making focusing on close objects difficult
- The lens becomes denser, making seeing in dim light harder and driving difficult.
- The pupil reacts more slowly to changes in light lowering reaction time.
- The lens yellows, changing the way colors are perceived.
- The number of nerve cells decreases, impairing depth perception.
- The eyes produce less fluid, making them feel dry.

Loss of near vision: During their 40s, most people notice that seeing objects closer than 60-100 cm becomes difficult. This change in vision, called **presbyopia**, occurs because the lens in the eye stiffens. Normally, the lens changes its shape to help the eye focus. A stiffer lens makes focusing on close objects harder. Ultimately, almost everyone gets presbyopia and needs magnifying reading glasses. People who need glasses to see distant objects may need to wear bifocals or glasses with variable-focus lenses.

Need for brighter light: As people continue to age, seeing in dim light becomes more difficult because the lens becomes less transparent. There are two types of photoreceptors in the human retina, rods, and cones. Rods are responsible for vision at low light levels (scotopic vision). They do not mediate color vision and have a low spatial acuity. Cones are active at higher light levels (photopic vision), are capable of color vision and are responsible for high spatial acuity. The central fovea is populated exclusively by cones. There are 3 types of cones which we refer to as the short-wavelength sensitive cones, the middle-

wavelength-sensitive cones, and the long-wavelength sensitive cones or S-cone, M-cones, and L-cones for short. The light levels where both are operational are called mesopic. A denser lens means that less light passes through to the retina at the back of the eye. Also, the retina, which contains the cells that sense light, becomes less sensitive. For reading brighter light is needed. On average, 60-year-olds need 3 times more light to read than 20-year-olds.

Changes in color perception: Colors are perceived differently, partly because the lens tends to yellow with aging. Colors look less bright and contrasts between different colors may be more difficult to see. Blue looks grayer, and blueprint or background look washed out. However, older people have trouble reading black letters printed on a blue background or reading blue letters.

The pupil of the eye reacts more slowly to changes in light. The pupil widens and narrows to let more or less light in, depending on the brightness of the surroundings. A slow-reacting pupil means that older people may be unable to see when they first enter a dark room. Or they may be temporarily blinded when they enter a brightly lit area. Older people become more sensitive to glare. However, increased sensitivity to glare is often due to darkened areas in the lens or to cataracts.

Fine details, including differences in shades and tones, become more difficult to discern. The reason is probably a decrease in the number of nerve cells that transmit visual signals from the eyes to the brain. This change affects the way depth is perceived, and judging distances becomes more difficult.

Older people see more tiny black specks moving across their field of vision. These specks, called floaters, are bits of normal fluid in the eye that have solidified. Floaters do not significantly interfere with vision. Unless they suddenly increase in number, they are not a cause for concern.

The eyes tend to become dry. This change occurs because of the number of cells that produce fluids to lubricate the eyes decreases. Tear production may decrease.

The appearance of the eyes changes in several ways:

- The whites (sclera) of the eyes turns slightly yellow or brown. This change results from many years of exposure to ultraviolet light, wind, and dust.
- Random splotches of color appear in the whites of the eyes, particularly in people with a dark complexion.
- A gray-white ring (arcus senilis) appear on the surface of the eye. The ring is made of calcium and cholesterol salts. It does not affect vision.
- The lower eyelid hangs away from the eyeball because the muscles around the eye weaken and the tendons stretch. This condition (called ectropion) interferes with lubricating the eyeball and contribute to dry eyes.
- The eye appears to sink into the head because the amount of fat around the eye decreases.

Ears

Most changes in hearing are probably due as much to noise exposure as to aging. Exposure to loud noise over time damages the ear's ability to hear. Nonetheless, some changes in hearing occur as people age, regardless of their exposure to loud noise. As people age, hearing high-pitched sounds becomes more difficult. This change is considered age-associated hearing loss (presbycusis). For example, violin music may sound less bright.

High-pitched sounds are particularly hard for older people to hear. The consequence of presbycusis is that words become harder to understand. As a result, older people think that other people are mumbling. The reason is that most consonants (such as k, t, s, p, and ch) are high-pitched, and consonants are the sounds that help people identify words. Because vowels are lower-pitched sounds, they are easier to hear. Older people hear “Ell me exactly what you wan oo ee,” rather than “Tell me exactly what you want to keep.” To help, other people need to articulate consonants more clearly, rather than simply speak louder. Understanding what women and children say may be more difficult than understanding what men say because most women and children have higher-pitched voices. Gradually, hearing lower pitches also becomes more difficult.

Many older people have more trouble hearing in loud places or in groups because of the background noise. Also, earwax, which interferes with hearing, tends to accumulate more. Hairs grow out of the ears and disturb sounds.

Mouth and Nose

Generally, when people are in their 50s, the ability to taste and smell starts to gradually diminish. Both senses are needed to enjoy the full range of flavors in food. The tongue can identify only five basic tastes: sweet, sour, bitter, salt, and a relatively newly identified taste called umami (commonly described as meaty or savory). The sense of smell is needed to distinguish more subtle and complex flavors (such as raspberry).

As people age, taste buds on the tongue decrease in sensitivity. This change affects tasting sweet and salts more than bitter and sour. The ability to smell diminishes because the lining of the nose becomes thinner and drier and the nerve endings in the nose deteriorate. However, the change is slight, usually affecting only subtle smells. Because of these changes, many foods tend to taste bitter, and foods with subtle smells may taste bland.

The mouth tends to feel dry more often, partly because less saliva is produced. Dry mouth further reduces the ability to taste food.

As people age, the gums recede slightly. Consequently, the lower parts of the teeth are exposed to food particles and bacteria. Also, tooth enamel wears away. These changes, make the teeth more susceptible to decay and cavities (caries) and make tooth loss more likely.

With aging, the nose lengthen and enlarge is the individual cases and the tip drops a little.
Thick hairs may grow in the nose and on the upper lip and chin.

Is it a defined and guaranteed process, a decline of what most love so much? Taste and smells can be trained. Both senses are possible to train inexperience and sensitivity. To do this it is possible to follow the same procedures as a connoisseur a person who has a great deal of knowledge about the fine arts, cuisines, or an expert judge in matters of taste. Training the senses is not yet common good but, with an increasing growth of the senior population, a growing awareness of interests in foods and fine wines and other products of desire, it is a need.

Brain and Nervous System

The number of nerve cells in the brain decreases. However, the brain can partly compensate for this loss in several ways:

- As cells are lost, new connections are made between the remaining nerve cells.
- New nerve cells form in some areas of the brain, even during old age.
- The brain has more cells than it needs to do most activities—a characteristic called redundancy. (there is more brain that is used).

Nerve cells lose some of their receptors for messages. Blood flow to the brain decreases. Because of these age-related changes, the brain functions slightly less. Older people react and do tasks more slowly, but given time, they do these things accurately. Some mental functions—such as vocabulary, short-term memory, the ability to learn new material, and the ability to recall words—are subtly reduced after age 70.

After about age 60, the number of cells in the spinal cord begins to decrease. Usually, this change does not affect strength or sensation. Nerves repair themselves more slowly and incompletely. But it is possible to stimulate the neural system (NEUREX) through the use of exercises, challenges, and electric stimulation. With the right stimulus, the loss of capacity can be compensated to a certain level.

Heart and Blood Vessels

Heart and blood vessels become stiffer. The stiffer arteries are less able to expand when more blood is pumped through them. Blood pressure and often increase in elderly people and veins expand.

Differences between young and old hearts become apparent when the heart has to work hard and pump more blood—for example, during exercise or an illness. An older heart cannot speed (fast acceleration) up as quickly or pump as fast or as much blood as a younger heart. Older athletes are not able to perform as younger athletes.

Muscles of Breathing and the Lungs

The muscles used in breathing, such as the diaphragm, do weaken. The number of air sacs (alveoli) and capillaries in the lungs decreases. Slightly less oxygen is absorbed from air breathed in. The lungs become less elastic. In people who do not smoke or have a lung disorder, these changes do not affect ordinary daily activities, but these changes make exercising more difficult.

The lungs become less able to fight infection, partly because the cells that sweep debris containing microorganisms out of the airways are less able to do so. A cough, which also helps clear the lungs, slowly becomes weaker. Lung contractions decrease in intensity (size).

A major increasing problem is air pollution with an increase is small size particles in the air. These dust and other particles have a damaging effect on the lungs and in many cases more than smoking. But when people combine the polluting efforts it is eminent that they enter a danger zone.

Lungs should be trained in a not so usual suggested way. Singing is a great way to train the lungs. Joining a group is the best way to receive training and get social connections. A quire or a choir is a group of singers that practices and performs together. The best place is one which pays attention to the physical training behind the singing.

Digestive System

Overall, the digestive (muscular) system is less affected by aging than most other parts of the body. The muscles of the esophagus contract less forcefully, but the movement of food through the esophagus is not affected. Food is emptied from the stomach slightly more slowly, and the stomach cannot hold as much food because it is less elastic. The muscles that support the digestive system have “over strength”, they are more powerful than needed when young. But nature did so intentionally. These muscles can work against gravity even when in an upside down position. The strength of these muscles slowly decreases but due to the leftover power there is no negative impact. But the speed of contractions also decreases which is responsible for a slower moving.

The digestive tract produces less lactase, an enzyme the body needs to digest milk. As a result, older people are more likely to develop intolerance of dairy products (lactose intolerance). People with lactose intolerance feel bloated or have gas or diarrhea after they consume milk products. Reducing intake of milk containing products must be actively promoted when this happens.

In the large intestine, materials move through a little more slowly. In some people, this slowing contributes to constipation. During passing the liquid re-absorption continues and this contributes to a harder content.

The liver becomes smaller because the number of cells decreases. Less blood flows through it, liver enzymes that help the body process drugs and other substances work less efficiently. As a result, the liver is less able to help remove drugs and other substances from the body. The effects of drugs—intended and unintended—last longer. As mentioned before the intake of long-term drugs exhausts the body and organs and prevents proper uptake of the needed active ingredients. This is a matter of concern for future delivery systems of drugs during aging and long-term use.

Kidneys and Urinary Tract

The kidneys become smaller because the number of cells decreases. Less blood flows through the kidneys, at about age 30, they begin to filter blood less well. Especially the kidneys are a physical condition dependent organ. Persons with a good physical condition and active lifestyle favor positively of this with better functioning kidney system. As the year's pass, they remove waste products from the bloodless well. They excrete too much water and too little salt, making dehydration more likely. Nonetheless, they almost always function well enough to meet the body’s needs.

Certain changes in the urinary tract may make controlling urination more difficult:

- The maximum volume of urine that the bladder can hold decreases. Older people need to urinate more often.
- The bladder muscles contract unpredictably (become overactive), regardless of whether people need to urinate (constant feeling of the need “to go”)
- The bladder muscles weaken, the contraction is not maximal. As a result, they cannot empty the bladder as well, and more urine is left in the bladder after urination.
- The muscle that controls the passage of urine out of the body (urinary sphincter) is less able to close tightly and prevent leakage. Older people have more difficulty postponing urination. These changes are one reason that urinary incontinence (uncontrollable loss of urine) becomes more common as people age.
- In women, the urethra (the tube through which urine leaves the body) shortens, and its lining becomes thinner. The decrease in the estrogen level that occurs with menopause contributes to this and other changes in the urinary tract.

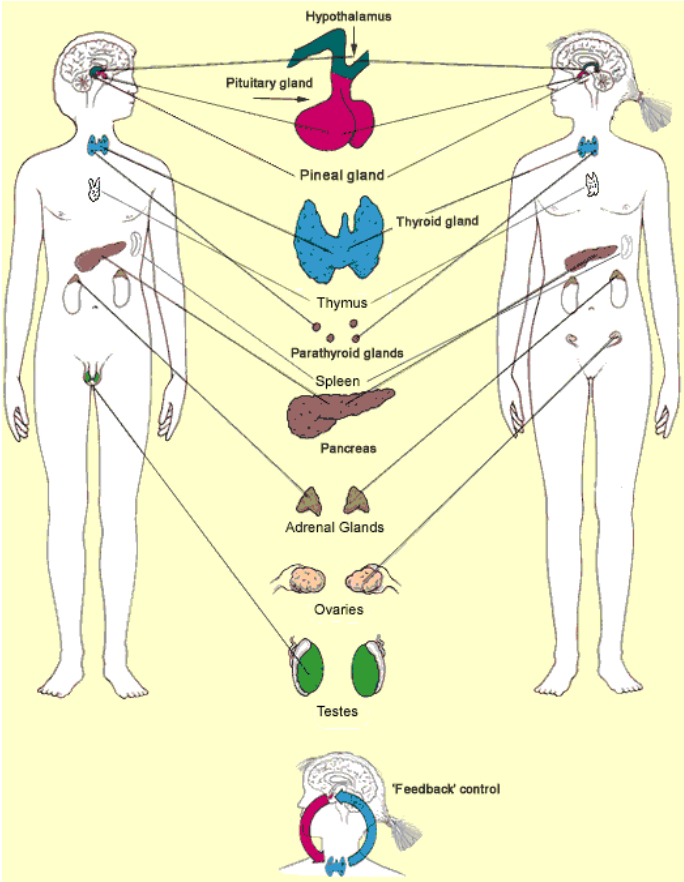
- In men, the prostate gland tends to enlarge. In many men, it enlarges enough to interfere with the passage of urine and to prevent the bladder from emptying completely. As a result, older men urinate with less force, take longer to start the stream of urine, dribbling urine at the end of the stream, and to urinate more often. Older men are also more likely to be unable to urinate despite having a full bladder (called urinary retention). This disorder requires immediate medical care.

Reproductive Organs

Women
The effects of aging on sex hormone levels are more obvious in women than in men. In women, most of these effects are related to menopause, when the levels of female hormones (particularly estrogen) decrease dramatically, menstrual periods end permanently, and pregnancy is no longer possible. The decrease in female hormone levels causes the ovaries and uterus to shrink. The tissues of the vagina become thinner, drier, and less elastic (a condition called atrophic vaginitis). In severe cases, these changes can lead to itching, bleeding, pain during intercourse, and a need to urinate immediately (urinary urgency).

The breasts become less firm and more fibrous, and they start to sag. This change makes finding lumps in the breasts more difficult. Because the breasts change with aging, finding lumps that could be cancer is harder. Some experience a (minor) growth in size and increased hair.

Some of the changes that begin at menopause (such as lower hormone levels and vaginal dryness) interfere with sexual activity. However, for most women, aging does not greatly detract from the enjoyment of sexual activity. Not having to worry about becoming pregnant may enhance sexual activity and enjoyment. The use of lubricants solves the dryness problem.



Men

In men levels of the male hormone testosterone decrease, resulting in fewer sperm and a decreased sex drive (libido), but the decrease is gradual and marginal. Most men experience a sinuslike need for sexual activity. They will feel high needs at some points in time while at others they even resent the thought of it. This influence judgment and honesty.

Although blood flow to the penis decreases, most men can have erections and orgasms throughout life. However, erections do not last long, slightly rigid, or require more stimulation to maintain. A second erection requires more time. Erectile dysfunction (impotence) becomes common as men age and is often due to a disorder, usually a disorder that affects blood vessels (such as a vascular disease) or diabetes.

Endocrine System

The levels and activity of some hormones, produced by endocrine glands, decrease.

- Growth hormone levels decrease, leading to decreased muscle mass.
- Aldosterone levels decrease, making dehydration more likely. This hormone signals the body to retain salt and therefore water.
- Insulin, which helps to control the sugar level in blood, is less effective, and less insulin is produced. Insulin enables sugar to move from the blood into cells, where it can be converted to energy. The changes in insulin mean that the sugar level increases more after a large meal and takes longer to return to normal. More about the hormones is found in chapter 3

Blood Production

The amount of active bone marrow, where blood cells are produced, decreases. Therefore, fewer blood cells are produced. Nonetheless, the bone marrow can usually produce enough blood cells throughout life. Problems may occur when the need for blood cells is greatly increased—for example, when anemia or an infection develops or bleeding occurs. In such cases, bone marrow is less able to increase its production of blood cells in response to the body's needs. A simple treatment should be a temporary high altitude stay every year. Another, more intensive way, is a weekly leg training with (high) resistance.

Immune System

The cells of the immune system act more slowly. These cells identify and destroy foreign substances such as bacteria, other infecting microbes, and probably cancer cells. This immune slowdown partly explains several findings associated with aging:

- Cancer is more common among older people.
- Vaccines become less protective in older people.

- Some infections, such as pneumonia and influenza, are more common among older people and result in death more often.
- Allergy symptoms may become less severe.
- As the immune system slows down, autoimmune disorders become less common.

After this review of the negative effects of aging on our health situation, it is important to get solutions. These solutions are Age Control related and not Anti-Aging. The main reason why to emphasis on this is the illusionary effect that anti-aging promoters had during the last 30+ years. Most have created the illusion that it is possible to stop or even rewind the aging process. But even the apparent truth is known by all, many still did follow the belief of immortality.

Most anti-aging campaigns are brought from a pure commercial point of view. Even views which are still potentially harmful such as the differently available hormone therapies. These commercial therapies have a proven long-term negative effect on body and soul, let alone morality. Anti-aging seemed to be a commercially oriented movement which uses pseudo-science
without a holistic view, we do need in the aging science.

How is it possible to enhance a positive aging process? The facts are not as complicated as they may seem but some of this advises are straight ahead spoilers of a lazy, lay-back and irregular lifestyle. Aging is a natural process which only can be followed by natural “treatments” which “delay” the negative parts of the aging process.

10 Sexual performance and multiplication process

Aging has everything to do with sexual performance, “duties”, gender differences and multiplication. The natural task is to multiply the human race and to conserve the different species in it. Humans are a separate species in nature, not superior but on a different level. This distinguishes us from the animals. Humans have different functions, abilities, performances, and achievements. In short, the human build history when animals conserve species only, as far as currently is known.

The human achievements have made a difference. It created history and we are also a full part of nature. This is something impossible to deny. But the natural function is still to multiply. The knowledge and intelligence built throughout the centuries of experience, historically speaking, thought people to be sensible with multiplication. Some people have chosen not to get children while others consider it the most important part of their lives. It is a matter of respect and choice, both do have their functions and services to the existence of the human race. It is called awareness of responsibilities and needs. Some people do not feel the need of having children while others cannot have them. This is the reality. Most people still do not except nor respect others who decided to have a childless life. But for the sake of the future, it should be realized that these people are doing the human race a favor, all people should pay respect to them instead of insulting. They too have an important contribution to society, by giving up the possibility of having children they create space and place for others to have. Society should be more aware and alert on people who have children but who are not able to take care of them. These have a negative long-term impact on society.

Sexual performance during our aging process is separated into two segments.

- Sex as a need for multiplication
- Sex as a form of relaxation, enjoyment, and entertainment.

Male and female have a different opinion on both topics. This difference is fundamental and separates the genders. It is important to state:

- Sexual freedom is a right for everyone but the male is in power which restricts the possibilities and opportunities of the female. Sexual freedom is limited by the morality, religion, and philosophy of the male and enforced by violence and power. This is a negative balance in favor of the male and opposing freedom of the female.
- Female sexual freedom is basically one of caring more than self-satisfaction while the male is more self-oriented and in many ways egocentric. Self-orientation in the female is considered egocentric and in most countries thought as vulgar or dirty. In many societies female sexual desire is met with punishment (even into the extreme).
- Potentially the male is multi partner-oriented while the female prefers a single partner companionship. The female desires emotional connection over physical satisfaction. Males prefer more physical oriented connections and less emotional involvement.
- Females seek stability in relationships while males often offer instability and uncertainty. Males prefer the multi-relationship even when not able to care for these partners. This again is negative for female and society and leaves the financial burden on people who are not or only partly responsible for it.
- Females have the “duty” to bear children for society and the continuation of the human race. Males should have the moral, psychological, financial and overall duty to participate in taking care of the children they are genetically connected to. This responsibility should be moral,

financially or otherwise enforced. Males who do not have or take this responsibility should not have the ability to multiply for the benefit of the human race (this is a hard political and moral statement of Arnaud van der Veere which is well aware of the consequences) A worldwide DNA database could connect all individuals to their relationships and enforce care (hypothetical suggestion). This database will have the following positive effect:

- All registered persons can be held accountable for children which are claimed to be related to them
- DNA matches can be calculated on suitability after database comparing (big data comparing)

The goal is to find a way to age more healthy. Sex is an important part of this. To understand this it is needed to focus on the importance of sex in the human life.

- From 0 – 8 years. The child is not morally aware of sexual behavior but surely of a more or less strong physical and emotional connection to the parents. Some children are already in the experimental phase. This is the first phase of awareness. They discover their own body and gender and do so of others through games and play. At the most time, there is no consciousness of sexual desire, it is a natural form of curiosity. Exploration of the personal and opposite gender gives the individual the ability to identify will equal gender types and "role play" that is part of the gender expression.
- Between 8 – 12 the second phase of awareness of the connection between individuals start to occur. Some children fall in love and others develop a sexual attraction. This happens in different ways and the development has many influencers. It is a critical period in the life choices of a child in relation to sex and gender orientation. In this phase, the first separation of affection, attraction, desire, lust, connection and relationship occurs.
- Between 12 – 16 the first emotional oriented feelings develop. These emotional feelings make a clear difference between individuals for sex, the kind of partner to set up a family with and the environmental influences on their choices. Dependent on culture and social environment many children have their first love-like experience. Not all have sexual encounters. In some cultures the girls – never the boys – considered ready to marry and get children. The first menstruation is a sign for that. In different societies, the female role to obey and follow gets it definitive character. A personal independent development is no longer possible.
- 17 – 23 is an active sexual exploring age. Females become aware of their reproductive possibilities and venerable position due to this. Some will start to explore opportunities to find a partner while others peruse in development (modern time, old times were completely different). Males become experimental and seek ways to avoid multiplication but desire pleasure. It is an interesting fact that the often said "seconds of pleasure" have to compete with the hours of trouble! To males, the seconds of pleasure prevail most of the time. At this stage, there is a strong dividing between countryside, city and economic development areas. In many communities, the female will bear the first child, get married and becomes a serving partner. Often education stops here. This is a negative development as it limits the child:
  - A well developed intelligent mother is able to transfer her intelligence to the child
  - An intelligent child is able to develop faster and further giving it an advantage in life
- Between 23 and 35 years old, male begin to realize time and feel a need to multiply and/or settle down. A new environmental awareness occurs. The focus on education, work and carrier become more apparent which pushes the need for a social stable status. Society "demands" a family of a male to make him a reliable subject. If the male has no family or a minimum clarity in

social relationship status it has an effect on job and carrier. The worldwide vision of female over 23 is still traditional focused on a family with children. This is a worldwide social, emotional and work pressure which is hard to resist for most women. To many, it is a goal in life and they settle for that – and for multiple other - reasons. In this age group, there is a strong increase in sexual behavior difference related to

  - Religion. Often religion plays a strong and important role. Desire and sex are pictured as wrong, often evil. But sexual misconduct takes often place in these communities.
  - Social environment. The influence of friends and connections
  - Culture. Traditional behavior and expectations
  - Family. The type of family they come from
  - Nature. Some people have developed desires on specific topics.
  - Gender. There are many gender-related sexual developments.
  - Climate. The influence of an indoor or outdoor culture
  - Economic status. Level of income
  - City or countryside or everything in between. Places of living.

- Between 35 – 50 years there is a general continuation of the development of the years before with a less adventurous label and often a more "lay back" attitude. Sex becomes a practical instrument, sometimes of recreational purpose or a "have too". To mothers these are years to pay interest and attention to children, combine housework, interests, friends / social network and a possible job position. Fathers spend attention to career or business. Both meet at home and sexual dealings start to move to the weekends and receive less or no attention. For many male this is an uncertain time as they lose out on physical abilities and often also shape, they become less attractive but still have the mind of the desire of a 30+ individual. Most males get detached from reality and consider themselves a sexual predator of the first class while reality did catch up long ago. During this period in life, the sexual problems on a personal and relational level become apparent and in many cases a source for separation or even divorce. Sexual problems play a larger role in city people than in the countryside. People without children become isolated. As society has a specific role of every person in mind, a childless person is considered weak, pitiful or otherwise negative. This should change as these people have had proven value in history and even did great things too of which society benefits until today. Respect is in a place for such a hard and important decision in the personal life of someone.
- Between 50 – 60 years the sexual life gets into a turmoil not because of desires and sudden needs but due to biological changes. Both male and female get into a hormonal change state which strongly effects choices and emotional conflicts. The power of impact and display thereof is cultural and place depended. In general, female seeking more female connections for reflection and understanding while male seek younger women (mates) for reference and confirmation that they are a real male.
  - Female hormones and fertility changes (menopause) and give some women a hard period. Some of the physical effects are
    - Flushes of blood which create the cold and hot sensation
    - Stress experiences and mood swings
    - Dryness of the sexual area
  - Males also experience changes such as
    - Growing belly and fat presence
    - Hypersexual interest in younger female
    - Interest in personal appearance (cloth, car, luxury goods)
    - Career (most will lose opportunities due to age) / stress

Changes affect sexual capacities at all ages but when the individual is getting older these changes have a higher impact and measurable results. Performances on a sexual level decrease often to a dramatic level. A small survey on relationships and sexual behavior uncovered the following;

- Younger women feel attracted to an older man for the following reasons;
  - Financially stable and supportive
  - Sexually controllable by the female side
  - Emotionally more stable, better in planning, realistic vision
- Older men prefer the younger woman for the reasons;
  - Get a feeling of respect
  - Sexually more attractive
  - Less mental pressure (fewer questions, no need to explain everything)

- After 60 there is more compassion for sexual desires and understanding. The desired passion slowly fades away. In recent decennia, there is an increasing group of mainly male who continue or start experimenting with different sexual interests. In sexually oriented clubs, there is an increase in memberships in this age group. Most female find other ways to distress the sexual system through social and other activities and interaction with female friends. There is a growing difference between male and female interests. But on the other hand, there is a growing group of elderly who connect and find common goals, interests, and reasons for living. The development of this is strongly founded in the form of society.
  - A society was male and female mix and have equal chances. This form of society shows worldwide the highest possible change to grow very old.
  - A society where male and female are separated. In this society, neither male or female seems to pass the 100-year border often. Exceptional cases are available.

Older parents

Worldwide there is an astonishing increase over the next decade in the number of people in their 60s who have children that are not yet 18. While no one should question the ability of someone in their 60s to care for teenagers, the financial consequences are impossible to ignore.

The rise of the parent is inevitable given how many women are having children in their 40s. In 2017 the birth rate among women aged 40 and above surpassed that of women aged under 20 for the first time since 1947, according to the UK Office for National Statistics. Births to the 40-plus have more than trebled since 1981.

Traditionally the over-55 period is when things calm down financially. It's also the period when many people start shoveling their money into a pension to take advantage of tax reliefs. But as the trend to having children later in life continues – not least because getting on the property ladder while young is so much more difficult – it's not really clear when and how this generation will be able to put anything extra into their pensions.

But the crucial part of life is that most of the mortgage is paid off by the time these new elderly parents hit their early 50s. They are able in their 60s to release significant amounts of equity. The suffering of financial drawbacks is limited when starting a family late.

The advantages of late parenthood are high. Both parents had been able to pursue great careers, in good health and, by the time of having children, the property ladder assured them of a good-sized

home. The only drawback could be a parent coping with teenage kids at the same time as caring for elderly parents.

This generation won't just be worse off than their parents in many ways. They also look like the generation that will have to work well into their 70s to have any hope of financing their retirement.

Advantages of Children with Older Parents

Feeling More Wanted
Children with older parents often take center-stage in their parents' lives. They receive a lot of attention from their parents and feel very loved and wanted. Older parents are more likely to be settled professionally and are able to spend more time with their children.

Financial Advantages
Older parents are more likely to be financially secure and able to provide an economically stable life for their children (at least for those with a middle-class background or higher). Their children are exposed to a variety of educational opportunities and are able to travel; attend better, possibly private schools; and be involved in extracurricular activities.

Emotional Privileges
Older parents seem to be more stable, relaxed, and less stressed-out by work or parenting issues. They are less worried about their finances or their career, allowing them to be more present and relaxed with their children. These children often grow up in stable two-parent families. The divorce rate among older parents is lower and these parents have more time to spend with their children.

Disadvantages:

Feeling Different From Peers
Children of older parents are aware that their parents are different- older than any other parents. That often leaves them feeling self-conscious and embarrassed. Some of these children are ashamed to bring their friends home to meet their parents, fearing they might be mistaken for grandparents. They are also aware of when their parents' energy declines because they won't participate in sports the way younger parents might. The experience that a greater "generation gap" separates them from their parents is common. These children may also be aware that their parents are a bit more "old-fashioned" in their music and fashion taste.

Fear of Parents Dying
Children of older parents often fear that they will lose their parents much earlier than their peers will. When they become aware of their parents' age, they may want to spend as much time with their parents, and squeeze in as many experiences, as possible. This can turn into a significant worry where a child may not want to leave home out of fear that parents will die.

Responsible for Parents at Early Age:
As young adults, children of older parents are frequently faced with emotional, medical and financial responsibilities for their parents at much earlier ages than their peers. They may be barely out of college when their parents are already on the verge of retirement or have declining health. Instead

of having their 20s and 30s to concentrate on jobs and marriages, they often have to assume a myriad of responsibilities for their parents, relatively early in life.

Not Enough Autonomy
Older parents often have small families and a lot of time to be with their children. Greater parental attention may result in a tendency to overprotect and micromanage children. Children may feel they do not have enough autonomy. While intellectually stimulating, older parents can have an unrealistically high expectationions of academic achievement. Children may feel a great pressure to succeed and be high achievers.

Researching the group of centenarians on sexual activity and preferences it is discovered that there are no apparent activities but a constant need for warmth and affection. This lead to an important part of the sexual relationship between people. The main content of any sexual relationship should be the warmth and affection when preferring the continuation of a healthy relationship. Aging is based on the acceptation of our biological processes (respect of existence) and not giving in to many impulsive behavior patterns. These impulsive deeds are considered dangerous by nature for our personal wellbeing and the continuation of the species.

Spontaneous sex at a higher age, special sexual preferences, addiction to sexual habits are not biological needs of the human race and less natural than considered. As mentioned before people who wish to reach an old age should consider the samples of old aged people and make up their minds. Fact is that most of these old centenarians have had stable relationships, some several, with a strong emotional foundation. Sex was mainly a matter of attachment, warmth, affection and other display of unity and less of a physical explosion of desire. It is important to know that positive active sex life is a good and natural habit but it should always be voluntary based on the personal free will of the people who participate in any direction, style, group or individual expression.

Sexual development and decline are both biological and emotional processes. Often it is considered that sexual activity is an indicator of health but this statement is questionable. A person can be physically in good health while mentally have problems. Mental changes do have an effect on the biological system but in general and if not long-lasting, the impact on health is marginal.

Conclusion: the sex life of the individual is bounded by many rules and regulations which most are unwritten in society and of social content. The slow process of losing sexual abilities should be a process of acceptation and change in body and mind. Other ways will surely lead to a more early death.

11 (Natural) supplementation and superfoods

Since the '80's Arnaud van der Veere has been researching supplements, herbal treatments, healthy and unhealthy medications, hormone therapy and many more "secrets" to a long life. Longevity is the goal of people over 30 and a child's dream of immortality. By the time people realize the speed of life it is already a long way ahead on the path and changes are inevitable. Most people become aware of the venerability of life when parents and love-once die. To most people, it happens during their 30's. A frightening experience especially when death is due to illness or other tragic events. Most people consider this avoidable death. It should be possible to prevent oneself against death. Is that possible?

If advertisements and promotional articles are to believed it is surely possible to have a long and prosperous life in good health and with all the fruits of it. But when stick to the facts it is easy to understand that the factors of influence are unlimited and control is not possible. That is the hard reality. A person has never lived in hands. But this does not imply they should sit back and see what is coming. Active living is needed to enjoy given time and assure the spend time is useful and most of all workable. Active people have proven the longest life, sedative people the shortest.

Food is medicine and poison at the same time. It is important to understand food as medicine and part of the program for longevity. In former parts, the microelements of food have been explained and studied. In this part, the macro parts of foods are of interest. Besides the chemical reactions of food inside the body one should be aware of other important elements related to food:

- Smell
- Taste
- Looks (decoration)
- Colors
- When and where it is served
- Speed of serving
- The reason why we eat (company)
- Activity

Fact is that there is no single herb or medicine that is able to extend our life. Looking for supplementation or superfoods which help the individual life is a useful but also dangerous and difficult path. Most readers do not realize that herbs can be potentially dangerous and that the intake of herb combination can cause toxic reactions in the body. The study of the treatment and combination of herbs and other products is still on the way even with respectively 10.000 years (Ayurveda) and 5000 (TCM = Traditional Chinese Medicines) of practical experience.

What is known about the use of herbs in combination with daily food?
In other parts of this book, it is mentioned that the specific biological development of the digestive system suits the food that is consumed on a daily basis. The digestive system creates a set of enzymes and saliva to digest daily food in a specific pattern. It is possible to change a little in this existing combinations but the main program is hard to change. This biological given fact also influences the ability to consume and digest medical herbs from other parts of the world.

The Indian and Chinese diet is completely different from a Western diet. The differences are fundamental. It is possible for all eaters of specific kitchens to switch but the need and desire to their

born kitchen continue to exist as the body is in demand of the specific ingredients which cannot be found in the other diet. The desire is not a psychological wish for the food but a digestive/biological need. As mentioned before the gut has its own brain.

Arnaud van der Veere called the study of food compatibility “food congruence”. Food has a direct relation to the personal digestive system. With “food congruence” people study the possibility of a combination of basic local diet with herbal, chemical and other medications. Is it possible to combine food with “medication” and have an optimal result?

Commerce has moved “alternative and complementary” medicines to all corners of the world but there is hardly any study known which made the effectiveness of combinations – food & natural medication – measurable and factual. During research, some foods have been discovered which have a global impact and are able to pass any digestive tract in the world. These foods can be considered world food medicines.

Prof. Dr. Mao divided the supplements and superfoods as follow:

- Superfoods are complete food products without any addition or preparation
- Supplements have undergone at least one or more treatments of mechanical or chemical nature

In perspective of this dividing, the natural powers become clear. In this part, a small sample of products is displayed. The study covers hundreds of thousands of foods, herbs, superfoods, ingredients or supplements. Yearly many new products enter the market and researching all is an impossible task. To find effective products a few rules where used:

- The product must be on the market for at least 5+ years
- Science data must be available, researchers has taken place
- The product is accessible at more than 2 continents
- Price must be limited to availability for the majority of people

The quality of local and other natural whole foods (sometimes mentioned as superfoods) depends on the following

- Soil. The composition of the soil influences the quality of the product completely
- Liquids. For its development, a plant depends on the liquids of the environment and the ability to solve the nutrients and being absorbed by the plant for growth
- Climate. The external factors for growth such as sunshine, warmth, cold and humidity

- Garlic. A simple but real healthy supplement that is able to be involved and interact with any kitchen/diet in the world without losing its possible medical capacities. One of the major reasons is the fact that it can be grown nearly everywhere. A negative part can be considered the smell but when more people eat it, the smell becomes common
- Ginseng. This root originates from a different area in the world with each a specific known effect. Most of the root is used because of the involvement of alcohol. Research has proven several active components but a relation to age is still to be proven.
- Onions. The health benefit of onions is still under research. Onions can be eaten in different forms. Cooked or fresh are a few of them. Research to the venerability of active ingredients in relation to the medical activity is still on the way. There are many different species of onions which each a specific feature of content and taste.

- Combination tomato/broccoli is known in nearly every kitchen around the world. The anti-oxidant properties of it are proven. The only open part of the discussion is the amount of each ingredient in the combination.
- Spice herbs are a common use all over the world since centuries and a part of the diet in nearly every country:
    - Basil (also: Thai Basil) - Highly aromatic with a robust licorice flavor.
    - Chervil - Delicate anise flavor.
    - Dill - Light and feathery herb with a pungent herb flavor.
    - Fenugreek - It has a rather bitter, burnt sugar flavor.
    - Lemon Thyme (also: Thyme) - Sweet lemon aroma and a fresh lemony-herbal flavor.
    - Cayenne Pepper - Made from dried and ground red chili peppers.
    - Cinnamon- serves double duty as a spice in both sweet and savory dishes
    - Coriander Seed - Earthy, lemony flavor.
    - Marjoram - Floral and woodsy.
    - Mint - Surprisingly versatile for such an intensely flavored herb.
    - Oregano - Robust, somewhat lemony flavor.
    - Rosemary - Strong and piney.
    - Paprika - Adds a sweet note and a red color.
    - Saffron - Saffron has a subtle but distinct floral flavor and aroma.
    - Turmeric – Food coloring and ability to control inflammation
    - Thyme - Adds a pungent, woodsy flavor.

Mentioned food particles are used all over the world and for hundreds of years a practical tasty part of the food. But besides their taste, they have a lot of functions. These functions are:

- ✓ Blood thickness
- ✓ Blood content (red blood cells, defense system, blood cluttering etc.)
- ✓ Cell (re)building
- ✓ Liquid regulation
- ✓ Inflammation
- ✓ Fat control
- ✓ Digestive stimulation and other functions
- ✓ Enzyme and hormone assistance / boosting
- ✓ On a mental level such as depression, emotional weakness, relaxation and so on

Beside the “common” food there are a huge amount of so-called natural supplements. Here it is possible to distinguish the following segments:

- ❖ Herbal supplements made from single or herb combinations. Often these supplements are built on TCM or Ayurveda claims which are hard to check or even have no actual congruence with the personal food pattern.
- ❖ Combination of herbal and chemical products. In these supplements are mixes of standard or chemical ingredients with more commonly used and know herbals are used.
- ❖ Chemical supplements build on amino acids, vitamins, and minerals.
- ❖ Phantasy products are made with ingredients which are unproven, unclear or even less healthy. Most of these products do tricker a physical reaction of the body to give an idea “see it works”. Sometimes these products have dangerous side effects.

What is a Superfood?

1- it must be a good source of nutrients, and possess a diverse array of them. This includes phytonutrients.
2- many healthy foods contain unhealthy elements, such as calories, fat or cholesterol. Superfoods contain little or none; they should also be absent of toxins, hormones, artificial ingredients, pesticides, chemicals, food dyes, etc
3- most superfoods offer significant health benefit claims, such as lowering the risk of developing certain types of cancer or helping to alleviate the symptoms of other maladies.

Are these statements proven facts with independent research? The reports are not clear and most are contradicting each other. The best way to use these foods is in the way they have always served the eater: good in taste, healthy as perception and not harmful to most people.

Fruits – most fruits are high in antioxidants and vital nutrients. Fruits that may consider superfoods are easily available such as most berries, for instance, blueberries and raspberries. Coconuts are a superfood and an energy alternative to sugary and chemical-filled sports drinks. Other berries and fruits that may be harder to find in some areas include noni, acai and goji berries. All fruits should be seasonal but in the current global market, this has changed. Fact is that the transportation of fruits harms the ingredients. Many fruits are taken of their carriers (plants, trees or bushes) without being ripe. Only in the ripe stage, the fruit will carry all the benefits of health. In many cases, the unripe fruits also carry products that are harmful and have an unknown effect on health in the long term. Eating local ripe fruits is the safest way.

Vegetables – Nearly all green leafy vegetable can be considered a superfood, and there is no problem finding plenty of it in the local market. From turnip greens, collard greens, spinach, kale, lettuce, broccoli and others. To benefit the digestive system vegetables must be a major ingredient of daily food.

Honey – Honey is considered to be a superfood, but be aware that not all honey is created equal. One of the important content is the pollen, which is filtered out by most trademarks for specific reasons. The use of honey as a health supplement demands specific knowledge as the calorie content is high and it has a strong influence on insulin through the blood sugar level.

To clarify the commercial interest in superfoods here are a few samples with an explanation to understand why these “superfoods” receive the attention they get. As much as available the content of the products is displayed here. With the actual nutritional components, it is possible to make a well-balanced conclusion of the real activity of a product. The principle of “food congruence” should be an important part of the decision to use the product.

Açai

Native to the rainforests of South America, the açai is a small purple berry that has been touted as a weight-loss and anti-aging aid. The fruit contains high levels of antioxidants in the form of anthocyanins, which said to help fight cancer and heart disease.

Serving Size: 1 oz	Total Carbohydrates 4.0 g
Calories 30.0	Dietary Fiber 1.0 g.
Total Fat 1.5 g	Sugar 3.0 g.

Goji Berries

They contain a lot of vitamin C. Native to Tibet and Inner Mongolia, these orange-red tangy berries have been used by Chinese herbalists for centuries to treat visual ailments and poor circulation and to help boost the immune system. Goji berries are rich in plant-based antioxidants and compounds.

Serving Size: 1 serving (10 g)	Calories from Fat 2 per serving Calories 32
Total Fat 0.18g Saturated Fat 0.023g Polyunsaturated Fat 0.083g Monounsaturated Fat 0.027g	Total Carbohydrate 6.92g Dietary Fiber 0.5g Sugars 5.46g
Sodium 19mg	Potassium 5 mg
Protein 1.41 g.	

Cacao/Cocoa Powder

Cacao powder contains flavonoids, which are known to help lower blood pressure and improve blood flow to the brain and heart. With fewer than 15 calories per tablespoon and containing almost no fat, cacao provides a strong chocolate flavor.

Serving Size: 1 tablespoon	Calories from Fat 7 / total Calories 12
Total Fat 0.74g Saturated Fat 0.436g Polyunsaturated Fat 0.024g Monounsaturated Fat 0.247g	Total Carbohydrate 2.93g Dietary Fiber 1.8g Sugars 0.09g
Potassium 82mg	Protein 1.06g

Seaweed

Sea-grown vegetables are high in omega-3 fatty acids, which may prevent sudden heart attack and stroke. Seaweed contains important minerals, such as calcium and magnesium, iron, potassium, iodine, and zinc. There are many different species of sea-weed with all different ingredients but like plants, the soil of growing is important for the development of content. As the content of the different species varies also the nutritional aspects do:

Serving Size: 1 cup	Calories from Fat 2 / total Calories 30
Total Fat 0.21g Saturated Fat 0.07g Polyunsaturated Fat 0.045g Monounsaturated Fat 0.028g	Total Carbohydrate 6.74g Dietary Fiber 0.6g 2% Sugars 0.4g
Sodium 71mg	Potassium 147mg
Protein 1.9g	

Chia Seeds

Chia seeds are high in omega-3 fatty acids, fiber, and calcium according to the commercial information. From fact sheets, we discover a difference.

Serving Size: 12g	Calories from Fat 36 / totalCalories 60
Total Fat 4g	
Total Carbohydrate 4g Dietary Fiber 4g	Protein 2g

Maca Powder

Grown in the Andes, Maca is a root vegetable that is picked, dried, and processed into a powder. Maca has been used to boost energy, endurance, and libido.

Maca contains:	
• carbohydrates – 50 gr / per 100 gr.	◦C17-1-9 heptadecenoic – 1.5%how maca works

• protein 11 gr / 100 gr • fiber – 8,5 gr / 100 gr •Essential Amino Acids: ◦Aspartic Acid – 97 mg/1 g proteinmaca nutrition facts ◦Glutamic acid – 156 mg/1 g protein ◦Serine – 50 mg/1 g protein ◦Histidine – 22 mg/1 g protein ◦Glycine – 68 mg/1 g protein ◦Arginine - 99.4 mg/ 1 g protein ◦Threonine – 33 mg/1 g protein ◦Alanine – 63 mg/1 g protein ◦Tyrosine – 31 mg/1 g protein ◦Phenylalanine – 55 mg/1 g protein ◦Valine – 79 mg/1 g protein ◦Methionine- 28 mg/1 g protein ◦Isoleucine – 47 mg/1 g protein ◦Leucine – 91 mg/1 g protein ◦Lysine – 55 mg/1 g protein ◦HO- Proline- 26 mg/1 g protein ◦Proline – .5mg/1 g protein ◦Sarcosine – .7mg/1 g protein •Free Fatty Acids: ◦C12-0 -lauric – 0.8% ◦C13-1-7 trideconoic – 0.3% ◦C13-0 tridecoanoic – 0.1% ◦C14-0 myrstic – 1.4% ◦C15-1-7 pentadecanoic – 0.5% ◦C16-1-9 palmtoleic – 2.7% ◦C16-0 palmitic – 23.8%	◦C17-0 heptadecanoic – 1.8% ◦C18-2-9-12 linoleic – 32.6% ◦C18-1-9 oleic – 11.1% ◦C18-0 steric – 6.7% ◦C19-1-11 nonadecenoic – 1.3% ◦C19-0 – nonadecanoic – 0.4% ◦C20-1-15 eisosenoic – 2.3% ◦C22-0 behanic 2.0 ◦C24-1-15 nervonic – 0.4% ◦C-24-0 lignocenic – 0.4% •Vitamins & minerals: ◦Thamin (B1) – 1mg/100g – ◦Riboflavin (B2) - .76mg/100g – ◦Ascorbic Acid (C) - – 3mg/100g – ◦Niacin 35mg/100g – ◦Calcium – 450mg/100g – ◦Phosphorus - 220mg/100g – ◦Magnesium – 104mg/100g – ◦Potassium – 1500mg/100g – ◦Sodium 25mg/100g – •Sterols - ◦Brassicasterol – 9.1% ◦Ergosterol – 13.6% ◦Campesterol – 27.3% ◦Ergostadienol – 4.5% ◦Sitoserol – 46.5%

Kefir

Kefir is an ancient drink that originated in Russia. Similar in taste to yogurt, kefir is made from fermented milk and is slightly sour. Its popularity has soared in recent years because of growing interest in probiotics, which are known to boost the immune system and support good digestive health. Kefir is considered to be high in proteins.

Serving Size: 1 cup	Calories from Fat 64 / total Calories 135
Total Fat 7.1g Saturated Fat 4.09g Polyunsaturated Fat 0.421g Monounsaturated Fat 1.785g	Total Carbohydrate 10.4g Sugars 11.96g
Cholesterol 22mg	Sodium 101mg
Potassium 330mg	Protein 7.43g

Hemp Seeds

Hemp seeds contain virtually no trace of the psychoactive ingredient THC. The seeds are high in protein and contain all essential amino acids needed for growth and repair. Hemp seeds have a high ratio of omega-6 and omega-3 fatty acids and are a good source of amino acids, magnesium, and potassium.

Serving Size: 30g	Calories from Fat 130 / total Calories 170
Total Fat 14g Saturated Fat 1g Polyunsaturated Fat 11g Monounsaturated Fat 2g	Total Carbohydrate 2g Dietary Fiber 1g Sugars 1g
Protein 10g	

Black Garlic

The black bulb is created by fermenting raw garlic through prolonged exposure to heat and humidity, giving it a sweet, mellow flavor and an inky hue. In addition to the sulfuric compounds that provide garlic with its suggested heart-healthy and anticancer benefits, the fermented cloves are a source of probiotics.

Serving Size: 15g	Calories from Fat 0 / total Calories 40
Total Carbohydrate 9 g	Sugars 5g
Protein 1g	

Kale

Kale contains iron, vitamins, fiber, antioxidants and those ingredients do support (make red blood cells; miscellaneous; help the poo; By weight, typical kale contains more calcium, vitamin B6 – and indeed calories – than typical cabbage, broccoli, brussels sprouts, spinach or carrots. Typical kale contains less vitamin A than carrots, less iron, magnesium or potassium than spinach and less fiber than brussels sprouts. The question does it suit the diet?

Serving Size 1 cup, chopped cooked with no fat (67 g)	Sodium 29mg
Potassium 328.97mg	Carbohydrates 7g
Dietary Fiber 1g	

Avocado:

It contains monounsaturated fat, which helps to protect the cardiovascular system.

Serving Size: 1 avocado around 150 gram	Calories from Fat 265, total calories 322
Total Fat 29.47g Saturated Fat 4.273g Polyunsaturated Fat 3.65g Monounsaturated Fat 19.696g	Total Carbohydrate 17.15g Dietary Fiber 13.5g Sugars 1.33g
Sodium 14mg	Potassium 975mg
Protein 4.02g	

In all cases there is a lot of “maybe”, “could be” and “possible” facts of the fruits and vegetables but hardly any has strong scientific evidence. Does this make it unreliable? No, it does not but it is proven that these products do not work for every person and that is why the random tests of modern science

cannot state the facts as they are. As mentioned before there must be a “food congruence” with the eater to make it work.

Health and superfoods are only that good when taken in the right season in the best possible combination for the body. It must be kept in mind that additional actions as heating, cooling, drying or even hydrating of the product can change the activity of content and total product. Synergetic combinations of food and fruit enhance the possible forces of nature and become strong supporters of health. Expert advice is needed when starting.

Lingzhi mushrooms

Lingzhi is a polypore mushroom that is soft (when fresh), corky, and flat, with a conspicuous red-varnished, kidney-shaped cap and, depending on specimen age, white to dull brown pores underneath. It lacks gills on its underside and releases its spores through fine pores, leading to its morphological classification as a polypore.

Because of its bitter taste, lingzhi is traditionally prepared as a hot water extract product. Thinly sliced or pulverized lingzhi (either fresh or dried) is added to a pot of boiling water, the water is then reduced to a simmer, and the pot is covered; the lingzhi is then simmered for two hours. The resulting liquid is fairly bitter in taste and dark, with the more active red lingzhi more bitter than the black. The process is sometimes repeated for additional concentration. Alternatively, it can be used as an ingredient in a formula decoction or used to make an extract (in liquid, capsule, or powder form). The more active red forms of lingzhi are far too bitter to be consumed in a soup.

The lingzhi mushroom is a species complex that encompasses several fungal species of the genus Ganoderma, most commonly the closely related species Ganoderma lucidum, Ganoderma tsugae, and Ganoderma lingzhi. G. lingzhi is frequently used in East Asia. The name of the Lingzhi fungus has a two-thousand-year-old history. The Chinese term lingzhi 靈芝 was first recorded during the Han dynasty (206 BC – 9 AD). Petter Adolf Karsten named the genus Ganoderma in 1881.

In the Chinese language, Lingzhi is made up of the compounds ling 灵 "spirit, spiritual; soul; miraculous; sacred; divine; mysterious; efficacious; effective" (cf. Lingyan Temple) and Zhi 芝 "(traditional) plant of longevity; fungus; seed; branch; mushroom; excrescence". Fabrizio Pregadio notes, "The term Zhi, which has no equivalent in Western languages, refers to a variety of supermundane substances often described as plants, fungi, or 'excrescences'." Zhi occurs in other Chinese plant names such as zhima 芝麻 "sesame" or "seed", and was anciently used a phonetic loan character for Zhi 芷 "Angelica iris". Chinese differentiates Ganoderma species between chizhi 赤芝 "red mushroom" G. lucidum and zizhi 紫芝 "purple mushroom" G. japonicum.

Japanese language Reishi 霊芝 is a Sino-Japanese loan word from lingzhi. This modern Japanese kanji 霊 is the shinjitai "new character form" for the kyūjitai "old character form" 靈. In Korean, it is called yeongji (영지; 靈芝). The word is cognate with Chinese língzhī (灵芝; 靈芝) and Japanese reishi (霊芝; れいし).

The first step is to use the fruit bodies, not the mycelium. Lingzhi / Reishi mycelium does not contain any triterpenes. Only the mushroom contains **triterpenes** which are why we use the mushrooms to make our extract. Because the levels of active compounds in Lingzhi / Reishi mushrooms can vary significantly from strain to strain within the species,

Mushroom Science also uses a two-step extraction process; first hot water extraction to extract the polysaccharides that contain the beta glucans, and then a second step using ethanol (alcohol) and hot water together to extract the triterpenes.

Researchers have identified three specific compounds that are essential to Lingzhi's powerful antioxidant and anti-aging effects:
1. Polysaccharides based on their ability to prevent abnormal blood vessel formation, and to boost immune system function.
2. Triterpenes protect the liver, lower blood pressure and cholesterol, prevent platelet clumping that leads to heart attack and stroke, fight allergic responses triggered by histamine, and also possess anticancer activity.
3. Ganoderma lucidum peptide is a unique protein that has remarkably potent antioxidant characteristics that are still being unraveled.

Lingzhi extracts work to lower blood sugar by several different mechanisms. **Lingzhi inhibits alpha-glucosidase, the chief enzyme responsible for digesting starches into sugars. This inhibition prevents the sharp after-meal spike in glucose that is so dangerous as we age.** They also limit the destruction caused by advanced glycation end products (AGEs), the proteins whose malfunction promotes aging and inflammation.

Scientists have suggested that beta-glucans, which are complex sugars found in Lingzhi, may also stop the growth and spread of cancer cells. The first book wholly devoted to medicinal herbs was Shen Nong Ben Cao Jing written in 25 to 220 AD. In it, it describes some health benefits of the Lingzhi.

Vaginal Infections and Sexually Transmitted Diseases
Lingzhi / Reishi (Ganoderma lucidum) is one of the primary herbs of choice in any immune deficiency disease. It possesses a broad spectrum of immunostimulating activities, as well as anti-inflammatory and antiallergenic properties. Lingzhi / Reishi contains more than 100 oxygenated triterpenes, many of which exhibit a marked effect on the activity of NK cells. It has been widely used for a variety of infectious diseases such as bronchitis and hepatitis. It stimulates phagocytosis, increases T-cell activity and is a treatment for viral hepatitis. Lingzhi / Reishi has been reported to increase CD4 cells in vivo. It is also used as an effective antidepressant.

Lingzhi / Reishi polysaccharide peptide (GI-PP) has demonstrated antitumor effects in mice and potential antiangiogenesis, a reduction of Bcl-2 antiapoptotic protein expression and an increase of Bax proapoptotic protein expression; therefore, inducing cell apoptosis might be one of the mechanisms of action in inhibition of human carcinoma cells.

High doses of GI-PP resulted in a decrease in the secreted vascular endothelial growth factor (VEGF). Taken together, these findings support the hypothesis that the key attribute of the antiangiogenic potential of GI-PP is that it may directly inhibit vascular endothelial cell proliferation or indirectly decrease growth factor expression of tumor cells.

It has been demonstrated that G. lucidum induces apoptosis, inhibits cell proliferation, and suppresses cell migration of highly invasive human prostate cancer cells PC-3. Experimental results on cell-mediated

immunity showed that G. lucidum could increase the percentage of CD5+, CD4+, and CD8+ T lymphocytes.

Experimental results on humoral immunity in horses showed that G. lucidum could help horses to produce a significantly higher quantity of specific antibodies in a shorter time. Although the pharmacology and clinical application of water extracts of G. lucidum have been extensively documented, little is known regarding its alcohol extract.

In the present study, the antitumor effect of an alcohol extract was investigated using MCF-7 breast cancer cells. The extract inhibited cell proliferation in a dose- and time-dependent manner, which might be mediated through upregulation of p21/Waf1 and downregulation of cyclin D1. Furthermore, this compound can directly induce apoptosis in MCF-7 cells, which might be mediated through the upregulation of a proapoptotic Bax protein and not by the immune system.

There are likely multiple mechanisms underlying the antitumor effects of G. lucidum. G. lucidum also demonstrated antioxidant activity, free-radical scavenging, and chelating abilities. No specific studies were identified on the use of G. lucidum for the treatment of HPV infection or cervical dysplasia; however, given the mechanisms of action of this herb, this may be a promising area of research and certainly merits consideration of this herb in an immune-enhancing protocol.

Resuming:

1. Lingzhi compounds, particularly the triterpenes and polysaccharides, limit tumors' growth rate by blocking the abnormal reproductive cycles of cancer cells.
2. Some of these compounds are directly toxic to cancer cells while sparing healthy tissue.
3. Lingzhi compounds inhibit metastatic processes and decrease the expression of genes involved in cancer cell survival, proliferation, invasion, and metastasis.
4. Lingzhi compounds also trigger the programmed cell death called apoptosis that's suppressed in malignant cells.
5. Protect cellular DNA from oxidant damage that causes aging and cancer.
6. Protect mitochondrial DNA and the mitochondria themselves from oxidant damage that weakens their energy-producing abilities and makes them inefficient, another major cause of aging.
7. Increase levels and activity of a large suite of natural intracellular antioxidant molecules, resulting in reduced oxidation of cell membranes and organelles that lead to aging and its related diseases.
8. Protect kidney tubule cells from oxidant damage that leads to kidney failure.
9. Increase expression of a key longevity gene and promote an increased lifespan in species ranging from yeasts to primitive worms, to mammals such as mice.
10. First, it can limit the size of the stroke-damaged area in the brain, which helps limit the behavioral and functional damage caused by the stroke.
11. Second, Lingzhi mushrooms protect brain tissue from hypoxia/reperfusion injury, the "one-two" punch of oxygen starvation followed by excessive oxidation that produces most of the damage in the brains of stroke victims.
12. Lingzhi extracts were found to stimulate the production of nerve growth factor, which in turn supports the rapid development of healthy neurons and enhances their mitochondrial function.

Lingzhi's powerful antioxidant and anti-inflammatory properties make these mushrooms attractive candidates for preventing neurodegenerative diseases such as Alzheimer's and Parkinson's.
The triterpenes and polysaccharides from the mushrooms reduce the oxidative impact of destructive proteins such as Amyloid-beta, the chief trigger of Alzheimer's disease and they protect brain cells from the inflammation known to cause Parkinson's disease. Studies reveal that supplementing with Lingzhi mushrooms has beneficial effects for stroke victims.

Together, all of these effects of Lingzhi mushrooms are shown to reduce the size and growth rates of human tumors, both in animals and in human clinical trials.

The most dramatic impact has been shown in colorectal cancer, which is the second leading cause of cancer death among cancers that affect both men and women. Clinical studies show that Lingzhi extracts suppress the development of adenomas, which are pre-malignant masses found in the large intestine. Lingzhi extracts inhibit the release of histamine from specialized immune cells called "mast cells." They have the ability to reduce the activity in nerves that transmit the itch sensation to the brain after a mosquito bite or similar itchy stimulus.

1. Eating Lingzhi Mushroom Will Boost Immunity
Lingzhi strengthens and reinforces our white blood cells. It stimulates a faster reaction time when the body detects bacteria and viruses. The bacteria are eliminated or neutralized before causing further harm to the body. Several types of research have proven the efficacy of Lingzhi in boosting the immunity.

In 2009, researchers were able to confirm that consuming Lingzhi can enhance the immune response of patients against infections.

2. Lingzhi Can Normalize High Blood Pressure
Researchers believe that the reason Lingzhi causes this is because of the presence of ganoderic acid B and C. Both these enzymes are known to inhibit the formation and synthesis of cholesterols in the blood vessels.

3. Lingzhi Can Improve Libido
One reason that the body's testosterone reserves go down is due to the metabolism of testosterone into dihydrotestosterone by the enzyme 5α-reductase. Lingzhi has the ability to inhibit this enzyme which results in an increase in a man's testosterone reserve. Lingzhi has the ability to suppress the enzyme 5α-reductase or the enzyme that breaks down testosterone into dihydrotestosterone.

4. Consuming Lingzhi Will Keep the Liver Healthy And Strong
Researches on Lingzhi or Ganoderma have shown that consuming Lingzhi can decrease the toxins that are in the liver. Over 30 scientific studies since 2000 have then proven the same. The same researches also showed that Lingzhi can increase the regeneration rate of the liver.

5. Lingzhi Helps In Cancer Management
Recent studies have shown that medicinal mushrooms can aid battle cancer because of the polysaccharides that have important benefits such as neuroprotective, anti-diabetes, radioprotective, antioxidant, anti-fatigue abilities and anti-osteoporosis.

Also, laboratory researches have shown that triterpenes in Lingzhi mushroom also have cancer-blocking properties. Triterpene molecules seem to impede or block tumor growth and reproduction by removing attachments of cancer cells to internal cells.

6. Balance the Hormones And Fight Diabetes With Lingzhi Mushrooms
Studies suggest that various anti-inflammatory and antioxidants compounds found in Lingzhi mushrooms modify the way that nerves transfer signals to the brain, boosting various functions within the central nervous systems and endocrine.

Lingzhi mushrooms have also been proven by various researches to inflict anti-diabetic effects and improve the lipid levels to prevent dyslipidemia. Positive effects on glucose levels can be seen as early as 12 weeks from the start of consuming Lingzhi.

7. Lingzhi Mushrooms Fight Asthma
The research found out that patients who drank Lingzhi tea can improve their response to cheaper medicines for asthma such as oral antihistamines, and even alone, the Lingzhi was able to improve the body's response to allergens.

8. Drinking Lingzhi Tea Can Help You Live Longer
The laboratory research in 2013 has found out that test subjects treated with Lingzhi based medications had a longer lifespan than those in the control group. The Lingzhi group consuming Lingzhi mushroom was able to live 9% to 20% longer than those that didn't.
Antioxidants present in Lingzhi mushrooms are believed to be responsible for this remarkable effect.

9. Lingzhi Mushrooms and Baldness
Androgenetic Alopecia is a natural process wherein men due to the decomposition of their testosterone go bald. It is neither harmful nor dangerous, however, it is sometimes a source of insecurity and social anxiety among men. Dihydrotestosterone (DHT) result when testosterone, the male sex hormone, is converted by the enzyme 5α-reductase. Men who are genetically prone to baldness have scalps that are sensitive to DHT

The results put Lingzhi on top of all the mushrooms tested. Lingzhi showed the highest percentage of 5α-reductase reduction, falling between 70 and 80%. For comparison, the next effective mushroom is Pleurotus osteratus, which showed an inhibitory percentage of around 60%.

11. Lingzhi Mushrooms Can Help With Arthritis
According to research, Lingzhi mushrooms have anti-inflammatory properties which can help prevent and alleviate the pain caused by rheumatoid and psoriatic arthritis. It does this by targeting the body's misfired autoimmune responses that cause inflammations.

12. Lingzhi Mushrooms Can Help at Weight loss
In a research done by the Memorial Sloan-Kettering Cancer Center in New York, Lingzhi mushrooms contain active components that can elevate metabolic rate. Increase metabolic rates result in the body using more energy, and the food digested more efficiently.

According to the Sloan-Kettering Cancer Center, Lingzhi mushroom supplements also have polysaccharides that serve as a powerful detoxifier. Polysaccharides also boost the natural healing

processes and are also believed to assist in digestion. Lingzhi improves the digestive system which can lead to a more efficient waste removal by the body and thus faster weight loss.

13. Lingzhi Mushrooms Prevent The Proliferation Of Sarcoma In The Human Body
Recent studies have found that the active ingredients in this mushroom play a major role in the death of sarcoma. This trial focused on mice injected with sarcoma cells to determine the effects of Lingzhi. The results showed that a higher dose of Lingzhi reduces the chances of death to a higher degree than any other form of treatment.

14. Lingzhi Mushroom Contains Powerful Anti-Inflammatory Properties
The lesser the secretion of cytokines, the better the chances of your immune system fighting chronic inflammation. Lingzhi mushrooms do this by activating NF-kappaB responses in the bloodstream, which result in reduced secretion of cytokines in the human body.

15. An Increased Intake Of Lingzhi Mushrooms Is Good For Cardiovascular Health
To evaluate the effectiveness of Lingzhi on the human cardiovascular system, 5 different trials on over 398 participants was conducted. From the results, it was concluded that a sufficient intake of Lingzhi mushrooms helps lower cholesterol levels, fasting plasma glucose, and triglyceride levels in the body. It also helps reduce symptoms of diabetes, specifically type 2 diabetes in certain patients.
Lingzhi also works as a powerful antioxidant to prevent chronic cardiovascular diseases caused by factors such as oxidative stress and inflammation.

"Chemical" supplements

What is called "Chemical"? These supplements passed one or more treatments other than mechanical heating, cooling, cleaning, shaking or smashing. These treatments can be mechanical or of pharmaceutical nature. The word does not imply "dangerous" or "medical". In fact, the word chemical is focused on "purity", "effective" and "target directed".

The commercial market is flushed with "nonsense" supplements. Only very few have actual active ingredients or a proven record. Before moving into the supplements details it is important to divide supplements into 2 main categories:

- voluntary supplements which are consumed by personal choice
- involuntary supplements are those who are added to the daily food and cannot be chosen, nor selected in free will

This needs clarification.

Supplements are an addition to normal food. For hundreds of years, people did add additives to food for different reasons. Ancestors used salt to preserve meats and fish, added herbs and spices to improve the flavor, preserved fruit with sugar, and pickled cucumbers in a vinegar solution. Today, consumers demand and enjoy a food supply that is full of flavor, nutritious, safe, convenient, colorful and affordable. These products are called: Food additives. A food additive is a (chemical or natural) product that is added to your food for mentioned reasons. The following table gives an impression of when and where they are used:

Types of Ingredients	What They Do	Examples of Uses	Names Found on Product Labels
Preservatives	Prevent food spoilage from bacteria, molds, fungi, or yeast (antimicrobials); slow or prevent changes in color, flavor, or texture and delay rancidity (antioxidants); maintain freshness	Fruit sauces and jellies, beverages, baked goods, cured meats, oils and margarine, cereals, dressings, snack foods, fruits, and vegetables	Ascorbic acid, citric acid, sodium benzoate, calcium propionate, sodium erythorbate, sodium nitrite, calcium sorbate, potassium sorbate, BHA, BHT, EDTA, tocopherols (Vitamin E)
Sweeteners	Add sweetness with or without the extra calories	Beverages, baked goods, confections, table-top sugar, substitutes, many processed foods	Sucrose (sugar), glucose, fructose, sorbitol, mannitol, corn syrup, high fructose corn syrup, saccharin, aspartame, sucralose, acesulfame potassium (acesulfame-K), neotame
Color Additives	Offset color loss due to exposure to light, air, temperature extremes, moisture and storage conditions; correct natural variations in color; enhance colors that occur naturally; provide color to colorless and "fun" foods	Many processed foods, (candies, snack foods margarine, cheese, soft drinks, jams/jellies, gelatins, pudding and pie fillings)	FD&C Blue Nos. 1 and 2, FD&C Green No. 3, FD&C Red Nos. 3 and 40, FD&C Yellow Nos. 5 and 6, Orange B, Citrus Red No. 2, annatto extract, beta-carotene, grape skin extract, cochineal extract or carmine, paprika oleoresin, caramel color, fruit and vegetable juices, saffron (Note: Exempt color additives are not required to be declared by name on labels but may be declared simply as colorings or color added)
Flavors and Spices	Add specific flavors (natural and synthetic)	Pudding and pie fillings, gelatin dessert mixes, cake mixes, salad dressings, candies, soft drinks, ice cream, BBQ sauce	Natural flavoring, artificial flavor, and spices
Flavor Enhancers	Enhance flavors already present in foods (without providing their own separate flavor)	Many processed foods	Monosodium glutamate (MSG), hydrolyzed soy protein, autolyzed yeast extract, disodium guanylate or inosinate
Fat Replacers (and components of formulations used to replace fats)	Provide expected texture and a creamy "mouth-feel" in reduced-fat foods	Baked goods, dressings, frozen desserts, confections, cake and dessert mixes, dairy products	Olestra, cellulose gel, carrageenan, polydextrose, modified food starch, microparticulated egg white protein, guar gum, xanthan gum, whey protein concentrate
Nutrients	Replace vitamins and minerals lost in processing	Flour, bread, cereals, rice, macaroni,	Thiamine hydrochloride, riboflavin (Vitamin B_2), niacin, niacinamide,

Types of Ingredients	What They Do	Examples of Uses	Names Found on Product Labels
	(enrichment), add nutrients that may be lacking in the diet (fortification)	margarine, salt, milk, fruit beverages, energy bars, instant breakfast drinks	folate or folic acid, beta-carotene, potassium iodide, iron or ferrous sulfate, alpha tocopherols, ascorbic acid, Vitamin D, amino acids (L-tryptophan, L-lysine, L-leucine, L-methionine)
Emulsifiers	Allow smooth mixing of ingredients, prevent separation Keep emulsified products stable, reduce stickiness, control crystallization, keep ingredients dispersed, and to help products dissolve more easily	Salad dressings, peanut butter, chocolate, margarine, frozen desserts	Soy lecithin, mono- and diglycerides, egg yolks, polysorbates, sorbitan monostearate
Stabilizers and Thickeners, Binders, Texturizers	Produce uniform texture, improve "mouth-feel"	Frozen desserts, dairy products, cakes, pudding and gelatin mixes, dressings, jams and jellies, sauces	Gelatin, pectin, guar gum, carrageenan, xanthan gum, whey
pH Control Agents and acidulants	Control acidity and alkalinity, prevent spoilage	Beverages, frozen desserts, chocolate, low acid canned foods, baking powder	Lactic acid, citric acid, ammonium hydroxide, sodium carbonate
Leavening Agents	Promote rising of baked goods	Bread and other baked goods	Baking soda, monocalcium phosphate, calcium carbonate
Anti-caking agents	Keep powdered foods free-flowing, prevent moisture absorption	Salt, baking powder, confectioner's sugar	Calcium silicate, iron ammonium citrate, silicon dioxide
Humectants	Retain moisture	Shredded coconut, marshmallows, soft candies, confections	Glycerin, sorbitol
Yeast Nutrients	Promote growth of yeast	Bread and other baked goods	Calcium sulfate, ammonium phosphate
Dough Strengtheners and Conditioners	Produce more stable dough	Bread and other baked goods	Ammonium sulfate, azodicarbonamide, L-cysteine
Firming Agents	Maintain crispness and firmness	Processed fruits and vegetables	Calcium chloride, calcium lactate
Enzyme Preparations	Modify proteins, polysaccharides, and fats	Cheese, dairy products, meat	Enzymes, lactase, papain, rennet, chymosin

Types of Ingredients	What They Do	Examples of Uses	Names Found on Product Labels
Gases	Serve as a propellant, aerate, or create carbonation	Oil cooking spray, whipped cream, carbonated beverages	Carbon dioxide, nitrous oxide

All products mentioned in this book (enzymes, vitamins, minerals etc.) are also used as food additives. This is something of consideration when a person wishes to add supplements to the daily routines. Additives can hardly be avoided but are active elements in the food which play a role in digestion. But are they really needed in the food? What is their function?

Following are some reasons why ingredients are added to foods:

1. To Maintain or Improve Safety and Freshness: Preservatives slow product spoilage caused by mold, air, bacteria, fungi or yeast. In addition to maintaining the quality of the food, they help control contamination that can cause foodborne illness, including life-threatening botulism. One group of preservatives -- antioxidants -- prevents fats and oils and the foods containing them from becoming rancid or developing an off-flavor. They also prevent cut fresh fruits such as apples from turning brown when exposed to air.

2. To Improve or Maintain Nutritional Value: Vitamins and minerals (and fiber) are added to many foods to make up for those lacking in a person's diet or lost in processing, or to enhance the nutritional quality of a food. Such fortification and enrichment have helped reduce malnutrition in the worldwide. All products containing added nutrients must be appropriately labeled.

3. Improve Taste, Texture, and Appearance: Spices, natural and artificial flavors, and sweeteners are added to enhance the taste of food. Food colors maintain or improve appearance. Emulsifiers, stabilizers, and thickeners give foods the texture and consistency consumers expect. Leavening agents allow baked goods to rise during baking. Some additives help control the acidity and alkalinity of foods, while other ingredients help maintain the taste and appeal of foods with reduced fat content.

Again it is important to divide the additional products into two categories:
Direct food additives are those that are added to a food for a specific purpose in that food. Most direct additives are identified on the ingredient label of foods.

Indirect food additives are those that become part of the food in trace amounts due to its packaging, storage or another handling. For instance, minute amounts of packaging substances find their way into foods during storage. A good sample is a plastic in the water of plastic water bottles sold worldwide.

Beside needed additives, for mentioned reasons, there are a lot of fun additives such as:
Color additives are used in foods for many reasons:
1) to offset color loss due to exposure to light, air, temperature extremes, moisture and storage conditions;
2) to correct natural variations in color;
3) to enhance colors that occur naturally; and
4) to provide color to colorless and "fun" foods.
Without color additives, cola wouldn't be brown, margarine wouldn't be yellow and mint ice cream wouldn't be green. Color additives are now recognized as an important part of practically all processed

foods to eat. Food additives have been a topic of public debate at many times all over the world. In general, it is possible to say that they are safe to use. There are rare cases of allergies and irritations

Food additives become important when they are used to fortify food. As defined by the World Health Organization (WHO) fortification refers to "the practice of deliberately increasing the content of an essential micronutrient, ie. vitamins and minerals (including trace elements) in a food irrespective of whether the nutrients were originally in the food before processing or not, to improve the nutritional quality of the food supply and to provide a public health benefit with minimal risk to health ", whereas enrichment is defined as " synonymous with fortification and refers to the addition of micronutrients to a food which is lost during processing

This implies they are added for “health” reasons to make foods more attractive for the health conscious buyer. Suddenly the additive becomes a fortification. This interferes in supplementation habits. Using fortified foods and supplements lead to overdoses of certain ingredients. Before combining it is important to make doses calculation. Make sure to know what is added to the fortified food products.

A little history is a place here. There are a lot of misconceptions about food supplements. The origin of these supplements is not the health business as they often claim. Body Building made the use of supplements common good. End 50’s and during the ‘60’s the first supplements appeared in the USA and Russia. It was only in the early 70’s that the first supplements did enter the market in Europe and even later in Asia and Africa.

Bodybuilding slowly came into fashion. Movies did promote the male physic as superior with bulky muscles, wide shoulders and strong bulky arms. Atlas was the sample and many males started to dream of being the man in the picture. All around the world “hardcore” gyms sprung up and competitions evolved. A psychological part of interest is the fact that it is the male who have specific male-look preferences, not the female. Body Building is a strong personal choice.

Each training was heavy. Maximum repetitions and power were the rules. The body needed fast recuperation for the next day. Interested scientist discovered the use of proteins, vitamins & minerals and many other products. A new market was born. Due to a relative exploding market, the developments of production went faster than the actual science developed. Most supplements did enter the market without proper evidence or even quality control. Bodybuilders became the new group guinea pigs of the pharmaceutical industry. One after the other products were launched. Beautiful names with even more commercial promising texts and pretentions entered the retail market. The supplement business was born out of profit and marketing.

Slowly but steady the evidence developed that some products did have an effect on the body. Bodybuilding did proof it by trial and error. Effects could be measured. But Bodybuilding was a small market. When the evidence was collected the industry did move into the health market and for the first time products did enter the standard consumer market with health claims and became competition for traditional markets such as homeopathy, Chinese Traditional Medicine, Ayurveda and local herb dealers.

To protect the traditional existing market Governments were requested to start making laws and rules & regulations which all favored the established pharmaceutical produced products.

Before starting with the use of supplements it is important to understand some professional terminology in this field of practice;

1 / Recommended Daily Allowance (RDA)
One hundred percent RDA is the full amount recommended by the National responsible authorities of the ingredient from the supplement. The recommended daily allowance is set to number/amounts of product that is considered safe with no side effects. It is a general statement and not an individual subscription. Sometimes the individual doses can be higher or lower.

2 / Serving size; this is the suggested doses of the product. All other ingredient facts refer to this.

3 / Information on nutrients when they are present in significant levels, such as vitamins A and C, calcium, iron, and sodium, and the percent Daily Value recommendation for consumption where a reference has been established.

4 / All other dietary ingredients present in the product, including botanicals and amino acids, for which no Daily Value has been established. They must be listed below those with a DV separated by a bar. The quantity present in each ingredient must be listed and they must be identified as having no DV.
5 / Herbal products must be identified by the common or usual name and the part of the plant used to make the supplement (such as root, stem or leaf). If the common or usual name is not listed in the Herbs for Commerce publishing, the Latin binomial name such as Tacoma mollis.HBK or Cecropia obstusifolia Bert. must be listed.

6 / Proprietary blends may be listed with the weights given for the total blend only. When this is done, components of the blend must be listed in descending order of predominance by weight.

Dosage units are listed as
•liquid volume (ml or milliliters, cc for cubic centimeters)
•dry weight (kg or kilograms, mg or milligrams, g or grams)
•or by biological assay (International Units)

An international unit (I.U.) is a standard unit of measurement of biological activity that is used for fat-soluble vitamins (A, D and E) as well as for some hormones, enzymes, and vaccines. It is an internationally-recognized standard established by the International Conference for Unification of Formulae. One I.U. represents a different amount for different substances. The weight equivalents for fat-soluble vitamins are as follows:

Beta Carotene
(Vitamin A) 1 mg = 833 IU
Vitamin D 2.5 mcg = 100 IU
Vitamin E 1 mg = 1 IU

Every substance disintegrates, or becomes less potent, with time. Manufacturers sometimes intentionally make substances more potent than labeled in order to compensate for their disintegration and to give the product a longer shelf life. This is called building in an overage. Both the disintegration rate and the overage built in to offset disintegration can cause further variances between a product's actual and labeled dosage amounts.

An expiration date indicates the date after which a product may no longer contain the labeled potency levels. This date reflects the disintegration rate of its ingredients as well as any overage built into the product. For professionals, the products are still useful until 2 / 3 years after the expirations date. Check content for contaminations. If a product has been opened and air has been in contact with the product, it is safety standard to dispose of this products at least a maximum of 6 months after opening. Stickering the product on the day of opening is handy for administrative purpose and keeps the daily practice safe.

Quality manufacturers include a lot number on all their products. Lot numbers are used to trace a product's journey through the supply chain so that the origin of its ingredients can be determined. This is useful for checking the quality of the product or in the rare event that a product needs to be recalled.

Some labels contain a claim that a product meets a certain level of dissolution or bioavailability or that it is certified for a dissolution standard such as USP. Dissolution is the portion of an ingredient, usually expressed as a percentage, that dissolves in the human digestive tract, thereby making it available for absorption in the body.

Bioavailability (absorption) is a measure of the digestibility of a dietary supplement into the bloodstream. The combined effect of dissolution and absorption determines how much of a consumed ingredient ends up in the bloodstream.

Bioavailability is important because it indicates the degree to which consumption of a substance affects the level (status) of that substance in the body. A substance with poor bioavailability could have little or no impact and therefore provide no benefit

Age-related doses
The same doses of protein that produce increased muscle protein synthesis in younger people often fail to do it in older people. Older people appear to absorb protein differently than their younger peers. One example of this is that older people absorb more protein when eating fewer meals, while younger people absorb more protein from more frequent meals. Several researchers have suggested that because of the increased difficulty older people have in absorbing and using food protein, they should choose higher-quality protein sources that are easier for the body to digest and absorb.

Douglas Paddon-Jones, Ph.D., a professor in the department of nutrition and metabolism at the University of Texas Medical Branch in Galveston, says his research shows that for people who are inactive, muscle loss can begin much earlier in middle age. Pair inactivity with low protein intake and continued muscle loss with age is inevitable.

"The combination of resistance exercises, such as lifting weights or push-ups, and higher protein intakes appear to protect muscle and strength, even during weight loss," says Donald Layman, Ph.D., a protein researcher and professor emeritus in the department of food science and human nutrition at the University of Illinois. He believes that getting high-quality protein can benefit the aging process.

Protein compared to age/body weight for a medium active male person

Male	40	50	60	70	80	90	100	Body Weight in KG

30	80	100	120	140	160	180	200	
40	70	85	100	120	135	150	170	
50	60	75	90	105	120	135	150	
60	60	75	90	105	120	135	150	
70	60	75	90	105	120	135	150	
80	50	60	70	80	90	100	110	
90	40	50	60	70	80	90	100	
Age								

Protein compared to age/body weight for a medium active female person

Female	40	50	60	70	80	Body Weight in KG
30	60	75	90	105	120	
40	60	75	90	105	120	
50	60	75	90	105	120	
60	50	60	70	80	90	
70	40	50	60	70	80	
80	40	50	60	70	80	
90	40	50	60	70	80	
Age						

1) Being metabolically active, muscle burns up calories as it requires energy for movement, stability, thermogenesis. The more muscle available and the more they move, the greater the metabolic demand on the body. This means resting metabolism is higher, resulting in a higher threshold before incoming excess calories are stored as fat for a rainy day.

2) Blood sugar control; The more muscle around the greater the storage area is for glucose to be taken out of the bloodstream and stored in the right places, this helps keep blood sugar levels in check. When a muscle is lost and fat gained during aging, this has a double whammy effect on blood sugar control as there's less muscle to store glucose but more fat that can interfere with insulin sensitivity. This can increase the risk of diabetes and other lifestyle-based health conditions as we age.

Recommendation list supplements, this list does not have the pretention to be complete but all selected are special for the target group over 50. Most important is the search for the highest possible bio-availability of a product and not the chemical cheap productions. This demands the knowledge mentioned in former chapters of this book.

Product	Group	Effect
Vitamin B12	Single vitamin	B12 is important for creating red blood cells and DNA, and for maintaining healthy nerve function.
Vitamin D		Vitamin D helps the body absorb calcium, maintain bone density, and prevent osteoporosis
Vitamin E		This is known as the vitamin for older people because it prevents the formation of free radicals and increases

		stress resistance thus improving blood circulation. Vitamin E, being a natural antioxidant, strengthens the heart and increases oxygenation of the cells and tissues and prevents quick oxidation.
Vitamin C		Responsible for fighting against premature aging of the cells by strengthening an intercellular element known as collagen. Capillaries carry nutritive substances and oxygen to the cells in the body. Hence, if these capillary walls are strong more oxygen can be carried to the cells.
Vitamin A		Increases and improves cell oxygenation. Eating foods like carrots, fish liver oils, leafy and green vegetables along with tomatoes that are rich in Vitamin A is highly recommended
Folate/Folic Acid		Reduced consumption of this all-important B vitamin may cause anemia. Older people who don't take fruits and vegetables or alternative fortified breakfast cereals could be falling short.
Vitamin D3		Vitamin D is essential for the absorption of calcium and for processing it into the bone. The Journal of Clinical Endocrinology and Metabolism confirms that over half the women involved in the treatment or prevention of osteoporosis are vitamin D deficient.
Vitamin B	Multivitamins	This comprises a group of around 20 different vitamins, some of which play a major role in combating the process of aging. Vitamin B1 takes care of the nervous system and the heart. Niacin, which is another part of the vitamin B group, protects the body against strokes and heart attacks. Pantothenic combats infection and produces increased levels of cortisone. B15 is responsible for lowering the oxygen supply to the body, especially for those living in areas where there is severe air pollution. It also fights against carbon monoxide that affects the lungs. Folic acid reduces the risk of high blood pressure by relaxing the blood vessels. Lecithin is the primary component of nerve and brain tissues. It is capable of preventing heart diseases that are caused due to atherosclerosis by destroying the heavy deposits of cholesterol in the arteries. Besides this, it also contains vital vitamins like D, E, K, and B.
Vitamin P (Flavonoids)		Like the above-mentioned vitamins, this is one of the most popular supplements for older people. It is a bio-flavonoid and also a co-vitamin of vitamin C and ascorbic acid. It is effective when taken along with Vitamin C supplements. It is effective in strengthening blood capillaries and regulating their permeability.

Potassium	Minerals	Getting enough potassium in the daily diet helps to keep bones strong. This essential mineral is vital for cell function and has also been shown to help reduce high blood pressure and the risk of kidney stones
Magnesium		Magnesium plays a crucial role in some 300 different physiological processes. Getting enough can help keep the immune system in top shape, the heart healthy, and bones strong. Many whole foods, including vegetables, contain magnesium. The recommended amount for adults under 65 years old is 300mg for men and 270mg for women. Older people may need more.
Zinc		Oregon State University's Linus Pauling Institute and College of Public Health and Human Sciences suggests that zinc deficiency may lead to immune system decline and increased inflammation associated with many health problems, including cancer, heart disease, autoimmune disease, and diabetes. Because older patients tend to consume less zinc and also appear to absorb less of what they do consume, it's important for older adults to pay closer attention to their zinc intake.
Iron		Iron-deficiency is suspected when the serum ferritin is less than 15 ng/mL. Locating the source of bleeding is successful in many patients, but in as many as 40 percents of cases, the source of bleeding is not found
Selenium		The claim: taking a 50 mcg nutritional supplement daily can improve vision. The truth: According to Chew, selenium is another form of antioxidant that has not yet been studied. "We do know that we haven't found nutrients that can turn vision loss around completely," said Chew. "So be cautious about supplements that say they can protect against an eye disease.". Lutein is known for its strength on combating visual imperative.
• histidine • isoleucine • leucine • valine • lysine • methionine • phenylalanine • threonine • tryptophan • glutamine		Amino acids /proteins Essential Amino Acid Supplements and the Elderly Researchers (Elena Volpi, Histamine Kobayashi, et al) published a report in The American Journal of Clinical Nutrition where they examined the amino acids responsible for stimulating muscle protein in elderly people. Healthy elderly subjects were chosen and given essential amino acid supplements. Sources: ttp://www.ncbi.nlm.nih.gov/pmc/articles/PMC3192452/ Powder / Liquid
Glutamine		Glutamine is an α-amino acid that is used in the biosynthesis of proteins. Its side chain is similar to that of

		glutamic acid, except the carboxylic acid group is replaced by an amide. It is classified as a charge-neutral, polar amino acid. Glutamine is the most abundant amino acid found in blood plasma. It is a major transporter of nitrogen from sites of glutamine synthesis (skeletal muscle, liver, lung) to sites of utilization, including kidney, intestine, neurons, cells of the immune system and, under appropriate conditions of acid-base balance, liver. Given the importance of plasma glutamine to cell function, dietary supplementation or parenteral nutrition can improve the outcome for critically ill patients, postsurgical patients or those recovering from injury.
BCAA		The branched-chain amino acids (BCAAs) are leucine, valine, and isoleucine. Leucine plays an important role in muscle protein synthesis, while isoleucine induces glucose uptake into cells.
EAA		The Essential Amino Acids are the BCAAs (leucine, isoleucine, and valine), histidine, lysine, methionine, phenylalanine, threonine, tryptophan. All of which cannot be produced by the body, so you must get them in the diet.
Fiber		Fiber helps promote healthy digestion by moving foods through the digestive tract. Foods rich in fiber, including whole grains, beans, fruits
Omega-3 Fats		These unsaturated fats, found primarily in fish, have a wide range of benefits, including possibly reducing symptoms in rheumatoid arthritis and slowing the progression of age-related macular degeneration (AMD),
Glucosamine Sulfate Chondroitin MSN		Glucosamine sulfate is a naturally occurring compound found in the body; it helps make up the fluid that surrounds and cushions joints. Only the liquid showed clear measurable results. Pill, capsule, and powders had a too high loss of content to be measurably effective.
Coenzyme Q10 (CoQ10)		CoQ10 is one of the most important antioxidants in the body. Levels decrease with age, so supplementing with it may help prevent the onset of cardiovascular disease. While more research is needed in this area, supplementing with 100-200 milligrams of CoQ10 per day may help offset the natural decline in levels and support heart health. Hobson notes that ubiquinol – a form of CoQ10 - can also be particularly beneficial, especially if you're taking statins. "Statins lower CoQ10 levels as its production shares the same pathway as cholesterol. Cholesterol's also required to transport CoQ10," he explains.

Carnitine		Carnitine works hand-in-hand with a metabolic enzyme called CrAT to improve exercise tolerance and stamina, according to the animal study. It plays a critical role in energy production. It transports long-chain fatty acids into the mitochondria so they can be oxidized ("burned") to produce energy.
Fish oils		Fish oils may have some benefit for rheumatoid arthritis, so eat fish at least twice a week, or see your GP or an Accredited Practising Dietitian to discuss how your diet could help manage or alleviate discomfort from arthritis.
HMB		The leucine metabolite beta-hydroxy-beta-methyl butyrate (HMB) has been extensively used as an ergogenic aid; particularly among bodybuilders and strength/power athletes, who use it to promote exercise performance and skeletal muscle hypertrophy. HMB is a precursor to the rate-limiting enzyme to cholesterol synthesis HMG-coenzyme A reductase. HMB may also directly stimulate protein synthesis, through a mTOR dependent mechanism.
GABA		GABA is synthesized by an enzyme called GAD from the amino acid glutamate in nerve cells and in the insulin-producing beta cells in pancreatic islets. GABA (γ-aminobutyric acid; 4-aminobutyric acid) is an inhibitory amino acid neurotransmitter. GABA acts as a trophic factor to modulate several essential developmental processes including neuronal proliferation, migration, and differentiation. In the adult brain, GABA usually induces hyperpolarization of neuronal membranes (which decreases neuronal excitability), in the juvenile brain GABA is depolarizing, it brings the neuronal membrane closer to the firing threshold, often enabling action potentials to be triggered. There has been a link between GABA and type 2 GABA is important for maintaining and potentially also in the making of new beta cells.
Creatine		Creatine itself can be phosphorylated into phosphocreatine with the addition of a phosphate ion take from ATP. Phosphocreatine comes into play by essentially acting as a phosphate store for when energy demands are high. At some point during the exercise, ATP is being reduced to ADP faster than ADP is restored to ATP. Our total ATP concentration is falling and thus so is our available energy. In the muscle, phosphocreatine is stripped of its precious phosphate which is then attached to a wandering ADP molecule. This provides a fresh new ATP molecule to power a cellular process.

Green Tea	Herbal	Green tea is full of compounds with antioxidant activity. Tea consumption has been associated with decreased cardiovascular risk, and regular, frequent consumption of green tea—defined as three or more cups daily—potentially lowers the risk of heart attacks. The potent antioxidant properties of polyphenols found in green tea help to reduce free-radical damage to cells and prevent the oxidation of low-density lipoproteins (LDL), inhibiting the production of plaque in the walls of the arteries.
Spirulina		Spirulina is a rich source of chlorophyll, serine, sylvite and vitamin B6 which help to lower blood pressure, decrease blood glutinousness, and maintain the softness of blood vessels. Spirulina is an excellent source of gamma-linolenic acid (GLA), which is beneficial in reducing cholesterol in the blood and to prevent heart disease and stroke.
Bilberry, Extracyan		Extracted from fermented Bilberry, Extracyan slows down the development of atherosclerotic lesions and protects the cardiovascular system
Ginko Biloba		Ginko Biloba is an ancient Chinese herb with a long history of supporting the brain. The Aging and Memory Research Center at the UCLA Neuropsychiatric Institute recently conducted a study that showed significant improvement in verbal recall among study participants with age-associated memory loss who took Ginko Biloba for six months. Mayo Clinic studies confirm that early evidence shows Ginko can improve memory, help with aging eyes, and reduce organ damage from chemotherapy.
Turmeric		The claim: two 500 mg capsules twice a day will help protect against cataracts. The truth: While many people have reported better eyesight from taking turmeric supplements or from having a diet high in turmeric, the effects of the nutrient on eye health has not been studied in humans, said, Stout. And while there may be benefits from taking antioxidants such as turmeric, Stout again cautioned against believing supplements with antioxidants work. "Somewhere, all of these supplements hang their hats on the antioxidant peg," said Stout, "but don't think that just because the nutrient is an antioxidant, it must be good."
Lutein		Unlike other nutrients, although found in the eye, Lutein is not produced in the body and can only be found through the nutrient in foods and in supplements. Other supplements in the AREDS2 trial include Xeoxanthin, and Omega-3 fatty acids.

All information is abbreviated and can only be used as a guideline for further research.

If the use of dietary supplements is considered the following rules should be followed:

•Learn. Find out as much as possible about any dietary supplement considered. Talk to the doctor, pharmacist, or registered dietitian. When reading fact sheets or checking websites, be aware of the source of the information. Could the writer or group profit from the sale of a particular supplement? Read more about choosing reliable health information websites. Even with decennia of experience in research and application, supplement marketing can be convincing but fake. Be aware.

•Remember. Just because something is said to be “natural” doesn’t mean it is safe or good. It could have side effects. It might make taken medicines either weaker or stronger. It could also be harmful with certain medical conditions. It is said that snake poison can be a treatment but also a certain death.

•Consult and inform the treating doctor.

•Buy wisely. Don’t buy dietary supplements with ingredients which are not needed. Don’t assume that more is better. It is possible to waste money on unneeded supplements. Internet buying is risky and without any guarantee. The risk of buying fake products is over 70%.

•Check the science. Make sure any claim about a dietary supplement is based on scientific proof. The company making the dietary supplement should be able to send information on the safety and/or effectiveness of the ingredients in a product. Remember, if something sounds too good to be true, it probably is.

Who needs supplements?
In generally when eating healthy and in a variety of foods, including fruits, vegetables, whole grains, legumes, low-fat dairy products, lean meats and fish, it is very likely that there is no need for supplements. But supplements — or fortified foods — might be appropriate in some situations:

•Women who may become pregnant should get 400 micrograms a day of folic acid from fortified foods or supplements, in addition to eating foods that naturally contain folate.
•Women who are pregnant should take a prenatal vitamin that includes iron or a separate iron supplement.
•Adults age 50 or older should eat foods fortified with vitamin B-12, such as fortified cereals, or take a multivitamin that contains B-12 or a separate B-12 supplement.
•Adults age 65 and older should take 800 international units of vitamin D daily to reduce the risk of falls.

Dietary supplements also may be appropriate if (samples, only personal consultation can be accurate) :
•Don't eat well or consume fewer calories than needed
•Is a vegan or a vegetarian who eats a limited variety of foods
•Follow any other type of diet that restricts an entire category of foods
•Don't obtain two to three servings a week of seafood, which supplies omega-3 fatty acids for heart health
•Have limited milk intake due to lactose intolerance or milk allergy, or simply don't consume enough dairy foods
•Have heavy bleeding during your menstrual period

•Have a medical condition that affects how the body absorbs or uses nutrients, such as chronic diarrhea, food allergies, food intolerance, or a disease of the liver, gallbladder, intestines or pancreas
•Have had surgery on the digestive tract and are not able to digest and absorb nutrients properly

- have had a chemo for cancer treatment
- working in a heavy physical job
- being under stress for a long period of time
- do regular exercise with high intensity

After 60 many people start to lose weight. This account mainly for people who had a steady weight during their lifetime. It does not count if a person is obese or overweighed. If so other rules come into effect.

Eat Frequently
One of the first things a senior or elderly individual should do in trying to gain weight is to eat more often. Aim for five or six small meals interspersed throughout the day, with no more than three or four hours apart. Take breakfast, lunch, and dinner at the normal times, but work in high-energy snacks like cheese and crackers, nut butter spread on fruit, granola or protein bars, smoothies, ready-to-eat cereal with milk or seeds like sunflower seeds in-between meals. Losing weight for most elderly can be dangerous. It is important to keep a steady (normal) weight during aging.

Choose Nutrient-Dense Foods
It's not a good idea trying to gain weight by eating high-calorie, high-fat foods. Fast food and processed or prepackaged foods like chips or pizza contain a large amount of saturated fat, trans fats, sodium, and cholesterol. Instead, fill the meals with whole grains, low- or non-fat dairy products, nuts, seeds, fruits, vegetables and lean proteins like poultry, seafood, lean meat cuts or beans and legumes.

Make Drinks Count
It's good for a senior or elderly individual to drink plenty of liquid every day, beverages are an easy way to add more calories to an underweight person's diet. Juice, low- or non-fat milk, smoothies, and shakes are all good ways to increase the caloric intake without adding in too much fat. Try adding ground flaxseed, nut butter, wheat germ or protein powder into smoothies and shakes. Be sure to not drink any of these calorie-dense beverages with a meal since they may fill up and keep from eating as much as needed.

Exercise
Most people probably think of regular exercise as a way to lose weight, not to gain it. But exercise can help seniors and elderly individuals gain weight by building up lean muscle mass and stimulating appetite. Any physical activity is good, but strength training in particular help to build muscles and lead to weight gain. Aim to exercise for three to five days each week, but talk to the doctor before starting an exercise plan if being a senior or elderly person with any type of health condition

There are many reasons for wanting to build muscle while getting older, but four stand out.

- More muscle in the legs and hips gives a better balance, which reduces the chances of falling
- If falling down, the more muscle surrounding the bones, the less likely they break
- The more muscle the stronger the bones are. The very existence of muscle in the body puts tension on the bones, which causes them to strengthen.

- Lack of strength compromises the quality of life while aging. Having sufficient muscle and strength keeps without assistance and a happy healthy life.

Sarcopenia
While aging muscle is lost in an accelerated rate, through a process known as sarcopenia. This is part of the aging process all have to go through, but factors such reduced levels of physical activity, poor diet, lower protein intake and poor anabolic response to food and exercise increases the speed and severity of this muscle loss.

The loss of muscle from sarcopenia, and in turn the corresponding loss of strength has a strong effect on quality of life making daily tasks more difficult, resulting in even less physical activity and the cycle continues. A reduction in strength increases the risk of falls and in turn, increases the mortality rate. Two factors that are associated with increased risk of mortality are:

1) Length of time spent sat down each day.
2) A person's ability to help them self-off the floor unaided.

Maintaining muscle as while aging is a hugely important aspect of health that often goes un-talked about, but the health and social benefits to maintaining strength and muscle as while getting older are priceless.

Sarcopenia affects both of these, preventing muscle loss and increasing muscle mass as while aging increases life expectancy and quality. It is said that when young the training is to look big and ripped, but it is also going to keep personal life for longer, healthier and happier as getting older.

Sarcobesity
Sarcobesity (or sarcopenic obesity) is a similar process to sarcopenia and involves losing muscle and gaining fat. This is a real problem, not only for the way of the looks only but to health too.

Background and aim
Older people with hip fractures are often malnourished at the time of their fracture and many have poor food intake while in hospital. Malnutrition may hinder recovery after hip fracture.

Use less salt
Everyone requires a certain amount of salt, but too much can increase the risk of high blood pressure and heart disease.

Building strength takes years, not weeks or months. It is an act of discipline and must be earned through a commitment to hard training and a good diet.

Calorie restriction and mTOR activity and aging It is hypothesized that some dietary regimes, like caloric restriction (CR) and methionine restriction, cause lifespan extension by decreasing mTOR activity. Some studies have suggested that mTOR signaling may increase during aging, at least in specific tissues like adipose tissue, and rapamycin may act in part by blocking this increase. An alternative theory is mTOR signaling is an example of

antagonistic pleiotropy, and while high mTOR signaling is good during early life, it is maintained at an inappropriately high level in old age.

CR and methionine restriction may act in part by limiting levels of essential amino acids including leucine and methionine, which are potent activators of mTOR. The administration of leucine into the rat brain has been shown to decrease food intake and body weight via activation of the mTOR pathway in the hypothalamus.

According to the free radical theory of aging, reactive oxygen species cause damage to mitochondrial proteins and decrease ATP production. Subsequently, via ATP sensitive AMPK, the mTOR pathway is inhibited and ATP consuming protein synthesis is downregulated, since mTORC1 initiates a phosphorylation cascade activating the ribosome. Hence, the proportion of damaged proteins is enhanced. Moreover, disruption of mTORC1 directly inhibits mitochondrial respiration. These positive feedbacks on the aging process are counteracted by protective mechanisms: Decreased mTOR activity (among other factors) upregulates glycolysis and removal of dysfunctional cellular components via autophagy.

Probiotics and prebiotica

'Probiotic' is a very generic term that includes a large number of species of microorganisms, particularly lactobacilli and bifidobacterial they are a live microorganism that, when administered in appropriate amounts, confers a health benefit on the host. Collectively, they crowd out harmful microbial invaders, break down fibrous foods into more digestible components and produce vitamins such as K and B12.

Prebiotics: Since probiotics are living microorganisms, they need food to stay alive and to grow in the gut. A "prebiotic" is a soluble fiber which probiotics feed upon to stimulate their growth.

Probiotics are extremely sensitive to light, moisture, and oxygen. These harmful elements can easily leak through plastic bottles during storage and shipping and cause the living probiotic microorganisms to die. Only a dark amber glass bottle can keep out harmful moisture and light. Plastic bottles can render probiotics useless as they are permeable to varying degrees of moisture. Don't waste your hard-earned money by taking the risk with a plastic bottle.

BEWARE OF Dead Probiotics: There have been reports of companies failing to store or ship their probiotics properly, causing the essential colony-forming units (CFUs) in them to die, leaving the customer with useless products.

Side Effects of Supplements

Some of the vitamins, minerals, amino acids, and other types of herbal formulas can come with odd side effects in some people. They may also have allergic reactions and some can cause problems when interacting with other supplements or medications. It is important to know that the manufacturers of supplements do not need to prove that their product is safe, nor do they need to inform of possible side effects or drug interactions.

Supplements sales are commercial, non-medical voluntarily taken products. They can be compared with “candy” in the store. Most people do not need it but use it. As with all other processed foods, supplements have active ingredients who become really active in the gut and further in the body. If the buyer is not aware of the effects and especially the side or reactive effects of the products, nasty things can happen.

Too many vitamins have the same effect as too fewer vitamins. This effect gives the naïve user the idea that they need more and more, resulting in toxification and disease. The use of amino acids or proteins can have drastic effects on the guts. Many people get diarrhea when using it. The reason is often an overdose of lactose.

Combination of mixtures of supplements can have unpleasant reactions with each other. They are all active components and eager to react. All are sold for that reason. When bringing them together in a solution or in the digestive system they can actively start reacting with each other creating new (sometimes unwanted and unintended) compositions. Supplementation is a specialist job, like the subscription of diets and should not be promoted to laymen as “fun product”.

12 Aging difference worldwide

The world's population is aging: virtually every country in the world is experiencing growth in the number and proportion of older persons in their population.

Population ageing is poised to become one of the most significant social transformations of the twenty-first century, with implications for nearly all sectors of society, including labor and financial markets, the demand for goods and services, such as (special) housing, transportation and social protection, as well as family structures and intergenerational ties.

According to data from World Population Prospects: the 2017 Revision, the number of older persons — those aged 60 years or over — is expected to more than double by 2050 and to more than triple by 2100, rising from 962 million globally in 2017 to 2.1 billion in 2050 and 3.1 billion in 2100. Globally, the population aged 60 or over is growing faster than all younger age groups.

In 2017, there are an estimated 962 million people aged 60 or over in the world, comprising 13 percent of the global population. The population aged 60 or above is growing at a rate of about 3 percent per year. Currently, Europe has the greatest percentage of the population aged 60 or over (25 percent). Rapid aging will occur in other parts of the world as well, by 2050 all regions of the world except Africa will have nearly a quarter or more of their populations at ages 60 and above. The number of older persons in the world is projected to be 1.4 billion in 2030 and 2.1 billion in 2050 and could rise to 3.1 billion in 2100.

Globally, the number of persons aged 80 or over is projected to triple by 2050, from 137 million in 2017 to 425 million in 2050. By 2100 it is expected to increase to 909 million, nearly seven times its value in 2017.

Older persons are increasingly seen as contributors to development, whose abilities to act for the betterment of themselves and their societies should be woven into policies and programs at all levels. In the coming decades, many countries are likely to face fiscal and political pressures in relation to public systems of health care, pensions and social protections for a growing older population.

While declining fertility and increasing longevity are the key drivers of population aging globally, international migration has also contributed to changing population age structures in some countries and regions. In countries that are experiencing large immigration flows, international migration can slow the aging process, at least temporarily, since migrants tend to be in the young working ages. However, migrants who remain in the country eventually age into the older population.

To begin addressing these issues, the General Assembly of the United Nations convened the first World Assembly on Ageing in 1982, which produced a 62-point "Vienna International Plan of Action on Ageing." It called for specific action on such issues as health and nutrition, protecting elderly consumers, housing and environment, family, social welfare, income security and employment, education, and the collection and analysis of research data.

In 1991, the General Assembly adopted the United Nations Principles for Older Persons, enumerating 18 entitlements for older persons — relating to independence, participation, care, self-fulfillment, and

dignity. The following year, the International Conference on Ageing met to follow-up on the Plan of Action, adopting a Proclamation on Ageing. Following the Conference's recommendation, the UN General Assembly declared 1999 the International Year of Older Persons. The International Day of Older Persons is celebrated on 1 October every year.

Action on behalf of the aging continued in 2002 when the Second World Assembly on Ageing was held in Madrid. Aiming to design international policy on aging for the 21st century, it adopted a Political Declaration and the Madrid International Plan of Action on Ageing. The Plan of Action called for changes in attitudes, policies, and practices at all levels to fulfill the enormous potential of aging in the twenty-first century. Its specific recommendations for action give priority to older persons and development, advancing health and well-being into old age, and ensuring enabling and supportive environments.

It's a fact that the world's population overall will increase by roughly one-third over the next 40 years, from 6.9 to 9.1 billion, according to the U.N. Population Division. But this will be a very different kind of population growth than ever before — driven not by birth rates, which have gone down fast around the world, but primarily by an increase in the number of elderly people. Indeed, the global population of children under 5 is expected to fall by 49 million as of midcentury, while the number of people over 60 will grow by 1.2 billion. How did the world grow so gray, so quickly?

One reason is that more people are living to advanced old age. But just as significant is the enormous bulge of people born in the first few decades after World War II. The world saw increases in birth rates during the late 1940s and 1950s, as returning veterans made up for lost time. In the 1960s and 1970s, much of the developing world also experienced a baby boom, but for a different reason: striking declines in infant and child mortality. As these global baby boomers age, they create a population explosion of seniors.

Eventually, the effects of the global baby boomers disappear. Then, because of the continuing fall in birth rates, humans face the prospect that numbers fall fast — if not faster — than the rate at which they grew. Russia's population is already 7 million below what it was in 1991. As for Japan, one expert has calculated that the very last Japanese baby will be born in the year 2959, assuming the country's low fertility rate of 1.25 children per woman continues unchanged. Young Austrian women now tell pollsters their ideal family size is less than two children, enough to replace themselves but not their partners. Worldwide, there is a 50 percent chance that the population is falling by 2070, according to a recent study published in Nature. By 2150, according to one U.N. projection, the global population could be half what it is today.

Population aging is an increasing median age in the population of a region due to declining fertility rates and/or rising life expectancy. Most countries have rising life expectancy and an aging population (trends that emerged first in More Economically Developed Countries, but which are seen now in Less Economically Developed Countries). This is the case for the most country in the world. The aged population is currently at its highest level in human history. The UN predicts the rate of population aging in the 21st century exceed that of the previous century.

Population aging is a shift in the distribution of a country's population towards older ages. This is usually reflected in an increase in the population's mean and median ages, a decline in the proportion of the population composed of children, and a rise in the proportion of the population composed of elderly.

The Oxford Institute of Population Ageing concluded that population aging has slowed in Europe and will have the greatest future impact in Asia.

The rate at which the population ages is likely to increase over the next three decades; few countries know whether their older populations are living the extra years of life in good or poor health. A "compression of morbidity" would imply reduced disability in old age, whereas an expansion would see an increase in poor health with increased longevity. Another option has been posted for a situation of "dynamic equilibrium". This is crucial information for governments if the limits of lifespan continue to increase indefinitely, as some researchers believe it will. The World Health Organization's suite of household health studies is working to provide the needed health and well-being evidence, including, for example, the World Health Survey, and the Study on Global Ageing and Adult Health (SAGE). These surveys cover 308,000 respondents aged 18+ years and 81,000 aged 50+ years from 70 countries.

The Global Ageing Survey, exploring attitudes, expectations and behaviors towards later life and retirement, directed by George Leeson, and covering 44,000 people aged 40–80 in 24 countries from across the globe has revealed that many people are now fully aware of the ageing of the world's population and the implications which this have on their lives and the lives of their children and grandchildren.

Most of the developed countries(with the notable exception of the United States) now have sub-replacement fertility levels, and population growth now depends largely on immigration together with population momentum, which arises from previous large generations now enjoying longer life expectancy. Of the roughly 150,000 people who die each day across the globe, about two thirds—100,000 per day—die of age-related causes. In industrialized nations, the proportion is much higher, reaching 90%.

Well-being and social policies

The economic effects of an aging population are considerable. Older people have higher accumulated savings per head than younger people but spend less on consumer goods. Depending on the age ranges at which the changes occur, an aging population may thus result in lower interest rates and the economic benefits of lower inflation. Because elderly people are more inflation-averse, countries with more elderly tend to exhibit lower inflation rates. Some economists see advantages in such changes, notably the opportunity to progress automation and technological development without causing unemployment. They emphasize a shift from GDP to personal well-being.

Population aging increases some categories of expenditure, including some met from public finances. The largest area of expenditure in many countries is health care, whose cost is likely to increase as populations age. This present government with choices between higher taxes, including a possible reweighing of tax from earnings to consumption, and a reduced government role in providing health care. However, recent studies in some countries demonstrate the rising costs of healthcare are more attributable to rising drug and doctor costs, and higher use of diagnostic testing by all age groups, and not to the aging population as is often claimed.

The second-largest expenditure of most governments is education and these expenses tend to fall with an aging population as fewer young people would continue into tertiary education as they would be in demand as part of the workforce.

Social security systems have begun to experience problems. Earlier defined benefit pension systems are experiencing sustainability problems due to the increased longevity. The extension of the pension period was not paired with an extension of the active labor period or a rise in pension contributions, resulting in a decline of replacement ratios.

The expectation of continuing population aging prompts questions about welfare states' capacity to meet the needs of their population. In the early 2000s, the World's Health Organization set up guidelines to encourage "active aging" and to help local governments address the challenges of an aging population (Global Age-Friendly Cities) with regard to urbanization, housing, transportation, social participation, health services, etc. Local governments are positioned to meet the needs of local, smaller populations, but as their resources vary from one to another (e.g. property taxes, the existence of community organizations), the greater responsibility on local governments is likely to increase inequalities. In Canada, the most fortunate and healthier elders tend to live in more prosperous cities offering a wide range of services, whereas the less fortunate don't have access to the same level of resources. Private residences for the elderly also provide many services related to health and social participation (e.g. pharmacy, group activities and events) on site; however, they are not accessible to the less fortunate. Also, the Environmental gerontology indicates the importance of the environment in active aging. In fact, promoting good environments (natural, built, social) in aging can improve health and quality of life, as well as reduce the problems of disability and dependence, and, in general, social spending and health spending.

An aging population provides an incentive for technological progress, as some hypothesize the effect of a shrinking workforce may be offset by technological unemployment or productivity gains.
Generally, in West Africa and specifically in Ghana, social policy implications of demographic aging are multidimensional, (such as rural-urban distribution, gender composition, levels of literacy/illiteracy as well as their occupational histories and income security). Current policies on aging in Ghana, seem to be disjointed, in which there are ideas on documents on how to improve policies in population aging, however, these ideas are yet to be concretely implemented perhaps due to many arguments for example that older people are only a small proportion of the population.

Due to the aging population, globally, many countries seem to be increasing the age for old age security from 60 to 65 (and higher, Netherlands is 67), to decrease the cost of the scheme of the GDP. Age Discrimination can be defined as "the systematic and institutionalized denial of the rights of older people on the basis of their age by individuals, groups, organizations, and institutions". Some of this abuse can is the result of ignorance, thoughtlessness, prejudice and stereotyping. Forms of discrimination: economic accessibility, social accessibility, temporal accessibility and administrative accessibility. In the majority of the countries worldwide, particularly countries in Africa, older people are typically the poorest members of the social spectrum, living below the poverty line.

In the latter half of the last century, the world's developed nations completed a long process of demographic transition. The field of demography describes this demographic transition as a shift from a period of high mortality, short lives, and large families to one with a longer life expectancy and far fewer children.

This transformation took many centuries in Europe and North America as people moved from farms to cities; basic public health measures steadily reduced the risk of contagious disease and modern medicine

prolonged lives to unprecedented lengths. In developing countries, this demographic transition is certainly underway, though these countries vary widely at their places along the spectrum.

Very low birth rates and the resultant population decrease have received considerable media attention, particularly in Europe and parts of eastern Asia. In the past, when demographers projected national and global populations, the projections commonly assumed that birth rates would decline worldwide but only to the "two-child" family, i.e., two children per woman or per couple on average. An assumption that fertility would fall below this rate would have some unpleasant consequences: a decrease in population size and a population top-heavy with retired seniors who would depend upon the social taxes paid by a dwindling number of younger workers. While it may not have been desirable to project such a gloomy scenario in the past, this is exactly what has transpired in many countries.

In Europe and eastern Asia, fertility remains at what is seen as catastrophically low levels, and countries have been slow to react. While such attitudes are now changing rapidly, any increases in the TFR (Total Fertility Rate) are few and modest at best. Reasons for low fertility can vary quite a bit across countries and some examples of those differences are used.

In Germany, it remains socially unacceptable to leave one's child in all-day daycare and most kindergartens close at 1:00 PM, placing a significant burden on parents. The administration of Chancellor Angela Merkel has placed great emphasis on providing a more accommodating climate for couples with young children, by increasing child payments and, ultimately, providing day-long childcare. Germany's policies become more in line with family-friendly France whose support of young families is legendary.

In Italy (also in China), childbearing outside of formal marriage is generally not socially acceptable, as it is in Sweden where over half of births are outside marriage. Young people in Italy face a tight job market, and as a result, marriage and childbearing can be delayed. In Eastern Europe, birth rates had been comparatively high prior to the breakup of the Soviet Union and Warsaw Pact. After that event, collapsing economies brought the birth rate down with them quite rapidly; this region now has Europe's lowest fertility. In Japan, raising children is not only perceived as expensive, but most family duties fall to wives as husbands often work long hours and participate very little in domestic chores.

The future course of TFR determines the level to which countries experience societal aging. What might we expect? The degree to which generous family policies affect birth rates is debatable, but the simple fact remains that countries with such policies have the highest TFRs. There is potential for change in low fertility rates, reflected in the results of the Eurobarometer surveys conducted by the European Commission. In the 15 countries surveyed in 2006, the "personal ideal family size" was above two children in all countries except Austria. This ranged from 3.0 among women in Ireland to 1.66 among men in Austria. The current TFR in Ireland is only 1.6.

One of the most striking features of the pyramid of aging is the very high proportion of the "old, old" which is defined as those age 80 years and over. In 2055, 19 percent of Japan's population falls into that category, including 634,000 centenarians. At the same time, the country's population size has shrunk from 128 million today to 90 million. The consequences for the country's pension and health care systems are without precedent. Today, the state of Japan's birth rate is being treated as a national crisis, it may safely be said that it is too little, too late.

Although future changes in fertility likely have the most noteworthy effect on changing the pyramid, past and future increases in life expectancy have had and have their own effect, particularly in the numbers of the old old. Currently, life expectancy at birth in Japan stands at 79 years for males and 86 years for females. These are without historical precedent and continue to rise as the projected pyramid. Japan's life tables for the years 1921-1925 show that life expectancy at age 75 stood at 5.3 years for males and 6.2 years for females. In 1995, those figures were 9.8 and 12.9 years, respectively. As high as these life expectancies are, they are still increasing. In 2004, life expectancy at age 75 was 11.2 years for males and 14.9 for females. A woman who survived to age 75 could expect to live to age 90.

The developed nations set records for high levels of societal aging, but what about developing countries? Given the higher levels of fertility at present, it is obvious that aging is less of a factor in poorer countries compared to wealthier ones. But aging takes place, and in some cases, rival levels seen in the developed world.

By 2050, the developing regions of Asia and Latin America will find that their populations age 65 and above, as a percentage of the working age population (ages 15-64), will be roughly equivalent to what is found in developed countries today. This certainly is a new challenge but also one for which there is time to prepare.

One significant difference in the projected age structures between developed and developing countries is that fertility in developing countries is not projected to fall to some of the very low levels observed in Europe—or at least today's projections do not make that assumption. It should be kept in mind, however, that several developing countries often referred to as "newly industrialized countries" (NICs), such as South Korea and Taiwan, saw such a decline in their TFRs that they now have the lowest fertility rates in the world.

In Africa, fertility today remains at quite a high level and, as mentioned earlier, does not appear to be declining rapidly. Further, life expectancy remains low-barely 50 years in sub-Saharan Africa. For these reasons, Africa's population remains relatively young for the first half of this century and has yet to show the effects of rising life expectancy. In Asia, the outlook is much more diverse. China, which accounts for one-third of Asia's population, today has a TFR of only 1.5. In India, fertility decline has been much more gradual and remains modestly high at about 4 children per woman in some of its most populous states. Finally, Latin America's demographics have come to resemble that of its northern neighbors, and that region can expect a somewhat similar aging pattern.

In summary, for the foreseeable next few decades at least, extreme societal aging is likely to be found only in Europe and a few Asian countries. At the same time, the developing world remains comparatively young, deepening the demographic divide. Developed countries with low fertility face important choices if they are to avoid a collapse of pension systems and a burden of caring for never-before-seen proportions of elderly citizens.

For many countries, increases in birth rates are not sufficient because they happen too late, and few expect such increases to be significant. This clearly implies that the acceptability of immigration as a solution have to increase in order to solve labor force problems and increase the number of workers paying social taxes. Yet, out of all possible solutions, immigration has the least appeal. In the 2006 Eurobarometer survey, the three most commonly cited solutions to labor shortages were, in order: encouraging non-working women to participate in the labor market, encouraging part-time workers to

become full time, and raising the birth rate. Similarly, the three least popular solutions were the following: encouraging immigration from outside the European Union, raising the retirement age, and increasing weekly working hours.

East Asia
In East Asia, people are bound by a Confucian principle of filial piety, a moral of respect for the elderly, fathers and ancestors; here, elderly parents become the responsibility of adult children. Deeply rooted in traditional values, children are brought up knowing that they eventually exchange roles with their parents and care for them.

China
In China, an 'Elderly Rights Law' was introduced to inform adult children that they 'should never neglect or snub elderly people' and must make arrangements to visit them 'often', regardless of their proximity. Although not clear, on how often is enough, the law itself shows that in China, old people are not to be messed with.

Japan
In Japan, the 60th and 70th birthday is marked with big celebrations where children perform dances and offer gifts.

Singapore
Just like China, there are laws which place the interest of the elderly at heart: 'In Singapore, parents can sue their adult children for an allowance; those who fail to comply can face six months in jail,' according to the Associated Press.

The Mediterranean
In the Mediterranean respect for elders operates as a cultural norm. It is also common for extended families to live together with several generations under one roof.

African
Grandparents tend to live in with families and aging is celebrated. African-American funerals tend to be life-affirming and to have a celebratory air intermingled with the sorrow.

Northern-Europe
Parents are moved to care-homes when possible and applicable. The connection parent-children is less warm as in other parts of the world. Most elderly feel a form of loneliness.

Demographically, the world has reached a challenging point in its history. The prospect is for a growing developing world population and a shift of economic influence away from the developed world. While some aspects of this shift are clear, others are less easy to predict. Many countries become more ethnically diverse, particularly among their younger age groups.

Possible ways forward

The big exceptions to this general greying are south Asia and Africa, where fertility is still high. Since these places are home to almost 3 billion people, rising to 5 billion by mid-century, their youth could be a powerful counter to the greying elsewhere. But they slow the change, not reverse it.

The received wisdom is that a larger proportion of old people means slower growth and, because the old need to draw down their wealth to live, less saving; that leads to higher interest rates and falling asset prices. Some economists are more sanguine, arguing that people adapt and work longer, rendering moot measures of dependency which assume no one works after the age of 65.

The implication of a population that is getting a lot older without growing much is that, unless the retirement age changes, there are fewer workers. That means less output unless productivity rises to compensate. Under the UN's standard assumption that a working life ends at 65, and with no increases in productivity, aging populations could cut growth rates in parts of the rich world by between one-third and one-half over the coming years.

There are a number of ways in which to mitigate the potential economic and fiscal impacts of population aging. Here the potential of three plausible strategies in a UK context 1) boosting migration 2) raising productivity in the health sector and 3) encouraging longer working lives, are considered. There are, of course, more elements to consider including, and perhaps most importantly, the productivity of the labor force.

Migration
Migrant workers are typical of working age which implies they help to boost the labor supply and contribute to economic growth and tax revenues. As a consequence, migrant labor can help to boost economic output and support lower levels of government indebtedness.

Health productivity
It is assumed that productivity in health care rises by 2.2% per annum, but in reality, health productivity has only risen by 1.1% per annum since the 1970s. If the historical trend rate of growth in health care were to continue, debt to GDP would be 100 percentage points greater than if health care productivity rose according to planning. Delivering productivity increases in the health sector should, therefore, be a key public policy priority in responding to the challenges of population aging.

Longer working lives

The potential economic benefit of supporting the older workers who are involuntarily forced out of the labor market back into work is something to be studied. Participation should be done voluntary and under special conditions.

Community creation
Social engagement is important for healthy aging. The elderly community is an option for people to live together in an organized way. In The Netherlands, there are experiments with housing communities with care facilities where the elderly live in rented or owned apartments. These apartments are designed to accommodate the individual with decreasing capacities in mind. The facilities are prepared for change and adaption. This kind of communities improve life and living and could be built all over the world. Living in a community is an adventure and a challenge.

End of life

The living is hard work. First, as a child, a person has to pass through many learning phases. Suddenly confronted with puberty the world feels like it is completely changing. It becomes harder and less

enjoyable. Childhood is over and time to grow up starts after that. A few years on, for some a struggle and for others fun, the 20's come along. School changes for higher education or work. The real world has begun.

During 20's study and work keeps a person busy. Relationships start, some get married others stay single. Few are confronted with personal discoveries. Children are born and most settle down. A job, family, sorrow for tomorrow and so much more comes on everybody's way. Life is a follow up from tomorrow's wishes, wants and needs. But tomorrow hardly ever comes in peace and happiness.

Some people enter their 60's in good health but most start to feel the pains of past labor and other reasons. Life becomes a duty, routine and for some a burden. Every single day it is another struggle to survive, to make something of the day, not even with a hope for change at tomorrow. Others can enjoy life and have it filled with activities. Most are based on personal choices, character, and environment. Not all. Sometimes disease plays the breaker.

Entering the 70's, 80's and for few, the 90's is crossing a border every time of passing another marker. To some life becomes a burden, a serious source of unhappiness. Often after the loss of a partner, children or family members. Looking back on the life they consider; enough is enough.

But rules and regulations limit a choice of freedom. Life is not owned but it is linked to the responsibility of others. An individual life belongs to them (doctors and caretakers) as they are considered to be responsible. This is a strange situation but the laws are made this way. Nearly every law in the world has "the protection of life" as a part of their fundamental laws.

Euthanasia or suicide is illegal and there is an official punishment if failing to do so. Also for people who did not do everything to prevent others from doing so. Somebody gets punished when another person takes his / her life. But how can a person, who is a persistent to end life, find a solution?

Some countries offer liberated laws for elderly and serious ill persons to come and end their life (Switzerland) but most countries stop you from going there if they are aware of the intentions. The Internet offers some solutions but most of these are dangerous or unsuccessful. There is a growing worldwide awareness of the problem as more people come at age. The solution is in closed groups of active elderly who support, with the help of well-educated and specialized professionals, end of life options.

Nearly every person loves to live long and prosperous but when the final curtain must fall it is good to be the person in charge and not suffer till the end.

Considerations of a changing society:

- Is pension needed? Is it possible to consider other options for this?
- Is worked and the workplace fixed? Is it possible to build liquid workplaces?
- Must the financial system be changed to accommodate a new "aging"?
- Are communities the solution for the elderly?
- Does society need to give psychological support to the elderly based on the new inside on the aging process and the determination to live a life?
- Currently work is the central key of most people. This "kills" after retirement. Is the introduction of hobbies an option to prepare for the "retirement" period?

13 Tips

To promote a healthy lifestyle and positive aging it is important to have some tools & tips to create a personal lifestyle. It is not easy to continue a healthy lifestyle throughout life. Most people only have periods of being health conscious. The most important rule in life is, to be honest with oneself. Know when it is an unhealthy period and consider the consequences. Do not be stressed from good and bad periods. Be realistic. Every individual from past and future will pass this, there is no exception to this.

Keep the following rules of life in mind:

- Do not believe food gurus. They all lie for their own benefit. This also accounts for healthy profits.
- Seek balance in good and bad in everything. Real balance does not exist, try to come as close as possible.
- Expect no easy ride, be prepared for the rocky travels.
- Everyone dies but should try to postpone it as long as possible
- Every person falls ill. It is impossible to prevent that. Control sickness as much as possible.
- If falling ill, even seriously, do not panic, that never helps. Seek possibilities, not limitations.
- Every person lives in an environment and has little to no control over it. The health influence may vary. Always try to control these effects even when it is needed to move elsewhere. Try not to get stuck to a single spot on earth as even the birth ground is not sacred anymore. Be flexible.
- Social dealing is coherent on being human, try to deal with others more than oppose or confront
- The mood is not equal throughout life. It depends on many circumstances.
- Life is to be lived. Spend it wisely. Work when needed, rest when useful, be active.
- A partner can be a crown, a happiness but also gives sadness, stress, and separation. Nothing is permanent.
- The human is a social being. Stay connected at all time. Loneliness breaks even the best soul.
- Every good relationship is a treasure, treat it like that but expect it to be stolen one day.

These life tips are useful and logical. Probably they are already all known by heart. But are they a part of the individuals live already? Here are more seemingly obvious tips. Do not read them all at once. Take this chapter by parts and only use when needed. It is important to help others with this wisdom as it is universal and can save many lives.

- ✓ Watch what people eat and drink

It sounds obvious, but having a balanced diet is crucial for good health, energy and preventing illness. An ideal diet should be low in saturated fat, with fruit and vegetables, whole grains, oily fish, and small amounts of low-fat dairy and lean meat. Don't forget liquid to avoid dehydration, which can make you feel tired and confused. Tea, coffee and fruit juice also helps to stay hydrated, but avoid sugary fizzy

drinks. If drinking alcohol, keep at least two days per week booze-free to give the liver time to recover from the toxic effects of alcohol and don't exceed recommended daily limits for alcohol consumption. Alcohol is a gift of life, something to enjoy by the little, not by the large.

Avoid eating in front of the TV, computer, or another screen. When distracted by external influences there is no longer control over what and how much is eaten. Read the Nutrition Facts label found on food and drink packages to see how many calories and how much fat are in a single serving size of an item. Cook ahead and freeze portions for days when it is not possible to cook every day. Keep frozen or canned vegetables, beans, and fruits on hand for quick and healthy meal add-ons. Make a personal storage for when needed and control the expiry dates at least once a year.

"Write What You Bite"
If the middle-aged spread is creeping up —literally— try writing down what is eaten in a food journal. Studies show that people consistently tend to underestimate what they eat and keeping track can give more accurate ideas of how many calories they consuming and also help to see where it is possible to cut back.

- ✓ Look after teeth and mouth

Brush the teeth twice a day and floss daily. Floss helps to prevent gum disease by removing pieces of food and plaque from between the teeth. If it's left to build up it is possible to notice sore or bleeding gums, and gum disease can be linked to diabetes, strokes, heart disease and rheumatoid arthritis. Have regular check-ups.

Cut Out Empty Calories
One of the biggest changes to experience in the 30s and 40s is how the body uses and processes calories. The ever-feared slowing of the metabolism is actually somewhat of a reality. "Focus on cutting out empty calories, because they add up quickly and don't leave the feeling of being full. Avoid wasting nutrient needs on empty calories items like chips, soft drinks, and latte syrups.

Eat Every 4-6 Hours
Not only is it important to kickstart the metabolism first thing in the morning with a healthy breakfast, it is advised to eat consistently throughout the day. The best possible timing is to eat every 2 – 3 hours but that is not possible for everyone.

Reach for More Antioxidants
From former information, it is clear that antioxidants are healthy, but the nutrients are especially important when aging in order to prevent and fight against problems that may arise such as skin damage or even certain cancers. To incorporate anti-oxidant foods in the daily meals is important for the security of muscles and joints but also for other organs. Natural anti-oxidant support gives the body a steady supply of help and assists in its work of fighting health treats.

- ✓ Stay active

Daily exercise helps to stay strong and healthy. This lowers the risk of obesity, heart disease, stroke, diabetes, and even cancer. If that wasn't enough, staying active can boost self-esteem, improve sleep, and gives more energy. Government guidelines recommend that older adults do 150 minutes of moderate intensity activity per week, as well as strengthening exercises twice a week. For people who are serious with there life and health at least 60 – 90 minutes, a day of moderate to harder level is

advised with/under control of established specialists. In all honesty here one remark is at the place: established specialist are people with life experience, an easy to check the record of personal performance and of appropriate age (over 40 at least but preferred over 50).

Build on strength, not weakness

People age due to their strength, they die because of a weakness. The power of life is as it says, a power. When reviewing power as an electrical current it refers to a collection of force greater than its surrounding. In each body, there are strong and weaker organs. Each of these organs has a function. It is important to know which organ is strong and which one weaker. This can be measured by the electrical current of this organ. But what to do with the outcome? Does it matter to know the strength of each organ?

Aging is a process of the entire body. The weak and strong parts. When improving the power(s) of the stronger parts the weaker parts will move up in power level also. Improving the power organs reflects directly to all other parts of the body. This is only right when it concerns major organs. If the small organs are strong but the heart is weak, the overall body is weak. Organs and tissues are divided into levels of importance. There is a list of vital organs, supporting and following organs. Each has its priority in the functioning of the body on its own level.

The major organs of the body are:

1. The brain, this is the master organ and needs to be kept in good condition
2. Muscles. All over the body are muscles which are vitally important for all functioning.
3. Heart & lungs provide the needed food for the muscles
4. Liver & kidneys are the cleaners and provide vital hormones and enzymes
5. Stomach & intestines provide the food to fuel all former processes
6. Bones & joints keep the body upright moving and supply of red blood cells
7. An endocrine system which delivers all vital development and repair coordinators
8. All smaller organs and tissues

Every person has strong and weaker parts. If the difference is small there is no problem. A real problem occurs when the electrical and function becomes so low that there is a larger difference between the organs and tissues. A strong current difference weakens the stronger organs.

There are different methods to measure the different current levels and it is possible to improve the strength to become stronger and the weak to improve. When keeping the current different small it is possible to improve health and reach a higher age.

- ✓ Balance Disorders—Many older people experience problems with balance and dizziness (vertigo).

There are many different causes for balance disorders. Falls and fall-related injuries (including hip fractures) are serious concerns that can have a significant impact on life and ability to live independently. According to the Centers for Disease Control and Prevention (CDC), more than one-third of adults 65 years of age and older fall each year, and falls are the leading cause of injury-related death in seniors.

- ✓ Meditate

Going to the gym will strengthen the body, and meditating will work out the mind. Research published in JAMA Internal Medicine suggests that taking time to meditate daily can help reduce stress, anxiety, depression, and even pain. If never tried meditating, yoga can be a good practice to start with to help ease into that type of mindful state. All meditation starts with concentration exercises and slowly move to another level. Both concentration and meditation are guided learning sessions.

- ✓ Take care of your feet

Look after the feet by applying moisturizer to prevent dry skin and cutting toenails straight across. Make sure to have footwear that fits properly and supports the feet. If they're sore it may be tempted to stay in slippers, but a pair of trainers could be a good option as they are more supportive. Contact the GP if the feet become painful, feel very hot or cold or if having common problems like corns, bunions or ingrown toenails.

Sole Support -– As people age, the fat pads on the bottom of their feet compress, creating fatigue and pain. Consider wearing supportive shoes or inserting foot pads for better stability and comfort or socks that have extra padding and a wicking agent to keep feet dry and comfortable.

- ✓ Sort out sleep

Many have trouble getting – or staying – asleep as when getting older. This can leave a person feeling tired and grumpy. Avoid insomnia by cutting down on daytime naps, establishing a bedtime routine and going to bed at the same time each night. Try a warm drink such as chamomile tea or hot milk before going to bed.

Many adults complain of sleep problems as they age, including insomnia, daytime sleepiness, and frequent waking during the night. But getting older doesn't automatically bring sleep problems. Poor sleep habits are often the main causes of low-quality sleep in older adults. Fight afternoon fatigue –- Fatigue is a common problem among older adults, especially after lunch. Having a glass of water and a high-antioxidant food like a prune can revitalize the body and stimulate the mind.

Artificial lights at night can suppress the body's production of melatonin, the hormone that makes sleepy. Use low-wattage bulbs – or exchange for red or blue - where safe to do so, and turn off the TV and computer at least one hour before bed.

Make sure the bedroom is quiet, dark, and cool, and the bed is comfortable. Noise, light, and heat can interfere with sleep. Try using an eye mask to help block out the light.

Develop bedtime rituals. A soothing ritual, like taking a bath or playing music will help to wind down. Go to bed earlier. Adjust the bedtime to match when feeling tired, even if that's earlier than it used to be.

- ✓ Maintain the brain

Some cognitive decline is a normal part of aging. Most people start with memory recalls that fail. Studies have shown that a lifestyle that includes cognitive stimulation through active learning slows cognitive decline. Never stop learning and challenging the mind! Take dance lessons, learn a new language, attend lectures at a local university, learn to play a musical instrument, or read a book.

- ✓ Staying healthy through humor, laughter, and play

Laughter is strong medicine for both the body and the mind. It helps to stay balanced, energetic, joyful, and healthy at any age. A sense of humor helps to get through tough times, look outside oneself, laugh at the absurdities of life, and transcend difficulties. Laughter is the Best Medicine

- ✓ Memory Problems—It's important to know: While some degree of forgetfulness is normal with age,

significant memory loss or cognitive decline is not an inevitable part of normal aging. If a person experiences mental lapses that interfere with daily life, help is needed. Serious memory problems or a decrease in cognitive function may be caused by a treatable, underlying condition—such as dehydration, malnutrition or sleep deprivation—or a medical problem like Alzheimer's disease or dementia.

- ✓ You can't teach an old dog new tricks.

One of the more damaging myths of aging is that after a certain age, it just won't be able to try anything new or contribute things anymore. The opposite is true. Middle-aged and older adults are just as capable of learning new things and thriving in new environments, plus they have the wisdom that comes with life experience. If believing in and have confidence in oneself, it is possible to set up a positive environment for change no matter what the age.

- ✓ A key ingredient in the recipe for healthy aging is the continuing ability to find meaning and joy in life.

While aging, life changes and gradually it is possible to lose things that previously occupied time and gave life purpose. For example, the job may change, retirement, children leave home, or other friends and family move far away. But this is not a time to stop moving forward. Later life can be a time of exciting new adventures if let it.

- ✓ Cultivate your relationships

Plus twenty-eight percent of older adults live alone, and living alone is the strongest risk factor for loneliness. Common life changes in older adulthood, such as retirement, health issues, or the loss of a spouse, may lead to social isolation. Maintain communication with family and friends, especially after a significant loss or life change. Schedule a regular time to meet with friends and family – over coffee, during a weekly shared meal, or around a common interest. Reach out to friends who might be isolated or feel lonely. Personal social connection and interactivity save lives, not social apps.

- ✓ Make community connections

Older adults who engage in meaningful community activities like volunteer work report feeling healthier and less depressed. Tips: Join a planning committee, volunteer, take a trip with friends, play cards at the local senior center, or join a book club. Remember that participating in activities should be fun, not stressful!

- ✓ Volunteer. Giving back to the community is a wonderful way to strengthen social bonds and meet others,

and the meaning and purpose to be founded in helping others enrich and expand life. Volunteering is a natural way to meet others interested in similar activities or who share similar values. Even if mobility becomes limited, it is possible to get involved by volunteering on the phone. Find support groups in times of change. If a loved one is coping with a serious illness or recent loss, it can be very helpful to participate in a support group with others undergoing the same challenges.

- ✓ Reduce stress

While aging, stressors change and so does the ability to deal with stress. Long-term stress can damage brain cells and lead to depression. Stress may also cause memory loss, fatigue, and decreased the ability to fight off and recover from infection. In fact, it is estimated that more than 90% of illness is either caused or complicated by stress. It is not possible to entirely avoid stressful situations but people can learn better techniques to cope with stress. Take care when stressed by getting enough sleep, exercising, and eating nutritious foods. Talk to a loved one or counselor about stress, and try some relaxation techniques, such as circular breathing, yoga, or meditation. Remember to always keep things in perspective – try to accept and adapt to the things that cannot be under control.

- ✓ Focus on the things to be grateful for. The longer a person lives, the more is lost. But while losing people and

things, life becomes even more precious. When one stops taking things for granted and appreciate and enjoy what is still there life offers even more.

- ✓ Acknowledge and express feelings. Most people have a hard time showing emotions, perhaps feeling that

such a display is inappropriate and weak. But burying feelings can lead to anger, resentment, and depression. Denial is a basic instinct in most cultures. Find healthy ways to process feelings, perhaps by talking with a close friend or writing in a journal or article on social media.

- ✓ Accept the things that can't be changed. Many things in life are beyond control. Rather than stressing out

over them, focus on the things that can be controlled such as the way chosen to react to problems. Face limitations with dignity and a healthy sense of humor.

- ✓ Look for the silver lining. As the saying goes, "What doesn't kill us makes us stronger." When facing major

challenges, try to look at them as opportunities for personal growth. If personal poor choices contributed to a stressful situation, reflect on them and learn from mistakes.

- ✓ Stay positive.

One of the best-known ways to keep feeling young is having a positive mental outlook. For a healthier and happier life, surround oneself with positive, vibrant people – and be one. Cheerful people are less likely to get sick. They also live an average of 7.5 years longer. Do the things that make happy more often, and try to let go of negative emotions like anger, guilt, resentment, grief, and shame. Negativity saps vitality and creates stress, which affects health and well-being. If there is a need for guidance in recharging the happy engine, find a qualified therapist or certified coach who can help redirect negative emotions.

- ✓ Practice prevention

Many accidents, illnesses, and common geriatric health care conditions, such as falls, chronic illness, depression, and frailty, are preventable. To prevent illness, get a yearly flu vaccine and wash hands after using the restroom and before handling food. To prevent a fall, complete a home safety checklist, use assistive devices, wear appropriate footwear, get vision checked, take vitamin D and calcium, and get some form of exercises into a daily routine.

- ✓ Get medications to check. When you visiting the healthcare professional, bring all of the prescription and

over-the-counter medications, vitamins, herbs, and supplements are taken, or a complete list that notes the names of each, the doses are taken, and how often used. Ask the healthcare provider to review everything brought or put on the list. He or she should make sure they're safe to take, and that they don't interact in harmful ways with medication or current health problems. The older a person is, and the more medicines are taken, the more likely to experience medication side effects, even from drugs bought over-the-counter.

- ✓ Find the right healthcare professional and make the most of the visits. See the healthcare professional

regularly, answer questions frankly, ask any questions without holding back, and follow advice. If there are multiple, chronic health problems, the best is to see a geriatrics healthcare professional—someone with advanced training that prepares to care for the most complex patients.

- ✓ Coping with change

Coping with change is difficult, no matter how old a person is. The particular challenge for older adults is the sheer number of changes and transitions that start to occur—including children moving away, the loss of parents, friends, and other loved ones, changes to or the end of a career, declining health, and even loss of independence. It's natural to feel those losses. But if that sense of loss is balanced with positive ingredients, that is a formula for staying healthy while aging.

- ✓ Give up smoking

Smoking is bad for the body and brain. It's linked to a whole range of different health problems, including heart disease, lung cancer, and bronchitis. The good news is that if stop smoking, regardless of age, circulation, lung capacity and energy levels will improve.

- ✓ Addiction kills

Any form of addiction is in one way or another a life-threatening event. Even the most innocent stamp collection can turn into a complicated addiction. In healthcare, there is a dividing between positive and negative addictions.

Positive	**Negative**
Sport	Medication
Birdwatching	Smoking
Fishing	Drinking
Collecting things	Gambling

- ✓ Driving safety (Giving up driving means giving up a measure of independence. Seniors may be unwilling

to stop driving, even though continuing to drive can pose a safety risk for themselves and for others.).

- ✓ Fire/smoke safety (Memory lapses, which are more common in older adults, increase the risk for

household fires caused by cooking, candles or smoking. It's important to have working smoke detectors and carbon monoxide detectors in the home.)

- ✓ Extremely hot or cold weather. (Seniors are at increased risk for health problems caused by hot or cold

temperatures, especially when the cooling or heating systems in the homes aren't functioning properly.) Older adults are at increased risk for certain types of crime, including burglary and fraud—identity theft, fake check and wire transfer scams, investment and credit card fraud and fake online charity solicitations.

- ✓ Unfortunately, many elderly are at risk for another type of crime that takes place in their home, in the

home of a family member, or in a living facility or nursing home and is committed by people responsible for their care. Called elder abuse, this type of crime can take many forms. Elder abuse can be physical, emotional (psychological) or sexual. It may involve neglect, abandonment or financial exploitation. Physical elder abuse is the non-accidental use of force against an elderly person that causes injury or pain. It includes hitting, shoving and kicking, as well as misusing drugs, restraints or confinements on a person who is elderly.

Emotional or psychological elder abuse can be verbal or non-verbal. It includes intimidation (e.g., through yelling or threatening), humiliation and ridicule, as well as ignoring, terrorizing or isolating the elder from family and friends.

Sexual elder abuse involves sexual contact with a senior without personal consent, as well as forcing the elder to view pornographic material, watch sexual acts or undress.

Neglect and abandonment are the most common type of elder abuse. They involve failing to fulfill care-taking obligations—either intentionally or unintentionally.
Financial exploitation elder abuse involves the unauthorized use of the elder's assets—funds or property. It also includes health care fraud and abuse, which is carried out by unethical health care providers and involves charging for health care services not provided, overcharging for services, over- or under-medicating, and insurance fraud.

- ✓ By age 50, most people notice changes to their vision, including a gradual decline in the ability to see

small print or focus on close objects. Common eye problems that can impair vision include cataracts and glaucoma. Hearing loss occurs commonly with aging, often due to exposure to loud noise.

- ✓ Prepare for end-of-life care

It's hard to predict when health problems might cause a person to become incapacitated and unable to make decisions. That's why many people take steps early to clarify their values about life-sustaining medical treatment and to make wishes known to family members and health care providers. This can be done by completing advance directives such as a "Living Will"—a written order that becomes part of the medical record. Find information about this process through the health plan, lawyer, or senior rights organizations.

Arnaud van der Veere

Life is only boring when at the end you discover nothing happened. This cannot be said of his life. Born in 1960 he started off facing death by Asthma. An uncountable amount of times he passed the border between life and death but was saved by his parents, sisters and a slow developing knowledge of the disease. Dr. Brokmuller made his life work by saving asthma patients and Arnaud was one of his lucky survivors. Facing death in the eye made him seeking for the truth of living, the value of life.

Life was a battlefield not only to stay alive but also to survive and create a destiny in life. This is probably the main reason why Martial Arts did attract him all his life. The ultimate fight with yourself while competing with others. Competition is not a measuring of yourself against others but more a status quo of a level on a specific moment in time. Collecting knowledge, organize it and make it available to others became a mission at a very early age.

Directed by teachers Arnaud started his lifelong study in chemistry. People who practice Martial Arts have always be seen as aggressive, low educated and more or less dumb by the educated world. This stigma was often used against him while starting a carrier in science. His progress was through the long way. From MAVO he went to MBO which he finished in one year to move on to the HBO that stood for 2 years at that time. Last year he got a job and opportunity to study at the TU Delft where he studied and worked until 1983.

During his study, he did build a sports career in Muay Thai and writing. The articles were published in different magazines. When he left his job at the University his next move was to open his own business and traveled more around Asia. Study and sport proved to be his passions. Thousands of articles on different topics are published and from 1984 until 2016 more than 22 books were published. His interest and topics vary but all focus on human health and interpersonal relationships. All have focused on Asia.

Since 2017 Arnaud did focus again on the chemical aspects of health and life and returned to his major topics of health and supplementations, aging and psychology. In 2017 he was appointed Professor at the ZUST University in Hangzhou, China.
Advises on lifestyle for your personal Age Control:

- Live a regular life. Use your biological clock as a guide. How?
    - Sleep enough. How much is personal between 4 – 8 hours. Never longer. Long sleep is bad sleep.
    - Eat enough. Use the 80% rule as a guide. Never eat till full but leave some space
    - Eat regularly. Get a food pattern, eat at regular intervals.
- Move. Keep the body active. Walk, cycle, run, sport or work in the garden. Be active at least 2 hours per day. Active implies a body intention of 20 – 30% of your maximum
    - Do power training. Lift weights or heavy objects to maintain muscular tension. This accounts for male and female alike. Heavy is relative and depends on body weight, gender, fitness level and other facts measured with a licensed specialist.
    - For some people, cardiovascular training is a need.
- Have the right level of hygiene. Do not overdo cleaning. Dirt is also a part of our physical resistance training. When your body is not able to defend itself due to much cleaning you have a problem.
- Take care of your health. Try regular checks and when not sure, visit a doctor. But do not accept medication to easy. Ask and understand before you use anything.

- Have good social contacts, join clubs, meetings or other social gatherings.

Everything that concerns a good physical and mental condition starts with social interactive knowledge. Sharing is caring is not just a saying but it actually helps you to benefit and grow a healthy long lasting life.