Lifespan Extension and longevity secrets through Alchemy, SIRT1 & SOX9 genes and the Maillard reaction

A researcher's notebook on the latest anti-aging substances and Alchemical Longevity Formulas

SCOTT RAUVERS

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DEDICATION

This book is dedicated to Colleen Lashway on the beautiful Hawaiian island of Oahu, for her years of service and dedication to the Hawaii Kai Public Library, and for her loyal commitment to the community of Hawaii Kai.

Also by Scott Rauvers……..

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All correspondence welcomed

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Over the past decade I have saved all the very best energy and health formulas from my suite of anti-aging books and put them on my website www.scott-rauvers.com. These formulas can be downloaded and printed out at your convenience for free and at no charge. Please remember that some herbs may interact with prescription medication and always trust your intuition when it comes to dosage.

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INTRODUCTION

During my freshman year in College I was first introduced to the science of aging when I took Gerontology as my major. During this time, I always pondered that there must already exist an antidote for people to live past 100 on a regular basis, and in good health. For example in the book of Genesis in the bible Methuselah was reported to have lived 969 years, Mahalalel 895 years, Lamech 777 years, Enosh 905 years, Kenan 910 years and Jared 962 years. Today more people are living longer than at any other time in history (with the exception of the biblical era). For example 92 year old William Shatner is still doing interviews and writing books and Carmen Dell'Orefice who is 91, is the world's oldest working supermodel. It is hoped the reader of this book joins the growing number of centenarians and supercentenarians. So why are we humans as a species living shorter lives, when at an advanced age of industrialization we should be living longer?

I have also been very pleased to see that many of the theories that I put forth in my 2012 book titled: Solar Flares and Their Effects Upon Human Behavior and Health, which stated that above average solar activity negatively impacts health and well-being, especially in the most vulnerable populations, that since then a number of published studies have come forward confirming my hypothesis. I am also so happy to see that much of the anti-aging discoveries I published years ago are now starting to surface in the published anti-aging literature, giving confirmation to many of my early theories on anti-aging. Especially my early research into probiotics, of whose benefits are now starting to gain mainstream recognition.

It has only been during the last 3 years that technology has

made it possible to explore the anti-aging substances in thousands, if not soon to be millions of plant species and their abilty to reduce free radicals and exhibit anti-aging properties. This book contains many of those studies with almost 900 cited references. This has resulted in this book having many major discoveries and breakthroughs. This book is meant for people who have a general understanding of the red powder of the Philosopher's Stone as well as the general terms regarding anti-aging. Endurance athletes can benefit from the information contained in this book for rapid recovery from heavy exercise or endurance sports.

As Lockheed Senior Engineer Boyd Bushman once said, "Follow the data to find the discoveries". The groundbreaking discoveries shown throughout this book are just that, from following the data.

C-reactive protein levels (CRP)

When your body is under prolonged stress and is low in specific nutrients, your liver makes up for a lack of nutrients by trying to fight the stress. Your liver than begins to experience chronic inflammation. However just before this inflammation occurs, there is an increase in C-reactive protein levels in your blood.

For example, a recent July 2022 research study [(1)] examined the effects of above average solar activity on the elderly in Boston, Massachusetts. The study involved 742 people and took place between May 2000 and December 2017. The average age of the participants was 73 years. The researchers found that changes in sunspot and geomagnetic activity caused their T-cells, which regulate the immune system, to become over-active. (T-cells help fight off disease and viruses). The study went on to state that above average solar weather conditions affected their body's C-reactive protein levels (CRP). The researchers discovered a significant increase in CRP levels depending upon sunspot activity. However CRP levels were not affected by increased geomagnetic activity on the earth, only the sunspot activity. The study also found that these effects were similar to that of air pollution. What earth's

geomagnetic activity did affect regarding the participant's health was their fibrinogen levels, which was not affected by sunspot activity. Fibrinogen helps regulate blood clots (helps stop bleeding) and healthy levels show a person is less at risk for cardiovascular disease.

Another study [2] found that for each increase in CRP levels, there is a 1.4 year reduction in lifespan in people aged 57 years or more. This study shows that CRP levels can act as a way to predict longer-term survival in middle aged men. Other published studies regarding solar activity and health include, Geomagnetic disturbances driven by solar activity enhance total and cardiovascular mortality risk in 263 U.S. cities (2019. Carolina Leticia Zilli Vieira et al) and Revealing the relationship between solar activity and COVID-19 *(*Mohammad Hossein Nasirpour et al. 2021).

Being one of the world's most respected experts on longevity nutrition for over a decade, I have discovered from my writing of 5 books on anti-aging which span thousands of pages, that the secret to longevity consists of a 2-fold process. 1 - Identifying longevity substances that exist naturally in your environment (or the right supplements). 2 - Having a calm mind and heart.

The environment you live in also relates to your longevity diet. If you lived in an area where there is lots of rain, you would eat more dry foods such as adzuki beans. If you lived in a dry region, you would eat more damp foods such as yogurt. Also if you were a person that ate a lot of raw foods, you would not live in an area with cold winters, but would be more suited to warmer climates. You can also do an Internet search using the term - **TCM dry foods** - to find numerous charts and articles regarding Traditional Chinese Medicine and damp and dry foods.

When author / scientist Greg Bradden travelled to some of the most remote places on earth and interviewed the longest living people [3] he discovered that they all stated that one of the reasons they lived so long was because they had calm hearts and minds. In other words, they did not allow

their emotions to get the better of them or see small minor events in their lives as major obstacles or allow them to cause them to get frustrated. They kept things that happened in their lives in healthy perspective. One way to have a calm heart to relax. For example, studies show [4] that practicing meditation short term creates considerable effects on brain energy, which helps reduce anxiety and depression.

Any experienced self-help coaching professional or a person who has been a motivational speaker for decades knows that between 1% and 3% of people aged 60 or older are very independently wealthy. They also know that independent self-wealth is a state of mind which stems comes from having the right mindset. I also came across this information when I wrote 3 of my self-improvement books (Learn to Create Wealth and Manifest Infinite Financial Abundance, Modern and Secret Teachings of Eternal Wisdom, Peace, Abundance and Prosperity and Secret Teachings for Manifesting Prosperity using Infinite Spirit (which you can read for free at scott-rauvers.com). This trend also appears to take place in centenarians (a person who lives past 100 years of age). According to research by Boston University [5], out of the entire population of the United States, centenarians existed at the rate of 0.27% (2021), with the highest numbers of centenarians found to be living in Hawaii and Connecticut. So in order to live past 100, it requires the right mindset and a calm heart is very likely the key.

A recent 2022 research study published by Columbia University [6] stated that getting good sleep is vital for your heart. They state that sleep impacts the heart and that not enough sleep affects the heart by influencing our decisions about food. Their research showed that lack of sleep, or not sleeping well, leads to food cravings which cause one to be more likely to eat foods high in saturated fat and sugar. This could be why research studies have proven that people who have good sleeping habits have up to a 35% lower chance of dying from heart syndrome [7]. Indeed studies show [8] that a positive relationship exists between sleep quality and

lifespan in centenarians, including people aged 80 or more, with the optimal range being between 7 and 9 hours sleep each night.

How Plants can Extend Human Lifespan

The purpose of this bfook is to give you, the reader, the best and latest research regarding natural plants and their associated extracts scientifically proven to extend lifespan. The use of plants for healing and longevity is a respected ancient tradition that is now much older than today's modern medical science of today [(9)]. It is estimated that today there are approximately 80,000 plants used worldwide for healing and longevity medicine [(10)]. It is a fact in the anti-aging literature that the most successful anti-aging herbs and substances also treat, eliminate or prevent cataracts. For example, the substances baicalein, forskolin, hesperidin, resveratrol and ginsenoside all lower intraocular pressure [(11)]. Resveratrol is a substance well known for its lifespan extention effects. A research study published in April 2016 titled: Effect of the Resveratrol Rice DJ526 on Longevity, published by Saidul Islam and colleagues found that the resveratrol rice DJ526 significantly extended the lifespan of fruit flies up to 41.4%. This has since been confirmed in follow-up studies (The Resveratrol Rice DJ526 Callus Significantly Increases Lifespan. Mousumee Khan et al. Apr 2019).

Mystery Solved. Why the Bristlecone Pine tree lives for thousands of years

The Bristlecone pine has been rigorously documented to live up to 5,000 years [(12)]. Many researchers and scientists, including myself for many years, were perplexed as to what actual substance was making these trees live thousands of years. Just as the famed Chinese immortals were reported to live high up in the mountains, the Bristlecone pine tree lives high up in the mountains in an environment that has scathing winds, acidic soil and long cold winters [(13)]. This cool, dry environment with low rainfall means it exists in an environment that has high hydrophobicity, where dust and dirt cannot cling and adhere to surfaces for long periods of

time. What is interesting is the Bristlecone pine tree grows in dry regions that have a soil content high in dolomite. Dolomite is abundant in calcium containing 40% magnesium carbonate and 60% calcium carbonate [(14)].

A clinical trial [(14)] looked administering the mineral supplement (Aquamin) which is composed of the red algae Lithothamnion corallioides, which contains 85% calcium and 2.4% magnesium to volunteers diagnosed with severe osteoarthritis of the knees. The clinical trail discovered that the participants who took Aquamin exhibited significant improvements in their 6 minute walking sessions. There were no significant differences observed in the walking distances in the placebo group and as will be explained later in this book an over-expression of the SOX9 gene is used to heal many arthritis disorders. It is interesting to note that the gene level of SOX9 is significantly down-regulated in people diagnosed with osteoarthritis compared to people who have not been diagnosed with osteoarthritis [(15)].

I hypothesize that the reason this pine tree lives so long is because the harsh environment forces it to produce substances to protect itself, which in turn creates substances that reduce the aging process. Evidence to support this hypothesis is the fact that one of the most powerful anti-aging substances, Resveratrol, is made in over 70 fplant species as a response to stress in its environment. [(16)]. This defense behavior is similar to the process where a sheep is injected with just enough snake poison to not kill the sheep, but to allow the sheep to produce antibodies which are used to treat snake bite.

Phytoalexins

Resveratrol just happens to be a phytoalexin (*stilbene*), which possesses very promising antioxidant properties [(17)]. Antioxidant effects take place when a substance behaves as a hydrogen donor and attaches itself to a free radical, sacrificing itself in the process, so that it may neutralize the free radical.

Phytoalexins slowly accumulate in plants as a byproduct of

their resistance to adverse weather conditions, parasites, fungal attacks, UV radiation, chemicals and general stress in the plant. As just stated, Resveratrol is made by over 70 plant species in response to stressful situations [18], the Bristlecone pine tree must be making a type of Phytoalexin. Research shows [19] that the most abundant substances in the Bristlecone pine are Pinene, Limonene, Phellandrene, Terpinolene, Camphene and Myrcene as well some unidentified substances. Research also states [20] that the Bristlecone pine also contains an abundance of Carene and that Carene has a sleep enhancing effect, improving sleep duration.

The plant Bupleurum gibraltaricum contains 33% Carene [783]. When researchers induced swollen inflamed feet in mice, they found that after applying the essential oil of Bupleurum gibraltaricum, that it exhibited considerable anti-inflammatory activity. The researchers concluded this reduction in swelling was due to the carene (Pharmacological activity of the essential oil of Bupleurum gibraltaricum: Anti-inflammatory activity. M.A. Ocete et al. May 1989). This is one of the few emerging studies that show Carene has been used to resolve a health issue.

In the book titled: **Xylem Monoterpenes of Pines: Distribution, Variation, Genetics, Function**, written by Richard H. Smith, he states that the Bristlecone pine trees in eastern Colorado and the Northern regions of New Mexico and Arizona contained between 1% and 5% a-pinene and 75% to 85% carene. Another region that contained 46% a-pinene and 39% carene was located at Spring Mountain Nevada; Tamarack Canyon, California and White Mountains California, with another region at Humphrey's Peak in Arizona. Also Bristlecone pine trees near Mt. Shasta California were found to contain up to 49% carene. His book goes into much more detail, including maps and locations of the regions of the trees. Highly recommended reading. Carene is also emitted by plants as a natural defense against insects [21]. Extremely high levels of Carene are emitted by the Sitka spruce tree, whose lifespan is between 700 and 800 years, in order to ward off weevil attacks [22].

A fungus that grows on the bottom of the ocean called

Eutypella scoparia also happens to contain carene [23] and this fungus has been found to exhibit powerful natural anti-inflammatory activity. The immortal jellyfish, Turritopsis medusa, sinks to the bottom of the ocean floor where it becomes a gelatinous blob, than over the next few days it becomes a polyp, which allows it to regenerate itself [24]. Further research may find that this jellyfish specifically picks locations where the fungus Eutypella scoparia is present when rejuvenating itself.

Carene Levels in Centenarians

Interestingly carene is found in significant amounts in centenarians [25] and is associated with healthy aging and longevity. Other substances found in centenarians include 1H-indole, 5 methyl, dimethyl trisulfide and formic acid butyl ester, all of which are anti-aging substances, with carene and 1H-indole, 5 methyl being the most abundant. Lower levels of these were found in younger people, most likely because bodies that are older use these substances to fight age related inflammation. 1H-indole is a substance that is produced by the good bacteria in your stomach (a probiotic) [26].

Plants that contain Carene as a major constituent -

Carene levels vary in plants and trees due to geographic region which can be affected by sun and winds, the soil type, elevation and growing conditions. Many of the plants and trees shown below are also abundant in pinene and limonene.

Black Pepper (Piper nigrum) [27] - - Leaf oil of Cedrus deodara [28] (Roxb. ex D.Don) G. Don (Pinaceae). The Deodar Cedar tree can live as long as 1,000 years and it is used to fight leukemia. - - Korean Pine trees [28]. - - Mediterranean cypress [29] (Cupressus sempervirens L.) (Cupressaceae), which is also used to fight leukemia. Some species of the Mediterranean cypress can live to over 1000 years - - Greek Juniper [30] (Juniperus excela M.Bieb) (Cupressaceae). Greek Juniper showed that in low doses, (10 ppm), that it enhanced the lifespan of C. elegans by 18.54% [31]. What was

also interesting in the study was that the worms exhibited a 30.40% longer survival rate when placed under thermal stress, compared to the control group. Also they expressed elevated levels of SOD-3 (39.49%) and GST-4 (glutathione) (25.13%). The glutathione gene is a gene that helps the body remove environmental pollutants [31] - - Pinus roxburghii Sarg. (Pinaceae) [32] which is also used to fight colon cancer. P. roxburghii trees can live as long as 123 years or more.

Alpha Brainwaves and Pinene

When looking at brainwave frequencies over the course of a lifetime between the ages of 3 and 7, theta brainwaves are the most dominant, with alpha starting to increase after age 7 [33]. Between 11 and 12 years of age alpha brainwaves peak, than begin to decrease until age 40 [34]. Between the ages 60 and 90, there is a major decrease in fast alpha brainwave activity [35] and in older people with dementia and people diagnosed with psychiatric diseases, alpha brainwaves will turn into theta waves [36] [37].

In a clinical trial involving 10 men and 10 women that inhaled α-pinene [38], women experienced significant increases in their alpha waves. When they inhaled β-pinene, they also experienced increases in alpha brainwaves, however the men experienced a decrease of alpha waves. However alpha waves were increased when they inhaled the a β-pinene scent. Another study [39] that tested participants inhaling Peppermint essential oil, which contains 15.99% Limonene and 7.71% Pinene, found increased alpha wave activity in the participants' prefrontal cortex region of the brain (up to 31%) when they looked at white pictures. Also when worms were exposed to the scent of Pinene, they showed better resistance to heat stress [40].

Interestingly when the Great Basin Bristlecone pine is exposed to higher temperatures, there is a significant decline in α-pinene/limonene levels ($P < 0.001$, $R2 = 0.414$), as well as α-pinene/3-carene levels [41]. I hypothesize that the pinene and carene are acting as heat stress reduction mechanisms, which is why they

decline in the presence of heat stress. This would also mean that methods the reduce heat stress may be one of the most powerful anti-aging mechanisms.

A little later on we shall explore in great detail why coffee is one of the most powerful anti-aging foods. As an interesting side note, both the words coffee and carene both start and end with the letters C & E. Also the words carene and coffee both contain two E's and each name consits of six letters.

The key is the type of coffee and how long the beans are roasted. When Luwak Green Arabica Coffee is fermented, the most significant compounds produced are α-pinene, furfural and 3-carene [42], and carene is found in Schinus terebinthifolia Raddi [43], which is used to treat respiratory diseases as well significantly reduce blood pressure due to its ability to lower oxidative stress [44]. Carene is also found in lime peel [45] and cinnamon [46].

Chapter 1
Exploring the anti-aging substances in roasted coffee

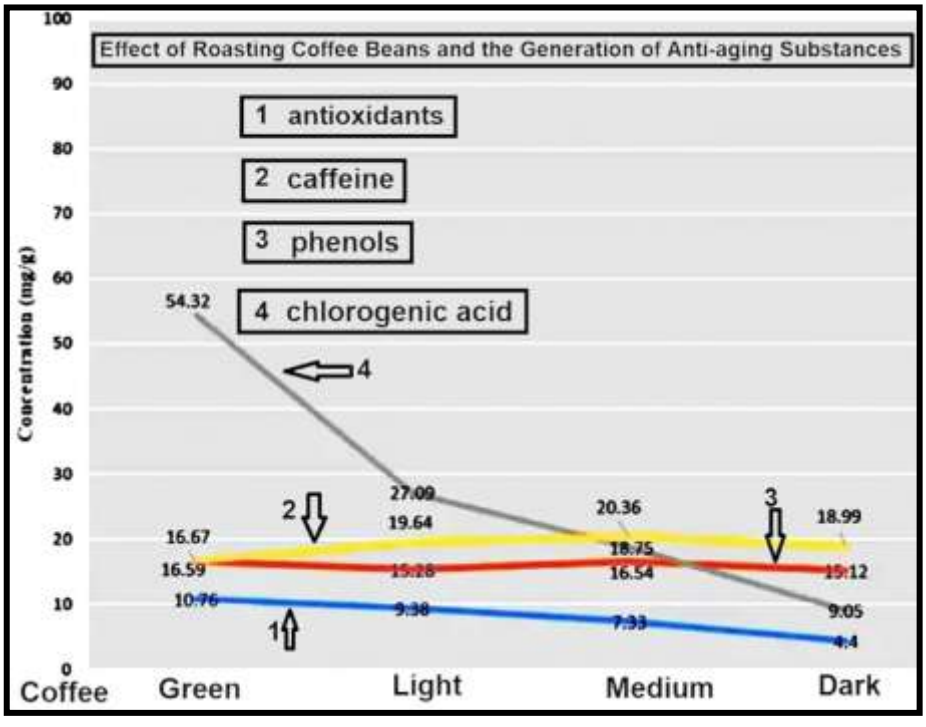
So now let's explore the reactions that take place in foods when they are heated starting with coffee. Roasting coffee beans will enhance salicylic and caffeic acid levels [50]. Interestingly, dark-roasted coffee contains significantly ($p < 0.0001$) higher salicylic acid levels, compared to medium and lightly roasted coffee beans. As roasting time increases, salicylic acid levels will rise. This has been confirmed by Pelvan et al. (2018). Higher temperatures also boost salicylic acid levels and coffee that experiences short brewing times shows higher levels of salicylic acid [50].


Caffeine

Chlorogenic acid is found in coffee, with concentrations as high as 70 to 350 mg per cup [51], with a negative correlation existing between chlorogenic acid levels and the degree of roasting, with light roast and green coffee having the highest amounts. Regarding country, coffee from Ethiopia has the highest levels of chlorogenic acid followed by Columbia. Columbian coffee also has the best roasting ability [51]. I hypothesize that the salicylic acid in coffee is enhancing the bioavailability of the chlorogenic acid. This could be why numerous studies show coffee extends lifespan. In some studies showing increases in lifespan up to 52% [52] [53] [54]. This means other bio-enhancers may enhance the absorption of chlorogenic acid. Further studies are needed to confirm this hypothesis.

Further Reading

The effect of time, roasting temperature, and grind size on caffeine and chlorogenic acid concentrations in cold brew coffee. Fuller M., Rao N.Z. Sci. Rep. 2017;7:17979. doi: 10.1038/s41598-017-18247-4.



Above Graph Courtesy of: Quantification of Caffeine and Chlorogenic Acid in Green and Roasted Coffee Samples Using HPLC-DAD and Evaluation of the Effect of Degree of Roasting on Their Levels. Shady Awwad, et al. Dec 2021.

What does Bioavailability Mean?

In order to carry out their maximum effectiveness, substances in foods must be fully released from the foods during the digestion phases in the gastrointestinal tract or colon to make them made fully absorbable (Heaney, 2001). If this properly takes place, they are then transported into the body's bloodstream and into systemic circulation throughout the body where they are used for numerous metabolic functions [55] (Wood, 2005). In many cases, the more hydrophilic the substance, the better its bioavailability. A patent titled: Hydrophilic matrix beadlet compositions with enhanced bioavailability (#WO2015173603A1), uses such a composition to enhance the bioavailability of fats and a Sept 2020 research study titled: Direct Conjugation of Resveratrol on Hydrophilic Gold Nanoparticles, published by Iole Venditti and colleagues, used gold nanoparticles created from cysteine and citrate to enhance the

bioavailability of resveratrol due to the strongly hydrophilic composition of the nanoparticles.

Regarding plants, the plant species Lonicerae Japonicae Flos, contains considerable levels of chlorogenic acid [56] and an extract of Lonicerae Japonicae Flos has been shown to extend lifespan in worms up to 21.8% [57]. It also significantly enhanced the gene bec-1, the gene responsible for normal aging and neurodevelopment and it also reduced toxins. The authors of the study concluded that Lonicera japonica exhibits major implications for promoting healthy aging and to treat age-related diseases.

What do Amino acids and Meteorites have in common?

You are reading one of the few books that explores modern day science to connect the dots of alchemy. So let's start connecting some of the dots. Let's first examine what substances are produced by meteorites as they enter earth's atmosphere.

When a meteorite is travelling through space, its temperature ranges from 100°C to 400°C [58]. However as soon as that same meteorite enters earth's atmosphere for its brief 10 to 15 second journey, this mass hurtling through earth's atmosphere will heat up to over 1,800 degrees Celsius (a super Maillard reaction, which we shall explore in more detail later on). If you heat glycine with alumina to 240 degrees Celsius, it will generate the amino acids alanine, alpha-aminobutyric acid, norvaline, norleucine, sarcosine, ethylglycine, methylalanine and ethylalanine [59]. These just happen to be the same amino acids found in meteorites [60]. These can also be synthesized in the lab through the application of an electric current through water, methane, nitrogen and ammonia [61]. Therefore, we have a solid basis to support the hypothesis that meteorites bring life to planets throughout our universe via a cosmic Maillard reaction.

This has been speculated as far back as the 5th century BCE, when Greek philosopher Anaxagoras coined the term Panspermia, which means life on earth came from chemicals in outer space, which initiate life as soon as they encounter the right environment.

During orbital experiments by ERA, BIOPAN, EXOSTACK and EXPOSE [62] the data showed that spores of B. subtilis were killed if they became exposed to the full environment of outer space; being killed in a matter of seconds. However if they were shielded against solar radiation, they were able to survive embedded in clay or meteorite powder. Researchers from both the University of Hawaii and the University of California, Berkeley, [63] [64] concluded that under the right conditions, outer space allows for the creation of amino acids.

Could the Philosopher's Stone be a matter of separating amino acids from a substance than using the right processing methods to create a compound that becomes not only super bioavailable, but that has transmutation properties?

Meteorites Create Gold

A research study published by the University of Bristol stated that gold and **platinum** came to earth from meteorites. The lead researchers in the study, Willbold and Elliott, stated that Earth's gold was the result of years of meteorite bombardment. As the gold-laden meteorites slowly became stirred into Earth's mantle via convection, geological formation created Earth's continents concentrating the precious metals into ore deposits which can now be mined.

References

The tungsten isotopic composition of the Earth's mantle before the terminal bombardment. Matthias Willbold et al. Sept 2011.

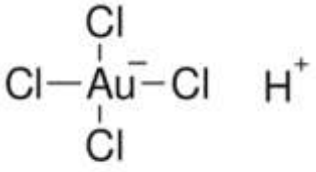
Meteorite storm showered planet in gold. New Scientist Magazine. Michael Marshall. September 2011.

How to use Amino Acids to make Gold

In an August 2016 published study titled: Catalytic Application of Nano-Gold Catalysts Acids by Light Irradiation, that was written by Lilia Coronato Courrol and Ricardo Almeida de Matos, the

authors created gold nanoparticles using only white light (*a xenon lamp*), Chloroauric acid, Milli-Q water (*creates ultrapure water*) and the amino acids valine, aspartic acid, threonine, tryptophan and arginine. As I shall go into detail later on in this book, key amino acids are valine and arginine.

What is also interesting is that when the Actinobacteria Rhodococcus is exposed to Chloroauric acid, it creates gold (Biosynthesis and Characterization of Gold Nanoparticles. Maria S. Kuyukina et al. Oct 2022). Actinobacteria are gram positive bacteria that help encode information in DNA. One of the functions of Actinobacteria is to help in the process of decomposition in organic substances. Another interesting thing is gold can be made from Saperavi red wine using chloroauric acid (Synthesis Of Gold Nanoparticles From Chloroauric Acid Using Red Wine. T. Pavliashvili Et Al. 2017).

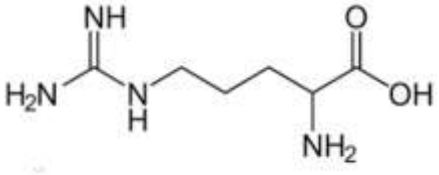


Chloroauric acid

Another research study published in October 1996 titled: An experimental study on gold solubility in amino acid solution and its geological significance, published by Zhang Jingrong and colleagues, stated that amino acids may have been responsible for the formation of source beds of gold. The researchers also stated that the proper concentrations of amino acids and temperature are key elements, with the pH being between 6 and 8 at 80°C giving the best results. Another paper, recently published in 2020 by Andrey A. Buglak and Alexei I. Kononov titled: Comparative study of gold and silver interactions with amino acids and nucleobases, stated the synthesis of silver occurs at an alkaline pH and that gold nanoparticles grow best at low temperatures in an acidic pH.

Later on you shall read how the Maillard reaction works and how it creates some of the most powerful anti-aging substances. The Maillard reaction involves the process of heat. An example is heating amino acids and sugars. This causes them to evaporate creating new or more concentrated substances. Getting back to the aforementioned paper (published in 2020), the authors of the study

stated that gold nanostructure creation can occur via a reduction of amino acids in water. The best amino acids for this being: arginine, tryptophan, methionine, phenylalanine and threonine. The amino acid glycine is also used as a method to extract gold from minerals (Use of amino acids for gold dissolution. C.G. Perea May 2018) and amino acids are used to stabilize gold nanoclusters (Andrey A. Buglak. Sept 2020).



Arginine

Another study published in June 2023 titled: Amino Acids as Reducing and Capping Agents in Gold Nanoparticle, published by Aleksandra M. Figat and colleagues, observed the formation of a black precipitate while they were synthesizing the gold nanoparticles. If you are familiar with alchemy, the black precipitate is a key element in the making of the Philosopher's Stone. The authors found they were able to synthesize gold nanoparticles with the following amino acids: Glycine, Valine, Asparagine, Leucine, Alanine, Leucine, Phenylalanine, Serene, Threonine, Isoleucine and Aspartic Acid. Also protein cages and peptides have been used to synthesize gold. You can read more about this in the paper shown below under further reading.

Further Reading

Binding Preferences of Amino Acids for Gold Nanoparticles: A Molecular Simulation Study. Qing Shao and Carol K. Hall. July 2016.

Chapter 2
Alchemy and bioavailability

n ancient Zhuangzi text that was written between 476 and 221 BC contains anecdotes and stories which exemplify the carefree nature of the Taoist sage Master Zhuang (Zhuangzi). It is one of the founding texts on Taoism, along with the Tao Te Ching. In Chapter 1.3 of the Zhuangzi it states that on Guyi Mountain there exists a spirit-like man whose skin appears icy as snow, is as chaste as a virgin, and does not eat grains. However, he drinks the dew and sucks in the wind to maintain his physical immortality. It is his concentrated spirit which brings bountiful harvests year after year, saving things from corruption [(65)].

The Basics of Alchemy

Honolulu Community College (www.honolulu.hawaii.edu) Program 23. Lesson 4.1 on Alchemy states Alchemy is the cosmic art through which parts of the animal and mineral parts are liberated from their temporal existence in order to achieve a state of perfection. In the case of minerals; gold. For humans, immortality, redemption and longevity. These transformations are brought about by a material substance such as an elixir, the Philosopher's Stone by psychological enlightenment or by revelatory knowledge.

Gold has been made by bombarding mercury with neutrons, which was first accomplished by Sherr, Bainbridge and Anderson in 1941. This was repeated in 1980 by Glenn Seaborg who transmuted bismuth into gold. If you look at a Periodic Table of the Elements, bismuth is right next to the element lead. And today scientists are able to create silver nanoparticles using lead (Lead–germanate glasses: an easy growth process for silver nanoparticles. Ricardo Schneider et al. Aug 2017).

If you read the early literature on Alchemy, it states that in order to make the Philosopher's Stone, one would collect fresh dew

from the grass by placing sheets on the grass and then wringing the dew out into a bucket. Next the dew would be put through a series of stages, many of which involve low heat. The time of year the collection of the dew was recommended was during the spring full moon and especially when the moon was in Taurus (refer to a Moon void of Course Calendar).

Research studies [66] have shown dew which settles on the grass contains significant levels of the amino acids glutamine/glutamate, proline and arginine. What is most interesting is the researchers in the study discovered that the amino acids showed a seasonal variation, with the amino acids in the dew peaking during March, showing above levels of proline and arginine. What is most interesting is proline has been shown to protect plants from heat [67].

Why the Bioavailability of nutrients decreases with old age

Bioavailability refers to the absorption, metabolism and activation of nutrients as they enter the body. The absorption of nutrients in the body fades as one grows older. Studies confirm that people of old age absorb less iron [68] and also exhibit reduced calcium absorption, which in turn affects their metabolism of vitamin D. (Barragry et al. 1978, Ebeling et al. 1992, Holick et al. 1989, Tsai et al. 1984). Also many elderly people are on prescription medication, which may decrease the way nutrients are absorbed [69]. Also micronutrient and macronutrient (including protein) intakes drop significantly after age 65 [70]. Studies also show that the bioavailblity of nutrients can be improved when the abundance of beneficial gut bacteria is at healthy levels or when there is a decrease of bad bacteria in the stomach (Bioavailability Based on the Gut Microbiota. Feng Zhang et al. Apr 2020). Also elderly people show a reduced ability to adapt to diets low in calcium [71] compared to younger people who are more able to rapidly adapt to such diets (Ireland and Dordtran 1973) and as shown earlier, the compound Carene, found in the 5,000 year old Bristlecone pine tree, has been proven to be extremely effective at keeping bones

strong and healthy.

Studies also state [72] that some elderly people suffer from a malabsorption of healthy nutrients in foods. These include amino acids, carbohydrates, lipids, minerals and vitamins, which can lead to specific illnesses [72].

A lower nutrient bioavailability can cause a decreased capacity of the kidneys to convert vitamin D into an active form. A research study examined an aged Puerto Rican population near the city of Boston and discovered that only 18% of adults between the ages of 51 and 70 had healthy levels of Vitamin D [73]. The bioavailability of certain nutrients is pH dependent. Nutrients that are not well absorbed due to a low acidic pH [74] include calcium, iron, beta-carotene, folic acid and vitamin B-12 (Russell 1986, Tang et al. 1996), (Camilo et al. 1996, Ribaya-Mercado et al. 1987).

Enhancing Calcium Bioavailability

Nuts are some of the very best anti-aging foods, especially nuts that are abundant in calcium. While many foods contain calcium, the key is eating nuts that have calcium that is easily absorbed into the body. The highest bioavailability of calcium from nuts comes from pistachios [75]. Pistachios also have a high zinc bioavailability as do hazelnuts.

Chapter 3
Amino acids, Caloric Restriction & Lifespan

Amino Acid and Lifespan

oday people on the Greek island of Ikaria live 8 years longer than Americans, have half the rate of heart disease, experience 20% less cancer and experience almost no dementia [76] [77]. The reason for their long healthy lives is because their diet is at least 90% plant-based and they obtain their protein from fish instead of meat. Beans, peas and chickpeas are also a staple part of their diet.

How Caloric Restriction lengthens lifespan

Tom Cruise is now over 61 years of age and looks very young for his age. This is because he follows a caloric restriction diet. In a 2021 Men's Health article titled: How Tom Cruise Remains Youthful at 61, and How You Can Too, which was published in July 2023 he stated in an interview that he uses a Beckham-devised diet. This diet consists of a total of only 1,200 calories, some grilled foods and almost no carbohydrates. Another person that has a calorie restricted diet is mathematician Courtney Brown [78]. He is in his 70's and looks to be in his mid 40's. He talks about his caloric restricted diet in one of his videos, which goes into more details. Other people who look young for their age, Lenny Kravitz, Chuando Tan, Christy Turlington, Gwyneth Paltrow (known for her strict diet), Bianca Lawson, Gong Li, John Legend, Sandra Bullock, Pharrell Williams, William Shatner, Gwen Stefani and John Stamos.

I used to believe that skin gets dried out as one gets older. However this is not always the case. 90 year-old working supermodel Carmen Dell'Orefice, who has been married three times, still has tight firm skin and no sagging neck or jawline.

Research shows [79] that a significant increase in lifespan is observed when calories in the diet are restricted between 25% and

60%, compared to diets without caloric restriction (Borut Poljsak et al. Dec 2020) and a recent 2021 study [80] found that by reducing your calorie intake by up to 30%, it can considerably increase your life expectancy.

Average Calories per Food Group	
Food Group	**Calorie total per 100g**
Non-starchy veggies (beets, broccoli, okra and carrots)	15-50
Fruits (bananas, berries, apples and tomatoes)	16-85
Starchy veggies (squash, potatoes and corn)	19-99
Whole grains (oats, rice and quinoa)	68-122
Legumes (lentils, beans and peas)	118-170
Flour based foods (bagels, bread and pasta)	147-290
Dried fruit (dates, raisins and prunes)	237-298
Foods with sugar (maple syrup, table sugar, corn syrup and agave syrup)	259-410
Seeds & Nuts (cashews, flax seeds and walnuts)	473-660
Oils (coconut, canola and olive)	876-900
Plant-based nutrition for healthcare professionals: implementing diet as a primary modality in the prevention and treatment of chronic disease. Julieanna Hever and Raymond J Cronise. May 2017.	

How the right amino acids lengthen lifespan

Certain amino acids have been shown to decrease lifespan; with increasing concentration [81]. These are phenylalanine, tryptophan, aspartate, tyrosine and valine. Three amino acids have been shown to exhibit the greatest increase in lifespan (at 5 mM doses). These were cysteine, asparagine and glutamine.

When cysteine-fructose is used in a Maillard reaction [82] it creates above average levels of antioxidant activity, as well as exerts metal chelating properties (the removal of toxic metals). We shall go into in-depth detail about the Maillard reaction later on, which also involves the chemical reaction taking place when proteins and sugars are both heated together.

Protein Toxicity

Nutrients which release acid precursors into your bloodstream are proteins and phosphorus, which includes the sulfur amino acid methionine. This can cause blood pH to decrease (become more acidic) [83].

Methionine restriction extends lifespan

Orentreich and colleagues tested their hypothesis that restricting the amino acid methionine in the diet could extend lifespan [84]. Their study found that when mice were fed a methionine restricted diet that it resulted in increased lifespan of between 30% and 35%. The mice showed leaner bodies, improved glucose homeostasis, lower blood glucose and insulin levels and in studies on fruit flies [85], restricting methionine by 67% extended their maximum lifespan and mean lifespan by 2.4% and 10.5%. It was interesting that there exists a methionine restriction "sweet spot" as the researchers discovered that severely restricting methionine levels by 88% did not extend their maximum or mean lifespan any further. This sweet spot may vary between organism and species, depending upon various factors such as weight, lifestyle and other factors.

Methionine toxicity due to more acidic blood levels can be

decreased by adequate glycine intake (Luka et al., 2009). Indeed research studies now confirm that adequate glycine intake may reduce methionine levels. Diets supplemented with Glycine also exhibit anti-inflammatory and anticancer effects in studies on mice [86] (Alarcon-Aguilar, 2008; Wang et al., 2013; Zhong et al., 2003) as well as demonstrated beneficial effects in humans diagnosed with type II diabetes in a 3-month clinical trial (Cruz, 2008).

When 344 mice were given a Glycine supplement [87], they exhibited a significant extension in their lifespan (with glycine being given at levels of 8% (the best), 12% and 20% (Brind, 2011). Excess glycine caused weight loss.

Caloric restriction works because it reduces oxidative stress in the body, which in turn reduces free radicals occurring in mitochondria. This reduction substantially reduces proteins which become oxidized which contribute to mutated DNA [88].

Because excessive and incorrect proteins are one of the main causes of aging, caloric restriction is simply a way to reduce the amount of the wrong protein in your diet. Because most meats contain excessive levels of protein, which includes an over abundance of amino acids, a reduction of amino acids in the diet is one way to reduce the amount of calories in your diet. There are now some good studies that confirm that excessive red meat consumption can cause health concerns. For example a recent research paper published in October 2022 [89], which was a systematic review and meta-regression study, evaluated the relationships between health and the consumption of red meat. The authors in the study concluded there exists some evidence that the consuming of unprocessed red meat leads to an increased risk of mortality and disease incidence and a May 2019 study [90] reported that epidemiological studies show diets high in animal proteins, particularly red meat, contains high amounts of methionine and that this may be related to age-related diseases. William Shatner writes in his 2018 book titled: Live Long and…. that he has significantly cut back on heavy meat consumption. Perhaps this is why he is one of the world's oldest living actors and

doesn't look 92 years of age.

When researchers examined the diet of one of the longest lived populations, the Japanese Okinawans, they discovered that they consumed fewer total calories. This was because they ate significantly less barley, wheat and other grains [91].

When we look at what exactly is in meat that is causing the health problems, we see that it is due to the protein amino acids isoleucine and valine, possibly due to them being subjected to high temperatures [92].

Out of all the common household oils studied for producing toxic compounds during the Maillard reaction (sunflower oil, extra virgin olive oil and canola oil), cooking in sunflower oil produced the least number of heat toxins [93]. Cooking in the sunflower oil created more Methylpyrazine, which is found in peanuts, coffee and red peppers. The cooking in the sunflower oil also produced more dimethylpyrazine, then the other oils, which is found in coffee.

So what happens if we cook some commonly eaten foods in sunflower oil? Would it show an increase in their nutrients? Studies by Hedrén et al. found that when sunflower oil was used to cook certain foods that they all showed increases in their beta carotene levels. Increases were observed in pumpkin (64%), cassava (47%), sweet potato (39%), boiled pumpkin (19%) and **boiled carrots (74%)** [94]. These are significant increases and it means the less toxins that are created during heat, the better the food is for the body.

A longitudinal study involving 2,983 men and women between the ages of 40 and 65 had their plasma levels of lycopene, carotene, lutein, zeaxanthin, and cryptoxanthin measured. The researchers found that people who had higher levels of these carotenoids showed higher cognitive scores. This study shows that people who have a diet with healthy levels of carotenoid-rich foods show stronger cognitive functioning as they grow older (*Lycopene and cognitive function. Kristi M. Crowe-White et al. May 2019*). As a side note, mango is not only rich in carotenoids, but also carene

(*Chemical Composition of Mango. Maria Elena Maldonado-Celis et al. Oct 2019*).

What is also interesting is when you do Oil Pulling, it has been found to have numerous health benefits. Oil Pulling is when you swish your mouth with sunflower oil for a period of time until it turns white then spit it out and rinse out the mouth. Oil Pulling is the main antidote for enjoying good teeth and gum health, and in some cases to help alleviate toothache, which I go into more detail in my book titled: The Complete Guide to Natural Toothache Remedies and Re-mineralization.

And as we shall explore in an upcoming chapter, when Ginseng is heated, the amino acid valine was one of the amino acids that was easily impacted by the Maillard reaction [(95)] and Valine has been shown to extend the lifespan of mice [(96)]. This means that plant protein amino acids in plants undergoing chemical reactions involving the proper heat, create mostly beneficial reactions. However, in the case of meat products, when meat is cooked, especially at high temperatures, it not only forms AGE's, but the valine may be creating more negative substances that contribute to ill health. Hence, there exists a "sweet spot" for the substance being heated where the amino acids undergo their phase transition to become beneficial substances for the human body. Let's examine the data to gather strong evidence to support this hypothesis.

The Branched Chain Amino Acids

Isoleucine and Valine are in the class of amino acids called Branched Chain Amino Acids (BCAA's). There now exist numerous scientific research studies involving humans, flies and rodents [(97)] that prove that reducing these amino acids in the diet extends lifespan.

So if we want to go one step further and eliminate the main proteins that are responsible for accelerating aging, we can look at the scientific research. The research shows [(98)] that when the amino acids isoleucine and valine are removed from the diet, it extends

lifespan. The research also shows [99] that the amino acid leucine is problematic, however this protein amino acid does not appear to be responsible for accelerating the aging process.

Foods with extremely high levels of Leucine include [100]
Adult bovine's rump, baked ham, bresaola, chicken breast, deer, guinea fowl, pork, rabbit, asiago, grana cheese, parmesan cheese, drained tuna, mullet roe, smoked salmon, raw dried broad beans, arachid butter, pine nuts and unsweetened cocoa powder.

Besides valine, leucine is also a branched-chain amino acid. Studies on both mice and humans [101] have discovered that diets low in protein are highly beneficial. A research study found that a diet that had low isoleucine levels was beneficial for the liver, restored homeostasis functioning and resulted in more energy in the body through the production of ketone bodies. There were other data points in the study that suggested that the reduction of these two amino acids greatly enhanced physical energy in the body. Hence, if you are vegetarian and want to have more energy, than a reduction in these two amino acids is key. The authors in the study concluded that reducing isoleucine be recommended as an approach for treating and preventing diabetes and obesity.

How to Increase your energy level if you are Vegetarian
From my own journey of becoming vegetarian, the very first problem I encountered was a lack of physical energy. This subsided after a few months because my body eventually adjusted and my energy returned back to normal levels. However when my energy returned, it returned stronger and more clearer than before. If you are just starting out vegetarian, the chart on the following page shows some non-meat foods that will help get you through the temporary energy crisis. If you want to learn more about becoming vegetarian, my book titled: The Vegetarian's Guide to Longevity via Gene Therapy and Raw Foods has all the information you could possibly ever need regarding a healthy vegetarian lifestyle.

How to get proper protein levels -

Skim Milk & Tuna contain adequate protein if you are vegetarian or vegan [102] and don't mind eating fish (pescatarian).

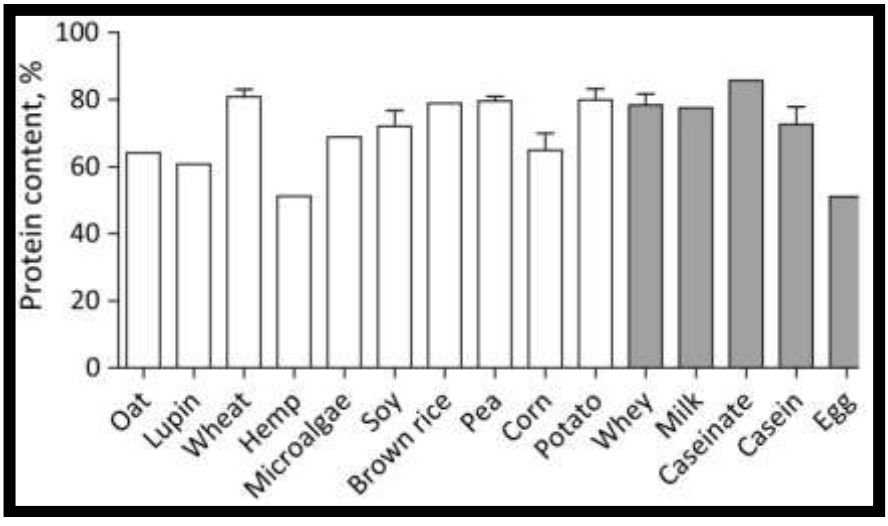
Protein Levels in plant based foods		
Wheat 32.3%	Brown rice 20.6%	Corn 7.3%
Potatoes 3.1%	Soy (includes Tofu) 2.7%	Peas 1.0%
Oatmeal 0.3%		
Protein content and amino acid composition of commercially available plant-based protein. Stefan H. M. Gorissen et al. Aug 2018		

Additional substances that contain an abundance of plant protein are calcium caseinate (38%), casein (34%) and eggs (32%) [103].

Some people may think taking the amino acid supplement Whey Protein will help give them enough protein, however research shows that Whey Protein contains high levels of isoleucine, leucine and valine [104] and studies on mice show that a reduction of isoleucine in the diet increases lifespan [105].

Vegetarians naturally have higher concentrations of glycine. Researchers speculate that the consumption of meat may reduce levels of glycine in the body [106]. This was shown in a clinical trial [107] where glycine levels declined slightly after eating meat for a week, even when glycine levels in the meat were 50% higher, compared to glycine levels in the vegetarian diet. Also another study found that a diet which included 8% glycine [109] led to a statistically significant increase in lifespan in both female and male mice. What was surprising in the study was that the mice were less likely to die of lung cancer, suggesting that glycine exerts its protective effects via lung homeostasis.

In summary, the best high physical energy foods (from highest to lowest) are - Microalgae, Soy, Brown Rice, Oats, Lupin, Wheat and Corn.



Above graphic courtesy of: Protein content and amino acid composition of commercially available plant-based protein isolates. Stefan H. M. Gorissen, et al. Aug 2018.

So what does the data say regarding how much amino acids in the diet should be reduced? Research has found [109] that when flies had a 50% reduction of branched chain amino acids in their diet, that they exhibited an increase in their lifespan. When these levels were increased to 85% their lifespan also increased, but they were more prone to sterility (*a reduced capacity to have offspring*). In a recent research study [110] published in July 2021, the optimal reduction of branched chain amino acids in mice was 67%. This gave them an increased lifespan of up to 30%. When it comes to humans, the percentage of reduction of BCAA's is similar, being 40% [111].

The Amino Acid Methionine. Victor or Villain?

Another amino acid which can be detrimental to the body in large amounts is Methionine. Natural energy foods that contain low amounts of Methionine include microalgae (0.0%), oatmeal (0.2%), lupin (0.3%), peas (0.4%), soy (0.4%) and wheat (0.9%).

When glycine is added to diets containing an above average

level of methionine, it has been shown to suppress methionine levels [112]. When the amino acid methionine enters your body it is than converted into homocysteine which is a substance that has been associated with accelerated aging and aging-related disorders. The amino acid that comes to the rescue is glycine, which reduces methionine levels in the blood [113]. When the amino acid methionine was reduced by between 30% and 40%, it extended lifespan in studies on mice [114] and when glycine was given to mice, it extended their life because it suppressed their levels of methionine [115]. This may be why diets supplemented with glycine exhibit anticancer and anti-inflammatory effects in mice. (Alarcon-Aguilar, 2008; Wang et al., 2013; Zhong et al., 2003) as well as be beneficial to patients diagnosed with type II diabetes. Significant extension of lifespan was also observed when mice were administered glycine at 8%, 12% and 20% in their diet (Brind, 2011) [116]. When the mice were given above average amounts of glycine, they lost weight. The glycine "sweet spot" that obtained the longest lifespan was ($p = 0.03$) glycine supplementation at 8%. Glycine has also been used to heal skin wounds, reduce alcohol overdose, treat leg ulcers, treat ischemic stroke and reduce the harmful effects of kidney drugs after an organ transplant [117].

Another study [118] hypothesized that glycine supplementation worked to reduce the levels of oxidative stress created by methionine. When the glycine was administered to mice at 8% or 12%, it increased their median lifespan from 88 weeks to 113 weeks; with their maximum lifespan increasing from 91 weeks to 119 weeks (45 months). The average lifespan of a mouse is 24 months. This is a significant finding, proving that the restriction / neutralization of problem amino acid proteins extends lifespan.

Glycine Synergy

When Glycine is combined with lysine and arginine and given as an oral supplement, it has been shown to lower cholesterol levels up to 51% [119]. The best ratios were when the amino acids Arginine/Lysine and Glycine/Methionine ratios were at the ratios

of 1:1 or 2:1.

Foods that meet this ideal amino acid ratio [120] include: whole dried egg, sweet potatoes, oysters, kale, spinach, bananas, asparagus, lotus roots, mung beans, oatmeal, corn, beets, egg yolk, beet greens, broccoli, dates and oranges.

Foods abundant in Glycine

Foods that contain an abundance of Glycine [121] include: grain products and milk and dairy products such as yogurt, kefir and chicken. Other foods include wheat, with the highest levels of glycine being in Hungarian wheat and the lowest in UK grains [122] and rice has been found to contain about twice as much glycine compared to proteins found in vegetables or animals [123]. Regarding spices, caraway seeds contain extremely high levels of glycine and lysine [124]. Caraway seeds were found to greatly enhance the ALDH2 gene [125], which is the gene that protects your body's organs against oxidative stress. Which may be why caraway seeds are used to treat chronic fatigue syndrome [126].

The following pages list a few of the detailed charts that are included with this book

Antioxidant Levels in Everyday Foods	
Name	**Antioxidant Level**
Oranges	0.9
Papaya	0.6
Dry Crushed Leaves Of The Baobab Tree	48
Dried Plum	3.2
Fresh Dog Rose	24
Dried Dog Rose	**78**
Raw Apple	0.4
Dried Apple	**3.8**
Pomegranate	1.8
Baobab Tree Fruit	10.8
Prunes	2.4
Dried Apricot	3.1
Fresh Leaves Of Cabbage-Tree- Stem (Moringa Stenopetala)	3.7
Dried Leaves Of Cabbage-Tree- Stem (Moringa Stenopetala)	**11.9**
Raw Kale	2.8
Cooked Broccoli	0.5
Dried Mango	1.7
Strawberries	2.1
Red Or Green Chili	2.4
Dried Dates	1.7
Black Olives	1.7
The total antioxidant content of more than 3100 foods, beverages, spices, herbs and supplements used worldwide. Monica H Carlsen et al. Jan 2010.	

F

Cyanidin	Delphinidin	Malvidin
acai fruit, raw cranberries, elderberries (chilean wineberry), raw black diamond plums (*raw brassica oleracea capitata group*), tasmanian hot peppers, purple wheat	bananas, raw billberries blueberries, grapes, black currants or juice, maqui, saskatoon berries, eggplant, black beans, cowpeas	bilberry, blueberries, jambul, grapes, grape juice, cabernet franc or cabernet sauvignon or syrah or shiraz wines, black beans, cowpeas
Pelargonidin	**Petunidin**	**Peonidin**
strawberries	bilberry, blueberries, raw grapes, raw guajiru (coco-plum), jambul, saskatoon berries	billberries, blueberries, cranberries, raw plums, saskatoon berries, cowpeas, cabernet franc or cabernet sauvignon or syrah or shiraz wines, purple wheat

Anthocyanin levels in common foods. (per 100 gm of fresh weight). (Zamora-Ros Knaze et al. 2011)

CY = Cyanidin DE = Delphinidin MD = Malvidin
PG = Pelargonidin PO = Peonidin PE = Petunidin

Food	CY	DE	MD	PG	PO	PE	Levels
black raspberries	323			0.15	0.55		324
raw blueberries	42	92	103		23	58	320
raw chokeberries	435			1.44			437
raw elderberry	758		61	1.13			820
raw bilberries	112	161	54		51	51	430
raw red chicory	232	13					246
blackcurrant juice	16	27		1.17	0.66	3	49
raw eggplant	0.02	13		0.02			13
red raw onions	6	2		0.02	1		9
crowberry juice	16	47	61		11	26	163
raw red cabbage	72	0.10		0.02			72
raw eggplant	0.02	13		0.02			13
cranberry juice	41	7	0.31		42		91
black grape juice	1	3	58	0.02	6	2	72

The Vascular and Anti-inflammatory Activity of Cyanidin-3-Glucoside and its Metabolites in Human Vascular Endothelial Cells. Hiren P. Amin. June 2015. Norwich Medical School.

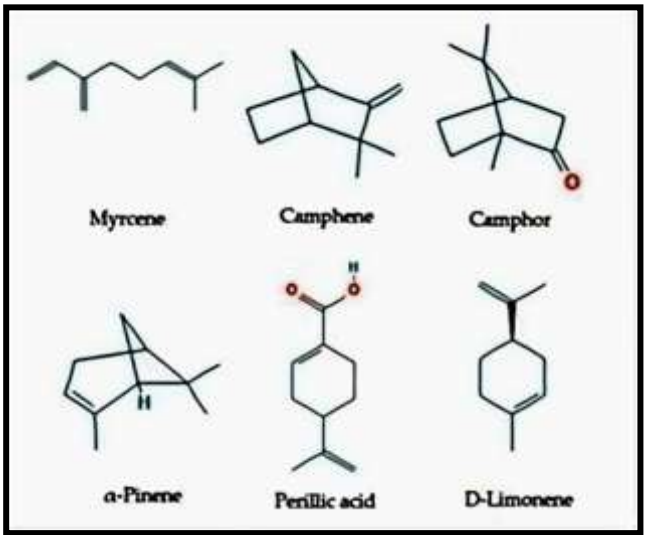
[459]. Studies show [460] that apple polyphenols made in a smoothie from apples reached the colon, allowing for a greater bioavailability of the polyphenols compared to apples not made into a smoothie.

A research paper [460] reported that heating and grinding which occur during smoothie preparation, could increase the bioavailability of the phenolic compounds, showing that pumpkin, purple carrot and banana smoothies exhibited the most phenolic compounds. And another study [461] found that when strawberry, juçara and banana smoothie were pasteurized, they showed a higher preservation of phenolic compounds, yet showed a

Increases in Nutrients of Smoothie Combinations [462]		
Increases In Phenolics. Starting With Highest Combo First	**Vitamin C**	**Gallic Acid And Vitamin C**
apple, mango, banana, passion fruit	apple, pineapple, mango, carrot, coconut	oranges, mangos, and passion fruit, peach,
apple, strawberry, raspberry, blueberry, banana		apple, mango, banana, orange, passion fruit, peach, lemon
apple, blueberry, banana, pomegranate, grape, currant		
apple, pineapple, pear, kiwi, lime, spirulina		
Protocatechuic Acid	**Coumaroylquinic Acid**	**Quercetin, Rhamnoside**
banana, grape, apple, cranberry, orange, pomegranate, acai, chokeberry, lemon	apple, mango, banana, passion fruit	blueberry and pomegranate.
	apple, strawberry, raspberry, blueberry, banana	
Naringin, Hesperidin	**Catechin And Hyperosides**	**Chlorogenic Acid**
oranges, passion fruit and mangos	blackberries, strawberries, grapes, currants and raspberries	berries, apples, bananas, citrus fruits and pears

When cereal is combined with polyphenols, it creates a delay in the absorption of the polyphenols. Which may be why you see cereal boxes in your local supermarket with fruit on the cereal box [463].

Food Sources Of the 6 main Anthocyanins	
Delphinidin	Red Wine & Berries
Petunidin	Black Goji Berries And Purple Potatoes
Malvidin	Blueberries
Cyanidin	Cherries
Peonidin	Berries
Pelargonidin	Stawberries



Above is a list of monoterpenes proven to delay age-related diseases as well as increase lifespan [890]. The chart on the following page lists many of the substances mentioned in this book showing the major compounds in each plant or herb.

The Dominant anti-aging substances in common foods, plants and herbs	
vanilla	vanillin, ethyl vanillin, coumaric acid, ferulic acidvanillyl alcohol and vanillic acid.
turmeric	curcumin.
thyme	cymene, gamma-terpinene, linalool, borneol, thymol and carvacrol.
star anise	anethole, limonene, estragole and phenylpropanoids.
sesame seeds	sesamin, tocopherol, stigmasterol, phytic acid, linoleic acid, oleic acid, β-sitosterol, campesterol and stearic acids.
saffron	camphor, thujone, β-thujone, viridiflorol and borneol cineole.
rosemary	ursolic acid, camphor, limonene, camphene, borneol, cineole, linalool oxide, carnosol, rosmarinic acid, carnosic acid, α-pinene and bornyl acetate.
red peppers	β-carotene, zeaxanthin, lutein, capsanthin, capsaicin and caffeic acid.
parsley	apiole, apigenin, myrcene, rutin, myristicin, p-1,3,8-menthatriene and β-phellandrene.
onion	quercetin, allyl propyl disulphide and protocatechuic acids.
mint	limonene, carvone and 1, 8-cineole.
ginger	gingerol, paradol, bisabolene, α-farnesene, β-phellandrene, shogoal, zingiberene, citral (neral and geranial), cineole and zingerone.
fennel	estragole, sabinene, β-myrcene, trans-anethole, fenchone, limonene, anisaldehyde, α-pinene, β-pinene and camphene.
‘	α-pinene, limonene, dill ether, sabinene, n-

dill	tetracosane, neophytadiene, α-phellandrene,n-heneicosane, n-docosane, n-tricosane, n-nonadecane, n-eicosane, β-myrcene and α-tujene.
coriander	linoleic acid, oleic acid, petroselinic acid, palmitic acid,vaccenic acid, myristic acid and stearic acids.
cinnamon,	cinnamaldehyde, linalool, humulene, cinnamyl acetate, cineole, eugenol, coumarin, τ-cadinol, ethyl cinnamate and β-caryophyllene.
celery seeds	lupeol acetate, hexadecanoic acid, 2 isopropyl-5-methyl-phenol, octadecanoic acid, stigmasta-5,22-dien-3β-ol, lup-20(29)-en-3-yl acetate and (3β, 24s)-stigmast-5-en-3-ol.
cardamom	limonene, linalool, terpinolene, 1,8-cineole, α-terpinyl acetate, myrcene and linalyl acetate.
black pepper	α-pinene, β-pinene, α-phellandrene, piperine, β-caryophyllene, myrcene, terpinolene, limonene and carene.
black cumin (*nigella sativa*)	β-pinene, p-cymene, p-mentha-1,3-diene-7-al, thymoquinone, cuminaldehyde, γ-terpinene and p-mentha-1,4-dien-7-al.
bay leaves	α-pinene, limonene, alpha-terpinyl acetate, 1,8-cineole and terpinene-4-ol.
basil	linalool, 1 8-cineole, estragole, eugenol, caryophyllene, β-ocimene, methyl cinnamate, α-cubebene and α-farnesene.
Asafoetida (*also called Asafetida*)	**rhamnose**, glucuronic acid, **ferulic acid**, umbel-liferone, asaresinotannols, galactose, l-arabinose, 2-butyl propenyl disulfide, farnesiferols a, b, c and glucose.

anise	anethole, para-anisaldehyde, methyl cavicol, estragole, γ-and hymachalen.

Chronic diseases, inflammation, and spices: how are they linked? ajaikumar b. kunnumakkara, et al. jan 2018.

Food sources of Important Vitamins		
Nm	**Source**	**RDA**
A	**Carotenoids:** green leafy vegetables (spinach, broccoli), carrots, orange flesh fruits (mangoes, melons and persimmons) and orange-flesh sweet potatoes. Red palm oil and pumpkin. **Retinol:** cheese, fish, butter, egg yolk and milk.	2,333-3,000 IU / 700-900 µg
D	**Foods:** mushrooms, liver, beef, egg, yolk, fortified cereal, dairy products, veal and fatty fish. **Sunshine**: ultraviolet B radiation.	600–800 IU / 15–20 µg
E	**Edible vegetable oils:** avocado, sunflower seeds, fruits (kiwifruit, mango), leafy green vegetables (chard, spinach), nuts (almonds, peanuts) and nut spreads.	22–33 IU / 15 µg
K	**Phylloquinone:** broccoli, spinach, cabbage, vegetable oils (olive, soybean, canola). parsley, and collard greens. **Menaquinone:** Fermented cheese and curds, Natto (fermented soybeans),	90–120 µg
C	Citrus fruits, tomatoes, brussels sprouts, broccoli, lettuce and potatoes.	75–90 mg
B1	**Citrus fruits:** pineapple, orange juice, strawberries and grape. Fish, legumes (beans	1.1–1.2 mg

	and lentils), asparagus, whole grain cereals, squash, nuts, brewer's yeast and soymilk.	
B2	Brewer's yeast, nuts, dark green leafy vegetables, whole grains cereals, eggs, milk and yoghurt.	1.1–1.3 mg
B3	Yogurt, cheese, legumes, milk, egg, meat, fish, fruits (avocados, dates, fogs and prunes), mushrooms and nuts.	14–16 mg
B5	Red fish, cereals, brewer's yeast, legumes, tomatoes, potatoes, egg yolk, milk, green leafy vegetables broccoli and mushrooms.	5 mg
B6	Milk, yogurt, mushrooms, broccoli, fish, shellfish and chicken.	1.3–1.7 mg
B7	Chickpeas, maize and whole grain cereals, starchy vegetables, bananas, potatoes, fish (tuna, salmon), beef, liver, nuts (peanut, walnut) and fruits.	30 µg
B9	**Nuts:** peanuts, walnuts, cereals, yeast, asparagus, milk, lentils, egg yolks, wheat germ and beans.	400 µg
B12	**Fish:** trout, salmon, herring and sardines, shellfish, spinach, dark leafy greens, asparagus, beets, turnips, mustard greens, milk and milk products.	2.4 µg
Revisiting food-sourced vitamins for consumer diet and health needs: a perspective review, from vitamin classification, metabolic functions, absorption, utilization, to balancing nutritional requirements. Chigozie E. Ofoedu et al. Sept 2021		

Average Vitamin Levels in Common Foods		
Vitamin	**Source**	**Vitamin Contents**
A	Chicken liver	308 µg
	Milk	6.2 µg
	Cheddar cheese	7.1 µg
	Beef liver	679 µg
D	Vitamin-D fortified non-fat	3.10 µg
	milk	1.03 µg
	Eggs	1.15 µg
	Oiled Sardines	
E	Sunflower Seeds	7.4 mg
	Peanuts	2.2 mg
	Sunflower oil	5.6 mg
	Almonds	6.8 mg
K	Cabbage	34 µg
	Broccoli	160 µg
	Spinach	27 µg
B1	Breakfast cereal (fortified)	1.5 mg
	Enriched white rice	1.4 mg
	Cooked Tuna	0.2 mg
B2	Scrambled Eggs	0.2 mg
	Fortified Instant Oatmeal	1.1 mg
	Fat free plain yoghurt	0.6 mg
B3	Whole wheat bread	1.3 mg
	Fortified Cereal	20 mg
	Tuna	8.6 mg
	Turkey	10 mg
B5	Avocado	1 mg
	Plain non-fat Yoghurt	1.6
	Fish trout	1.9 mg
B6	Chickpeas	1.1 mg
	Tuna	0.9 mg

	Potatoes	0.4 mg
B7	Sweet Potato	2.4 µg
B9	Spinach	131 µg
	Broccoli	45 µg
	Asparagus	85 µg
B12	Salmon	4.8 µg
	Low fat milk	1.2 µg
	Fortified breakfast cereal	1 .5 µg
	Canned tuna	2.5 µg
C	Tomato	17 mg
	Romine lettuce	28 mg
	Orange Juice	93 mg
	Grape Juice	70 mg
Revisiting food-sourced vitamins for consumer diet and health needs: a perspective review, from vitamin classification, metabolic functions, absorption, utilization, to balancing nutritional requirements. Chigozie E. Ofoedu et al. Sept 2021.		

Additional combinations that exhibit bioavailable synergy include: Sardines with cottage cheese, Spirulina with Yogurt, Poppy seeds with fried eggs and Banannas dipped in Teff (*Eragrostis tef*)

Exploring Synergistic and Longevity Substances in Foods

The tables on the following pages show which foods and substances extend lifespan, as well as synergistic substances that go with them. **Note**: Even through a substance in the following charts may show that it does not activate SOX9, or NRF2, future studies may show it does. Many substances that may not show an increase in SOX9, may show an increase in osteoblast proliferation differentiation. If this is the case, than the substance may exhibit similar effects to SOX9 up-regulation.

Synergy can be positive and negative. When a substance exhibits synergy, you need less because it exhibits stronger effects

or it may make the substances more easily absorbed by the body, penetrates the skin deeper or fights bad bacteria. Synergy can also be bad as it may interact with some medications and other herbs (*antagonism*). Trust your intuition and research for yourself if you are uncertain. Where you see this symbol (**), it denotes major synergism or increased effects.

Chart Legend	
S9 - increases SOX9 Gene	**SR - increases SIRT1**
NR - increases NRF2	**SY - exhibits synergy with….**
SU - available as a supplement	

Master table of synergistic and longevity gene upregulation substances and their synergy					
	S9	**SR**	**NR**	**SU**	**SY**
Herbs & Spices					
black cumin seed		*	*	*	
skullcap / baicalin	*	*	*	*	antibiotics / β-carotene /
chamomile flowers			*	*	apigenin-7-o-glucoside / ferruilic acid
coriander			*		chicory / probiotic / cumin seed oil / cefoperazone / gentamicin / tetracycline
rosemary		*	*	*	retinoic acid / antibiotics / ferulic & caffeic acids
cardamom			*	*	
astragalus			*	*	olive leaf / bitter melon / mulberry / phlorizin / atractylenolide / paeonia lactiflora / probiotics lactobacillus and bacillus cereus
mexican oregano			*		caffeic acid / chlorogenic acid / inalool, menthol,

					cinnamaldehyde, eugenol, thyme, rosemary, gentamicin, levofloxacin, polymyxin, kanamycin / antimicrobials
	S9	**SR**	**NR**	**SU**	**SY**
milk thistle (silybum marianum)	*	*	*	*	curcumin / silymarin / chrysin / artichoke / borututu
caraway seeds				*	retinoic acid / peppermint
fo ti he shou wu / polygonum multiflorum		*	*	*	reserveratrol / adriamycin
ginkgo biloba		*	*	*	green tea / aspirin / p. fruticosa leaf extract / fruticosa leaves
Plants					
green tea	*	*	*	*	lemon (**), imipenem / black pepper / lysine, arginine / quercetin, soy / theaflavin / cinnamon / ginger / acarbose / curcumin, /

					selenium / penicillin / sulindac / mint / honey / vitmin c / grape seed, gingko biloba, rosemary fruit of the persian oak (quercus brantii lindl.), amla (phyllanthus emblica l.), anar (punica granatum), dalchini (cinnamomum cassia, red onion,
	S9	**SR**	**NR**	**SU**	**SY**
longjing tea (*queen of green tea*)					Osmanthus fragrans flowers
rooibos tea		*			red palm oil
coffee / caffeine	*	*	*	*	isorhamnetin / catecholamines / ephedrine / sugar / aspirin / gallic acid / paclitaxel / isorhamnetin
dark chocolate / cacao		*	*	*	cinnamon / theobromine
coleus forskohlii / forskolin	*	*		*	phorbol ester / dexamethasone / carbachol
black tea		*	*	*	grape skins

lithospermum erythrorhizon / shikonin	*	*	*		antibiotics / erlotinib
comfrey			*	*	
	S9	**SR**	**NR**	**SU**	**SY**
lotus seed		*	*		phloridzin / green tea polyphenols
crabapple (*malus toringoides*)				*	
dendrobium officinale flower / dendrobium				*	
hawthorn berries		*	*	*	
burdock root	*	*	*	*	nettle leaves
lanceleaf tickseed (*coreopsis lanceolate flowers*) (*easy to grow at home anti-aging herb*)		*			
apple leaves			*	*	
coyol palm (*acrocomia aculeate*)				*	
beefsteak plant (*perilla frutescens*)			*	*	polygodial
wax gourd (benincasa hispida)		*	* *	*	

maitake mushroom			*	*	reishi & shiitake
maqui berry			*	*	citrus
	S9	**SR**	**NR**	**SU**	**SY**
Chrysanthe-mum		*	*	*	
erigeron breviscapus / breviscapine			*	*	
oroxylum indicum bark			*	*	acarbose
japanese knotweed			*		muscadine grape pomace extract
gotu kola (*centella asiatica*)		*	*	*	chloramphenicol / tetracycline / bacopa / vitamin e / curcumin
fructus psoraleae / psoralen	*	*	*		uva light / gold
dong quai (*angelica sinensis*)				*	
moringa oleifera leaves		**	**	*	moringa oleifera stem bark extract with ampicillin / amphotericin b
mango peel / mangiferin	*	*	**	*	antibiotics
citrus peel / nobiletin		*	*	*	atorvastatin / curcumin / sinensetin / sulforaphane **
passionfruit		*	*	*	
beet juice /		**	**	*	

betalain					
garlic / aged garlic		*	*		captopril / allicin / antibiotics / honey / fish
	S9	**SR**	**NR**	**SU**	**SY**
acai berry		***	*	*	olive leaf / reserveratrol
chickpeaas					beetroot / beet juice / betalain
Substances					
sulforaphane	*	*	**	**	selenium / mustard / luteolin / myricetin
luteolin		*	*	*	sulforaphane / quercetin / celecoxib
quercetin	*	*	*	*	luteolin / sulfamethoxazole / kaempferol / green tea / curcumin
curcumin	*	**	*	*	caryophyllene / lavocoxid / antibiotics / gemcitabine / xanthorrhizol / ginger / sulfinosine / epigallocatechin gallate / insulin / piperine / gallic acid / resveratrol

ellagic acid		*	*	*	lipoic acid / ferulic acid / quercetin / green tea / rutin
ferulic acid		*	*	*	ellagic acid / ascorbic acid / caspofungin / vitamin c isoferulic acid / coumaric acid / almond skins /
	S9	**SR**	**NR**	**SU**	**SY**
kaempferol	*	*	*	*	fluoroquinolones / 5-fluorouracil / quercetin / chrysin
genistein	*	**	**	*	tamoxifen / epigallocatechin gallate / curcumin / 5-fluorouracil/
horny goat weed / icariin	*	*	**	*	quercetin / rutin / formononetin / hispidulin
acacetin		*	*		
baicalein	**	*	*	*	daidzein / meropenem / trans-chalcone / gemcitabine / docetaxel / oxytetracycline / tetracycline / ceftazidime
vitamin c		*	*	*	vitamin e / green tea

vitamin e					vitamin c
carnosine	*	*	*	*	aminoguanidine , egcg, green tea, vitamin c, cod liver oil, grapeseed, bilberry
	S9	**SR**	**NR**	**SU**	**SY**
ginseng / ginsenoside rc	*	*	*	*	panax notoginseng saponins
resveratrol	*	*	*	*	cisplatin / oxyresveratrol / chrysin / curcumin / quercetin / chrysin / vitamin d / genistein / piperine / antiandrogen flutamide / polydatin / spermidine / fluorouracil / oxaliplatin / ginkgetin / cisplatin
hesperidin		*	*	*	mandarin peel extract / diazepam / chlorogenic acid
Epigallo-catechin	*	*	*	*	dl-cycloserine / digitonin / genistein (**) / luteolin /

					myricetin / daidzein / oxytetracycline / beta-lactams /tetracycline / cefotaxime
	S9	**SR**	**NR**	**SU**	**SY**
saffron		*	*	*	vanillin / pediculicide / low frequency electromagnetic fields
chondroitin sulfate	*	*	*	*	probiotics / vitamin c / glucosamine / curcumin / curcuma longa
linalool			*	*	chlorhexidine, cetylpyridinium, and triclosan (mouthwash only) / orange oil (external use only) / coumaric acid cumin seed
pinene			*		cineole/caryophyllene / pulegone, p-cymene, camphene (exterior only)
chitosan	***	*	*	*	thyme / whey protein / cinnamomum cassia presl /

					clove / zinc / caprylic acid, syzygium aromaticum (*preservation only*)
	S9	**SR**	**NR**	**SU**	**SY**
spermine	*	*	**	*	salicylic acid (**), putrescine
arginine		*	*	*	lactobacillus / phenylalanine /histidine/ ghrp-2 (kp 102) < hgh
lactobacillus acidophilus		*	*	*	probiotics / streptococcus thermophilus mk-10 / clove / cuminumcyminum l. oil / coriander seed / black rice / olive leaf extract
olive leaf extract		*	**	*	antibiotics / probiotics / metformin / hydroxytyrosol / oleuropein
vanillin / vanillic acid	***	*	**	*	catechins /clove
carnosic acid / rosemary	*	**	*		gentamicin / propolis (**) / curcumin / lutein / turmeric extract / tetracycline / lycopene (**), lutein and beta carotene

cinnamic acid		*	*		carvacrol (***) / vanillin / gallic acid / quercetin / thyme / polymyxin b
	S9	**SR**	**NR**	**SU**	**SY**
shikonin		*	*		antibiotics / erlotinib / metformin
bakuchiol		*	**	*	melatonin / garlic / vitmin c / ascorbyl tetraisopalmitate
limonene		*	*	*	berberine / carvone
mastic gum			*	*	pinene
anthocyanins		*	*		whey protein
cyanidin-3-glucoside		**	*	*	atorvastatin / acarbose / apple extracts / casein
gallic acid	*	*	*		caffeic acid (**) / protocatechuic acid / famotidine
apigenin-7-o-glucoside	**	*		*	luteolin / quercetin / cowpea extract / chrysanthemum / paclitaxel / pyrimethamine fluorouracil
peonidin	*				black rice germ
salicylic acid / aspirin					vorinostat / cyanidin / resveratrol / arginine /

					quercetin
Hydroxyl-cinnamic acids		*	*		leucine / sinapic acid
	S9	**SR**	**NR**	**SU**	**SY**
Hydroxyt-yrosol		*	*	*	
scutellarin	**	**	**		
silymarin / milk thistle	*	*	**	*	curcumin / chlorogenic acid / melatonin / chrysin / metformin
isorhamnetin			*		
Atractyle-nolide	**	*	**		
diosmin			*	*	fluorouracil
zeaxanthin			*	*	lutein / tocopherol / lycopene / zinc
beta-carotene					lycopene
phenylalanine				*	
uric acid				*	alpha-tocopherol
alpha-tocopherol					chlorogenic acid / beta-carotene / lycopene / gallic acid

Enhanced Bioavailability Of Nutrients In Foods		
food combination	**Effect**	**Synergisstic Substances**
banana & yoghurt and raw almonds **honey and garlic** **green leafy vegetables with lemon**	enhanced bioavailabilty of nutreints	vitamins a, e, c and zinc. vitamin c and iron
black pepper & green tea **green tea and lemon** **chocolate & raspberry**	immune system health	zinc, vitamin c, & vitamin d
fish with turmeric **turmeric with black pepper** **ginger and curcumin**	fights infection	zinc, vitamin c, & vitamin d
fish with garlic **olive oil with tomatoes**	strengthens body against chronic disease	vitamins a, k, d & zinc. calcium and selenium

grapes with onions **tomatoes with broccoli** **apples with berries** **meat with rosemary**		
chickpeas with beets	reproductive health	The B6 in the chickpeas increases the bioavailability of the magnesium in the beets. This can help ease symptoms of PMS and ADHD.
eating tomatoes, with boiled eggs carrots, and green leafy vegetables	eye health	increases absorption of carotenoids 3 to 9 times
extra virgin olive oil and apple-enriched dark chocolate	heart health	
black currant with rowanberry	controls blood glucose	

thyme honey with olive oil	significantly improves blood glucose	
red palm oil & rooibos tea	anti-inflammatory	
probiotics with prebiotics	enhances overall probiotics	
fish oil with tocopherols and rosemary extract	stronger antioxidants and also acts as a natural perservative	
almonds with dark chocolate	significant reductions in small dense low-density lipoproteins, which are lipoproteins that cause coronary heart disease	
carrots with hummus	The olive oil in the hummus increases the bioavailability of Vitamin A.	
tomatoes and olive oil	The olive oil enhances the bioavailabiilty of the beta-carotene up to five times more.	

Plant-based foods Nutrient Sources		
Food	**Sources**	**Generation Methods**
Protein	chickpeas, soy, soybeans	microbial fermentation (including mixed-cultured bacteria) which increases protein levels, Microalgae, products with essential amino acids.
Vitamin B12	breakfast cereals, yogurt and non-dairy milk alternatives.	fortification using natural vitamin B12-creating microorganisms via lactic fermentation, lupin fermentation used to create lupin tempeh, hydroponic cultivation methods, where crops grow in water that is enriched with vitamin B12.
Vitamin D	plant-based drinks, breakfast cereals, mushrooms, milk and eggs and Lichens D3 supplements.	vitamin D-biofortified eggs, UV irradiation of baker's yeast and mushrooms and lichens.
Iron	salt, dairy products, cereal-based products and milk.	biofortification, ferritin content enrichment, reduction of phytic acids, (*eg. soaking legumes or adding phytases during baking*), microencapsulation of an iron fortificant before mixing with foods, addition of ascorbic acid (eg. absorbic acid with Tofu).
Omega-3's	chia seeds, leafy green vegetables, flaxseeds, wheat germ, hempseeds and walnuts.	biofortificated foods such as eggs and dairy and eggs by incorporating algal or fish oil to cows' and hens' feed, cultured microalgae.
Calcium	breakfast cereals, plant-based drinks, Greek yogurt and kefir.	fermentation techniques involving mixed cultures of bacteria, Spirulina (Arthrospira sp).
Foods for Plant-Based Diets: Challenges and Innovations. Alexandra Alcorta et al. Feb 2021.		

Constellation and Subatomic Reaction	
Constellation	**Alchemical Effect**
Aries	Calcination
Taurus	Congelation
Gemini	Fixation
Cancer	Solution / Dissolution
Leo	Digestion
Virgo	Distillation
Libra	Sublimation
Scorpio	Separation
Sagittarius	Creation
Capricorn	Fermentation
Aquarius	Multiplication
Pisces	Projection

Recommended anti-aging reading list

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- Antiaging agents: safe interventions to slow aging and healthy life span extension. Ji-Kai Liu.
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- The synergistic potential of various teas, herbs and therapeutic drugs in health improvement: A review. Florence Malongane et al. June 2017.
- Synergistic Effects of Natural Product Combinations in Protecting the Endothelium Against Cardiovascular Risk Factors. Muhammad Yousaf et al. July 2022.
- Nutraceutical potentials of synergic foods: a systematic review. Tharani Devi Natarajan et al. Dec 2019.
- Antiaging agents: safe interventions to slow aging and healthy life span extension. Ji-Kai Liu. May 2022.
- SIRT1 Activation by Natural Phytochemicals: An Overview. Concetta Iside et al. Aug 2020.
- Natural Nrf2 Activators from Juices, Wines, Coffee. Mallique Qader et al. Dec 2020.
- Synergistic Effects of Chinese Herbal Medicine. Western Sydney University. X Zhou et al. July 2016.
- Nutraceutical potentials of synergic foods: a systematic review. Tharani Devi Natarajan et al. Dec 2019.
- The synergistic potential of various teas, herbs and therapeutic drugs in health improvement: A review. F. Malongane et al. June 2017.
- SynergyFinder is a web-application that is used for finding synergistic drug combinations
- Antiaging agents: safe interventions to slow aging and healthy life span extension. Ji-Kai Liu. May 2022.
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- Impact of Polyphenolic-Food on Longevity: An Elixir of Life. An Overview. Rosaria Meccariello and Stefania D'Angelo. Mar 2021.

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15) Overexpression of SOX9 alleviates the progression of human osteoarthritis in vitro and in vivo. Yuanming Ouyang et al. Aug 2019.
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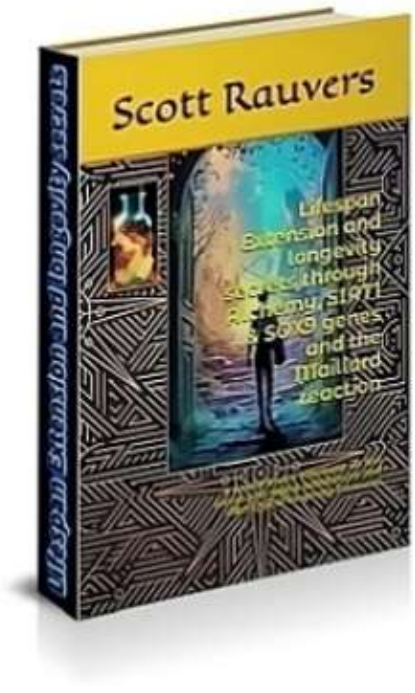
Scott Rauvers



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