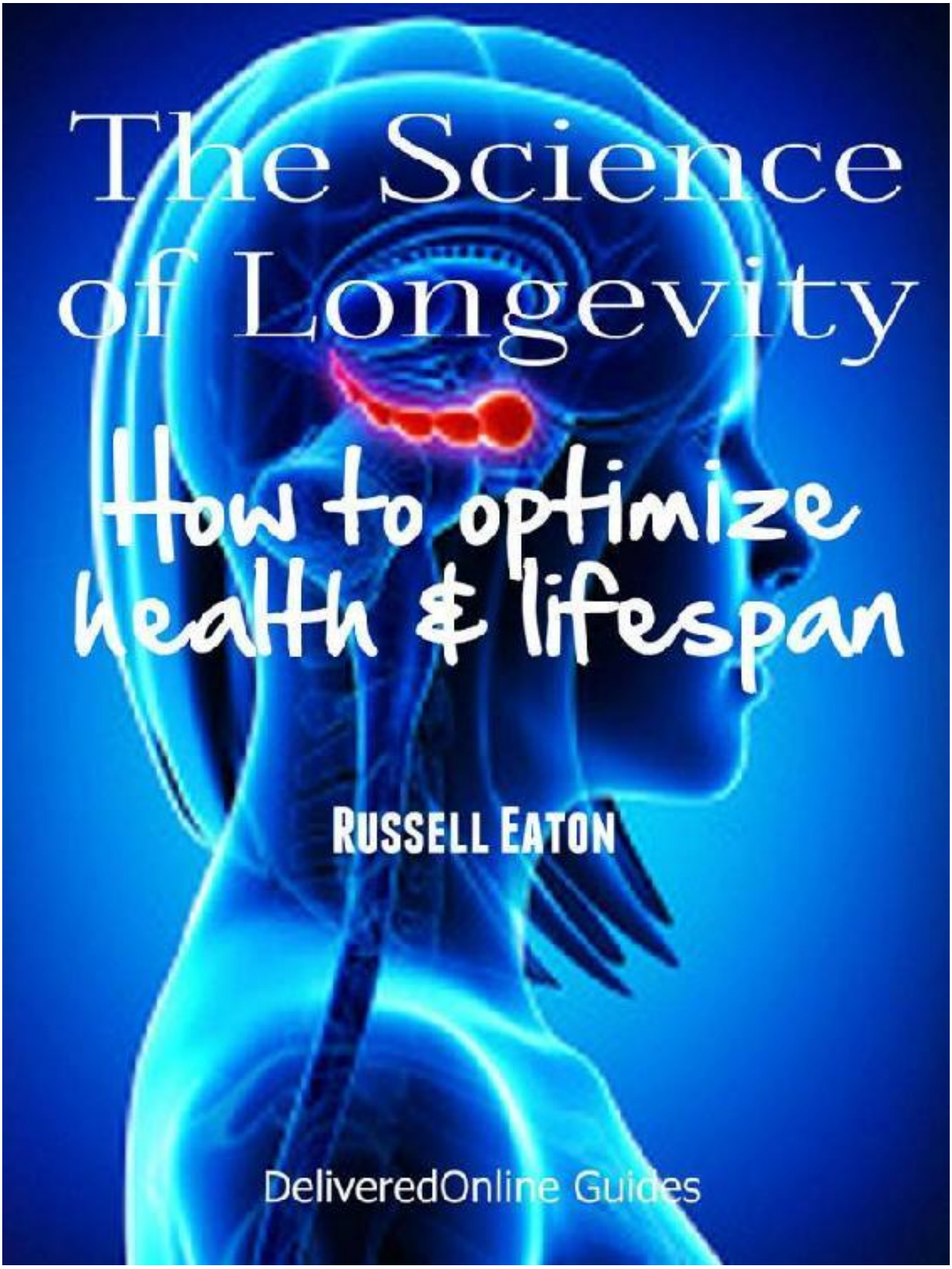
The Science of Longevity
How to optimize health & lifespan
RUSSELL EATON
DeliveredOnline Guides

The Science of Longevity
How to optimize health & lifespan

Russell Eaton

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Contents

Introduction

Most people want to live a long life provided you can remain reasonably healthy in your old age. Being healthy throughout life is by far the greatest way to extend your life. But to simply say *"be healthy if you want to extend your life"* is not enough and much too vague.

Taking action to improve your health is something that anybody can do regardless of your current circumstances and state of health. It is never too late. Clearly, if you need expensive medical attention for a specific condition, then having money may help. But that apart, you don't need to be a millionaire to be super healthy. What you need is a blueprint (a strategy if you like) that you can follow, step by step to optimize your health. This book gives you that.

In the context of good health, there are two things to always keep in mind throughout your life:

1. Being in good health is a wonderful, even exhilarating thing. Always remember this and never take your good health for granted.

When you are healthy you tend to take your good health for granted. It is only when you are not feeling so great (or when you're ill or in pain) that you long for good health. By really appreciating the wonder of good health you will be more motivated to strive for it.

2. Achieving good health is as much about what ***not*** to do as what to do. So always remember there are two sides to the coin.

If you smoke, drink to excess, take drugs, breath in polluted air, eat junk food, etc. you are polluting your body. This makes you old before your time and this prevents good health. So being healthy is not only about following healthy lifestyles, it's also about ***not*** following unhealthy lifestyles.

To summarize this point, always remember two things: 1. Appreciate good health and don't take it for granted, and 2. Realize that achieving good health also involves ***not*** doing unhealthy things.

If you're expecting a diet book with recipes, diet plans and weight-loss strategies please do see our sister book *'The Lipo Diet'*. This book, ***The Science of Longevity,*** is entirely focused on health optimization and lifespan extension. The very latest research is evaluated, and you are given a blueprint for vastly improving your health and living longer.

Unlike other books which focus on the historical and social aspects of longevity, this book is a practical manual showing how to be fit, young and healthy into your old age. In spite of the scientific approach, it is written in plain language with no fluff or hot air.

It used to be thought that the long-lived inherited some kind of 'longevity gene', but modern research has shown that a specific longevity gene is a myth. The genetic aging process is likely the result of hundreds of thousands of closely intertwined genetic factors rather than a specific longevity gene. It could be that in the future, with greater computing power, it will be possible to identify these genetic differences and apply them to unborn babies. But current medical science cannot do this, nor is it possible to 'turn on' certain genes that promote longevity (another myth).

A question that is often asked in relation to longevity is: *how can you live longer?* And another question is: *what is the most common cause of death in the long lived?* Both these questions are linked and here is the answer.

Most deaths are caused by auto-accidents, violence, accidental poisoning, or chronic illness (e.g. smoking, alcohol and drug abuse can cause chronic illness). And guess what, the long-lived die from ***exactly the same causes*** as everybody else. But there is one important difference, when the long-lived die from chronic illness they do it 20-30 years later compared to others.

Note: chronic illness is also referred to as chronic inflammation, since they go hand in hand. Tackling chronic inflammation will combat chronic illness, improve health and extend life. For this reason much research into longevity is focused on dealing with chronic inflammation. The strategies in this book help combat chronic inflammation. The terms 'chronic illness' and 'chronic inflammation' are interchangeable in this book.

"What do most major life-threatening illnesses have in common? It's not genetics or lifestyle, but chronic inflammation. Fighting this silent fire within will not only help you live longer, it will help you live better". Source: Alison Garwood-Jones, The secret to longevity, December 2010, http://alisongarwoodjones.com.

The secret to longevity is to postpone death from chronic illness by 30 years or so. And you do this by optimizing health throughout your life. The strategy then is to 'postpone' chronic illness, i.e. to postpone or avoid as long as possible illnesses like Alzheimer's, cancer, heart disease, stroke, Parkinson's, and others.

Chronic illness kills more people than all the other mortality causes put together. It is defined as a human health condition that is persistent or long-lasting and comes with time. The term 'chronic' is often applied when the course of the disease lasts for more than three months. You may not even know that you have a chronic health condition until it catches you unawares, such as an unexpected heart attack.

Dr. Peter Attia, M.D. (http://eatingacademy.com) rightly says that a key to longevity is to avoid harmful behaviours and he summarizes the eight key things we can do to optimize health and live longer as follows:

1. **What we eat**
2. **How we move**
3. **How we sleep**
4. **How we manage chronic stress**
5. **How our hormones are optimized**
6. **What drugs we take**
7. **What our sense of purpose is**
8. **Our social support network**

From this we can distil it down further to three very broad headings:

1. **Diet:** Follow a healthy diet.
2. **Lifestyle:** Follow a healthy lifestyle (physical activity, sleep well, social support, avoid stress).
3. **Pollution:** Avoid polluting your body.

We will look at each of these three broad topics under various sub-headings throughout this book.

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The takeaway message: it is never too late to improve your health and extend your lifespan. The sooner you start the better. The key to longevity is to avoid chronic inflammation.

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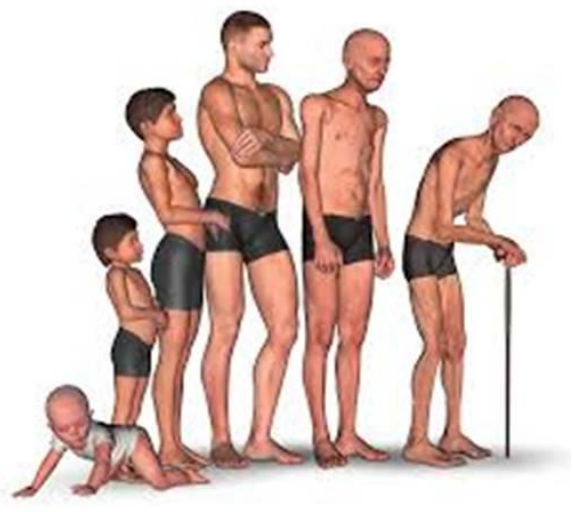

Longevity Falsehoods

Myths and misconceptions around the subject of longevity abound, mainly because of the huge health and pharmaceuticals industries trying hard to peddle their wares. By recognising such falsehoods you will be better equipped to optimize your health and live longer. Here are some of the falsehoods relating to longevity, which are examined under the following headings:

Resveratrol
Destiny
Programmed senescence
Calorie restriction
Antioxidant Supplements
CoQ10
Exercise
Krill Oil
Glutathione
Omega-3 Oil

*

Resveratrol

Falsehood: resveratrol supplements help improve health and prolong life.

Reality: resveratrol supplements do not improve health or prolong life.

The research is quite clear in showing that resveratrol does nothing to combat chronic disease or extend life. Don't waste your money buying any kind of resveratrol supplements; they are shown to be harmful and unhealthy. For example, some research shows that resveratrol nullifies the benefits of healthy physical activity: Gliemann L, et al, Resveratrol blunts the positive effects of exercise training on cardiovascular health in aged men, J Physiol. 2013 Oct 15; 591(20):5047-59.

Even dietary resveratrol is shown to be ineffective in terms of improving health or extending life.

"This study of nearly 800 older community-dwelling adults shows no association between urinary resveratrol metabolites and longevity. This study suggests that dietary resveratrol....does not have a substantial influence on inflammation, cardiovascular disease, cancer or longevity. There was also no difference [between those taking and not taking resveratrol] in the risk of developing cancer or cardiovascular disease. Relying on a single substance to keep you healthy is not recommended". Source:

Semba RD, et al, Resveratrol Levels and All-Cause Mortality in Older Community-Dwelling Adults. JAMA Internal Medicine, May 2014.

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"There is no evidence of benefit from resveratrol in those who already have heart disease. There is no evidence of an effect of resveratrol on cancer in humans. There is no conclusive human evidence for an effect of resveratrol on metabolism. There is no evidence for an effect of resveratrol on lifespan in humans as of 2016. In 2010, GlaxoSmithKline (GSK) suspended a small clinical trial of ..... resveratrol due to safety concerns, and terminated the study later that year. There is not enough evidence to recommend consumption of resveratrol beyond the amount that can be obtained through dietary sources, and more human clinical trials are needed". Source: Wikipedia.

Destiny

Falsehood: Maximum lifespan is already destined. Whatever one does you will not live longer than the pre-determined destiny. Therefore you cannot extend lifespan beyond the period that one is destined to live.

Reality: There is no pre-determined destiny to longevity (this is superstitious nonsense). Barring accidents, your lifespan is entirely determined by how you live your life. Unhealthy lifestyle factors such as smoking, alcoholism, a junk diet and so on will shorten your life.

Put another way, the body does not move inexorably towards a particular tipping point in time that we call death. Why not? Because the body is not a closed system, unaffected by exterior events. Diet, healthy lifestyles and other factors within your control determine your state of health and lifespan.

Taking unnecessary risks can also shorten your life. Examples: drunk driving, indulging in extreme/dangerous sports, over-taxing the body with intense exercise, exposing yourself to mugging in dark alleys late at night, regularly getting sunburnt (I think you get the picture).

The fact remains that if you make good choices, take good care of yourself and follow sound and healthy lifestyle factors, you can dramatically improve your health and live longer, even beyond a 120. You are not destined to die at 60, 70 or 80. You absolutely can control how long you live!

Programmed senescence

Falsehood: the body is programmed to die within a set period of time regardless of how healthy we are.

Reality: the body is not programmed to die within any set period of time, and a lot depends on our state of health.

As explained later in the book, our chromosomes have 'telomeres' at their tips. It is known that when our telomeres become too short we age more quickly and die sooner than otherwise.

The theory of 'programmed senescence' states that aging is driven by an innate internal clock that is controlled by gene expression. This internal clock is represented by our telomeres and 'senescence' refers to the point at which body cells cease to divide. It is well known to science that there is an upper limit to the number of times that a cell can divide, after which it dies. In other words, when the chromosome telomeres become too short, the cell can no longer divide.

The concept that our telomeres are governed by some kind of innate internal clock beyond our control is false, and hence the theory of programmed senescence is false. This is so because there is a lot that we can do to preserve our telomeres. So although just the act of living does indeed gradually shorten our telomeres, we can slow down this shortening process by optimizing health and following healthy lifestyle factors. By slowing down the 'wear and tear' of our telomeres we can greatly extend life.

Calorie restriction

Falsehood: it is believed by some that a calorie restriction diet can extend life.

Reality: in fact any kind of calorie restriction is unhealthy and certainly will not extend life. We won't dwell on this subject as it is fully covered in the chapter "The Calorie Restriction Myth".

Antioxidant Supplements

Falsehood: antioxidant supplements are good for you because they fight off disease and prevent premature aging of the body.

Reality: antioxidant supplements should be avoided as they cause nothing but harm.

The body's natural defences against oxidative damage are referred to as 'antioxidants'. They play a vital role in keeping us alive and well, and fighting off disease and the premature aging of the body. But it does not follow that taking antioxidant ***supplements*** is in any way healthy. Our body is perfectly capable of making all the antioxidants that it needs for good health.

The evidence shows that taking antioxidant supplements such as vitamins A, C, and E is counter-productive and conducive to disease and aging of the body.

There is a vast health industry that tries hard to sell you the false message that antioxidant supplements are good for you, so it is easy to be seduced into taking such supplements. This subject is examined at greater length in the chapter titled "Live Longer by Reducing Oxidative Stress".

CoQ10

Falsehood: CoQ10 supplements combat aging and illness and should be consumed regularly.

Reality: CoQ10 supplements do not combat aging and illness, and should do not be consumed regularly, if at all.

It is startling to think that according to a survey by Consumer Lab, Coenzyme Q10 is taken by 53% of the U.S. population, and yet this supplement is not proven to be beneficial.

CoQ10 is produced by the body and used for everyday functions of life including cellular energy. It is a fat-soluble antioxidant that transports electrons around the body, and is required by every single cell. To make energy, tiny organelles called mitochondria take fat and other nutrients and make useable energy within each cell. This conversion process needs CoQ10, so you can see it is an essential element to daily life.

As we age our body produces less CoQ10. This is part of the natural aging process. It is therefore argued that CoQ10 supplements can make up any shortfall in the amount that is produced naturally by the body.

However, there is no evidence that taking CoQ10 supplements makes up for any shortfall in the body's natural production of this vitamin. Furthermore, we can easily obtain CoQ10 from the diet. CoQ10 is naturally present in small amounts in a wide variety of foods and we only need a very small amount from the diet. In fact, few people experience deficiencies of this nutrient even in old age, although metabolic and mitochondrial disorders may increase the risk of deficiency.

Levels of CoQ10 are particularly high in organ meats such as heart, liver, and kidney, as well as beef, soy oil, sardines, mackerel, and many types of nuts and seeds. As explained in this book, it is not recommended that you include cooked meat in your diet because such food increases the risk of cancer. But a varied diet of salads, vegetables, sprouted seeds, nuts and seeds will give you plenty of CoQ10 without having to resort to supplements.

Furthermore, overdosing of CoQ10 can be harmful. Possible side effects include insomnia, rashes, nausea, upper abdominal pain, dizziness, diarrhea, sensitivity to light, irritability, headache, heartburn, and fatigue. CoQ10 might also reduce sperm production in men, cause a decrease in blood pressure and lead to an elevation in liver enzymes. Note also, that CoQ10 can interfere with certain medications such as anticoagulants and statins.

The evidence that CoQ10 supplements are beneficial is in fact very weak. Here's an abridged extract from Wikipedia.org in regard to CoQ10:

"CoQ10 is not approved by the U.S. Food and Drug Administration (FDA) for the treatment of any medical condition. A 2014 Cochrane Collaboration meta-analysis found no convincing evidence to support or refute the use of CoQ10 for the treatment of heart failure. Evidence with respect to preventing heart disease in those who are otherwise healthy is also poor.

A 2009 Cochrane review concluded that studies looking at the effects of CoQ10 on blood pressure were unreliable, and therefore no conclusions could be made regarding its effectiveness in lowering blood pressure.

Available evidence suggests that CoQ10 is likely ineffective in moderately improving the chorea associated with Huntington's disease.

While CoQ10 can improve some measurements regarding sperm quality, there is no evidence that CoQ10 increases live births or pregnancy rates".

No large well-designed clinical trials of CoQ10 in cancer treatment have been done. The U.S. National Cancer Institute identified issues with the few, small studies that have been done stating, *'the way the studies were done and the amount of information reported made it unclear if benefits were caused by the CoQ10 or by something else'*. Also, the American Cancer Society has concluded that CoQ10 may reduce the effectiveness of chemo and radiation therapy, so most oncologists would recommend avoiding it during cancer treatment.

A review study has shown that there is no clinical benefit to the use of CoQ10 in the treatment of periodontal disease. Most of the studies suggesting otherwise were outdated, focused on in-vitro tests, had too few test subjects and/or erroneous statistical methodology and trial set-up, or were sponsored by a manufacturer of the product.

A 2011 review by the 'Cochrane Collaboration' suggesting CoQ10 supplementation might benefit people with Parkinson's disease was subsequently withdrawn from publication following a review by independent editors.

Be aware that when you read about CoQ10 in glowing terms there is likely to be a vested interest in selling CoQ10 supplements.

Exercise

Falsehood: it is false to say that exercise is beneficial, healthy or that it extends life. By exercise, we are referring to any kind of physical exertion that is sufficiently vigorous and sustained as to make you sweat and/or pant for air.

Reality: all kinds of exercise should be avoided in favour of non-sweaty, non-breathless physical activity such as walking. More about this in the chapter "The Exercise Myth".

Krill Oil

Falsehood: krill oil is good for you and provides astaxanthin, a powerful antioxidant.

Reality: krill oil should be completely avoided as it causes nothing but harm.

Krill oil (whether supplied in capsules or as a liquid) is often touted by nutritional suppliers as a panacea for just about any malady you may have. The reasoning is that krill oil is high in astaxanthin, an antioxidant that is said to fight harmful free radicals inside the body.

Astaxanthin is a kind of carotenoid vitamin, and food sources mainly include yeast, salmon, trout, krill, shrimp, crayfish, and crustaceans. It is not required at all in the human diet, although some tentative research shows that astaxanthin may be beneficial in combating cardiovascular, immune, inflammatory and neurodegenerative diseases.

Astaxanthin supplements are cultivated from microalgae and sold as capsules. Such supplements may indeed offer some degree of antioxidant protection in the body, although evidence for this is scarce.

Furthermore, astaxanthin supplements should be used with care and that is why it is usually recommended that they be taken only under medical supervision. The most common use of astaxanthin is as a food dye, and in some countries its use as a food colouring agent is restricted by law.

Astaxanthin supplements may hinder an enzyme called 5-alpha-reductase. As a result, it may keep testosterone from changing into the hormone DHT in the body. Side effects can include lower libido, growth of male breasts, and erectile dysfunction. They may also lower blood pressure and calcium levels to dangerous levels.

This is why astaxanthin supplements should be avoided if you are pregnant or might become pregnant, or if you are taking any kind of immune suppression medication.

When it comes to krill oil it's another story.

The reality is that krill oil is unhealthy and should be completely avoided. It is particularly prone to going rancid when consumed, causing oxidation and free radicals which lead to illness. So, far from providing antioxidant protection, it does the opposite by causing harmful oxidative damage to body cells.

A presentation delivered at the 99th American Oil Chemists' Society (AOCS—the authoritative group in the field) stated: "*Krill decompose very quickly, so the current thinking is either to dry them aboard the vessel and bring the powder back to a land-based plant for oil extraction or to enzymatically digest the krill and then separate the oil.*" Source: Anthony P. Bimbo, Raw material sources for the long-chain Omega-3 market: Trends and sustainability, part 2, 2009, www.aocs.org.

In our sister book "The Fish Oil Myth" it is explained that fish oil in general should be avoided for a variety of reasons. But krill oil is even worse for health than regular fish oil. Here is why:

Krill oil provides EPA/DHA in the phospholipid form instead of the triglyceride form. There is absolutely no evidence that delivering EPA/DHA in the phospholipid from has any benefit. The human species has never consumed krill in the past. Genetically, humans have evolved to ingest triglycerides rather than phospholipids. There is no evidence that phospholipids in the diet are in any way beneficial.

Krill oil is marketed as being high in antioxidants. This is not so because the absolute level of antioxidants in krill is very poor compared to other foods. And once the oil is extracted, put into capsules and retailed through the supply chain, the oil will have degraded, rendering any antioxidant properties of the oil as virtually useless.

Note: Krill, along with algae, is the foundation of the food chain for many oceanic species. Commercial Krill harvesting has been banned in many parts of the world because such harvesting is an ecological disaster waiting to happen. You are urged to not support krill harvesting by consuming food or supplements from krill. And remember that those who promote krill oil may well have a monetary vested interest.

Glutathione Supplements

Falsehood: glutathione supplements are beneficial because they provide a powerful antioxidant that the body needs.

Reality: glutathione supplements should be avoided unless administered under medical supervision for a specific medical condition. The body does not need or require glutathione for good health.

Glutathione is often proclaimed to be the 'master antioxidant' and the most powerful way to reduce oxidative damage in the body. Glutathione supplements are sold, based on the argument that glutathione in the body decreases as you get older, possibly because your body can't create as much. Lower glutathione levels appear to go hand-in-hand with poorer health. For instance, lower levels may play a role in many conditions that are more likely to develop in older people. This is a weak argument with virtually no credible research to back it up.

Glutathione is not an essential nutrient for humans, since it can easily be made in the body from the amino acids L-cysteine, L-glutamic acid, and glycine. These amino acids are plentiful in the diet from many types of foods. But even if these three amino acids are not present in the diet it does not matter because they are not 'essential amino acids' - the body is perfectly capable of making these amino acids and hence making as much glutathione as needed for good health.

Furthermore glutathione does not have to be present as a supplement in the diet; in other words, we simply don't need glutathione supplements for good health.

The importance of glutathione for good health is not being disputed. It is well established that we need glutathione to prevent organ and muscle inflammation, to improve liver/heart/lung function, strengthen immunity, combat cancer and indeed to slow down the aging process.

But we don't acquire glutathione from glutathione supplements. All those glutathione pills that you see in health stores are useless because glutathione cannot be taken orally (it doesn't work biologically when swallowed). We acquire glutathione from a varied diet of fruit, vegetable, eggs, sprouted seeds, nuts, seeds, salads, legumes and the like. These foods provide all the amino acids that we could need.

The argument that glutathione in the body declines with age is disingenuous because just about all kinds of nutrients decline with age. As we age we generally become less capable of making and/or assimilating nutrients.

Glutathione shortage is a rare condition in people of any age (assuming you are reasonably healthy). Doctors can use glutathione supplements in the form of injections to meet specific medical needs such as a paracetamol overdose, but to indulge in such supplementation as a routine anti-aging treatment is ill-advised and completely unproven.

Do not be taken in by the false claims made by those who peddle useless glutathione pills.

Omega-3 Oil

Falsehood: omega-3 oil supplements are very important for the brain and general good health.

Reality: all omega-3 oil supplements should be avoided as they cause nothing but ill-health.

It is widely believed that omega-3 oil, taken as a supplement, is beneficial. It is claimed that omega-3 supplements combat inflammation inside the body, thus preventing illness and pre-mature aging. This myth arises from confusion between omega-3 oil taken as a supplement and omega-3 oil taken in the form of foods that naturally contain such oil. They are worlds apart.

Virtually all commercially processed polyunsaturated oils are made from seeds and sold under names such as Canola Oil, Rapeseed Oil, Safflower Oil, Sunflower Oil, Soybean Oil, Corn Oil and others. They are polyunsaturated oils by virtue of containing Omega-3, Omega-6 or Omega-9 oil (or any mix of the three).

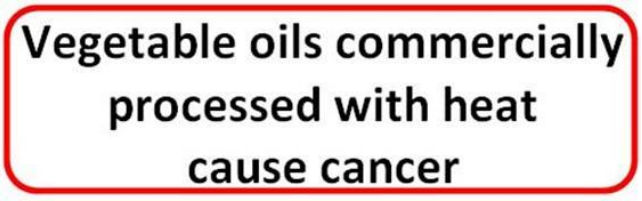
To extract and process the oil from seeds, intense heat is usually used. This has the effect of completely degrading the oil (the molecular structure is changed), and this in turn makes the oil much more likely to oxidize when stored or consumed. In fact, processed polyunsaturated oil will oxidize (i.e. go rancid) at just room temperature so must always be kept refrigerated.

"When you consume polyunsaturated fats at body temperature (which is 37 degrees C, a good 15 degrees C higher than average room temperature), they oxidize very quickly." Source: David Guillespie, The Big Fat Lies, Penguin Books, 2012.

When processed polyunsaturated fat is consumed it oxidizes and triggers free radicals inside the body by virtue of having been intensely heated when commercially processed. This increases the risk of cancer and other serious illness.

When you see un-refrigerated supermarket shelves packed with vegetable oils such as canola oil, Rapeseed Oil, Safflower Oil, Sunflower Oil, and others, you are looking at powerful mutagenic products. The high processing temperatures combined with a complete a lack of refrigeration make such oils toxic to the body and more likely to cause cancer than just about anything else you could consume.

If you use such products for frying or cooking, the mutagenic effect is even greater. These commercially processed vegetable oils should carry a health warning akin to cigarette packs. Something like: '***Warning: This Oil Causes Cancer***'. Or: ***'Warning: This oil clogs the arteries and causes heart attacks and stroke'.***



Omega-3 and Omega-6 oils are regarded as 'essential' polyunsaturates because the body cannot make them. We can only make two kinds of fats: saturated and

monounsaturated, and these two fats make up 97 percent of our body-fat. The other 3 percent of body-fat should come from Omega-3 and Omega-6 fats that we need to obtain from the diet.

This begs the question: if polyunsaturated fats are so bad for health how is it that omega polyunsaturated fats are essential in our diet?

The answer to this paradox is twofold: firstly, we need very little omega polyunsaturated fat for good health, and secondly a nutritious, varied diet will give you more than enough Omega-3 and Omega-6 lipids.

We need no more than 3-5 percent of the fat in our diet (and probably much less) to come from Omega-3 and Omega-6 oils naturally contained in food. For hundreds of thousands of years humans have obtained polyunsaturated omega fats mainly from raw nuts, seeds, berries, grubs, roots, flowers, herbs, insects, and from occasional meat and seafood (never from processed seed oils until very recently in human history).

There are small amounts of Omega-3 and Omega-6 fats in many plant-based foods. In today's world nuts and seeds provide the best and most readily available sources of polyunsaturated fats if consumed raw/fresh and in moderation.

Omega-3 and Omega-6 work together in our body and depend on each other, but the actual ratio of Omega-3 to Omega-6 is unimportant. It is a myth that human beings need to get Omega-3 and 6 in a certain ratio, such as a ratio of 2:1 or 1:1. If you think about it the idea is absurd: as mentioned, our remote ancestors ate a variety of nuts, seeds, berries, grubs, insects, flowers, herbs, roots (and occasional meat) and all these food products had greatly differing ratios of Omega-3 and 6.

Furthermore, only some of these items would be consumed on any one day, depending on what could be foraged or caught on a day-to-day basis. Therefore, the ratio of Omega3/6 will have varied wildly from day-to-day and week-to-week. It simply cannot be argued that humans have evolved for millennia on any particular ratio of dietary Omega-3/6.

Several studies have looked at the health effects of a diet high in Omega-6 and low in Omega-3 and have rightly concluded that the preponderance of Omega-6 in modern-day diets is a cause of illness. But such studies have falsely concluded that the health problems of such a diet are due to the high ratio of Omega-6. Such studies have not taken into account the fact that the harm caused by commercial vegetable oils is due to the intense heat used to extract the Omega-3/6 from the seeds. As mentioned, any kind of oil (particularly polyunsaturated oil) that has been heated causes oxidation and free radicals once consumed. It is this oxidation that causes illness, not any particular Omega oil ratio.

Providing the diet includes natural foods with unprocessed Omega-3 and 6 (in any ratio), the body will simply use both Omega-3 and 6 for its needs and any surplus Omega-3 or 6 is simply stored or excreted. The crucial factor here is to not consume processed Omega-3 or 6 from any source that has involved intense heat at any point. Hence, either consume unprocessed Omega oils from the original sources, such as raw

nuts and seeds, or at the very least ensure that the oil being used has been cold-pressed and has been refrigerated at all times in the supply chain and at home.

The typical American diet is said to have an Omega-3 to Omega-6 ratio of between 1:18 to 1:25 (in other words too much Omega-6 compared to Omega-3). This is indeed unhealthy, but not because of the ratio itself, but because virtually all the Omega-6 oil consumption will have typically come from processed oils that have used intense heat as part of the commercial oil extraction process.

"*The idea that this Omega ratio matters is a myth…without any data to support it*." Source: Walter Willett, MD, PH, American physician and nutrition researcher and Professor of Epidemiology and Nutrition and the chair of the department of nutrition at Harvard School of Public Health.

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"*The optimal quantity and type of Omega-3 fatty acid, and the optimal ratio of Omega-3 to Omega-6 fatty acid (if such an optimal ratio exists), remain undefined*". Source: Wang C, et al, Effects of Omega-3 Fatty Acids on Cardiovascular Disease, Evidence Report/Technology Assessment No. 94, prepared by Tufts-New England Medical Center, Publication No. 04-EOO9-2, March 2004.

*

"In 2011 the Academy of Food and Nutrition (previously known as the American Dietetic Association) invited several heavy hitters in the field of nutrition to debate [polyunsaturated oils]. These experts were in complete and utter agreement—that the ratio of Omega-6 to Omega-3 fats in the diet is totally unimportant". Source: Article posted on April 18, 2012 at www.quickanddirtytips.com: Monica Reinagel, MS, LD/N, CNS, Does the Ratio of Omega-6 Fats Really Matter?

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"There are fundamental problems with using an Omega 6/3 ratio in dietary recommendations.... the ratio takes care of itself." Source: Dr. William Harris, research professor at the Sanford School of Medicine in South Dakota, and an established authority on Omega-3 fats.

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"A group of nutrition scientists was convened by the American Heart Association to assess the validity of a target Omega 6/3 ratio. The scientists found that the use of a ratio as dietary advice for individuals is not only difficult to measure and implement, but there are flaws and limitations in applying such a target ratio for assessing risk of disease. Other researchers indicate that the ratio between the two fatty acids is unimportant". Source: Omega-6 Fatty Acids and Health Fact Sheet, International Food Information Council Foundation, June 5, 2009.

To summarize, we only need a minute amount of the polyunsaturate fatty acids Omega-3 & 6 for optimum health. In particular, polyunsaturated fats that have been processed with heat should be avoided as they rapidly oxidize and harm the body once consumed.

Virtually all commercially processed polyunsaturated oils and margarines should be avoided because intense heat has been used to extract the oil from the seeds.

As soon as you consume processed polyunsaturated fats, even if straight from the fridge, your human-body temperature will begin to oxidize the polyunsaturated fats. Oxidized fats create free radicals inside the body, leading to cell mutation, arterial plaque, cancer and heart disease.

What about Omega-3 supplements? They should also be avoided because even if cold-pressed and refrigerated, they will oxidize at body temperature when consumed. This applies to both fish Omega-3 and plant Omega-3 oil. Always seek out unprocessed sources of Omega-3 and Omega-6 such as raw nuts and seeds and remember that most types of plant-based foods contain small amounts of Omega-3 so you won't go short.

*

Here is a summary of the main points in this chapter:

* Resveratrol supplements do not improve health or prolong life.

* There is no pre-determined destiny regarding your longevity (this is superstitious nonsense).

* The body is not programmed to die within any set period of time - programmed senescence is a myth.

* Calorie restriction is unhealthy and certainly will not extend life.

* Antioxidant supplements should be avoided as they cause nothing but harm.

* CoQ10 supplements do not combat aging and illness, and should do not be consumed regularly, if at all.

* All kinds of exercise should be avoided in favour of non-sweaty, non-breathless physical activity.

* Krill oil should be completely avoided as it causes nothing but harm.

* Glutathione supplements should be avoided unless administered under medical supervision for a specific condition.

* All omega-3 oil supplements should be avoided as they cause nothing but ill-health.

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Science may one day come up with a magic pill to extend longevity. Or perhaps we will be able to transfer our minds into a new young body! Or cryogenics may offer some kind of solution. But until then we are stuck with our present reality.

In short, much longevity advice is useless or false. So how can we extend our lifespan and stay healthy in our old age? The answer is in fact quite simple: optimize your health. In other words, ***be as healthy as you can every day of your life***. This includes being slim. It is well established that being overweight greatly increases ill health and

shortens life expectancy. There is no such thing as being obese and being healthy. If you are not wholly convinced that this is so you are urged to visit Wikipedia.org under "obesity" and look for "effects on health".

Whatever your age and whatever your current state of health, it is never too late to improve your health, lose excess body fat and live longer. Quite simply, you can extend your life by optimizing your health as explained in this book. By doing this, you may live to be 60 instead of 50. Or you may live to be 110 instead of 90. Read on to discover specific ways to extend your lifespan and be super healthy.

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The takeaway message: much longevity advice is useless or false.

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The Calorie Restriction Myth

The latest research is clearly showing that a calorie restricted diet does not in fact extend life, and may even shorten longevity by causing harmful stress. What is clear is that a calorie restricted diet makes you fat, and being fat greatly promotes illness and a shorter life.

Low-fat and low-carb diets are both high-calorie diets, but they are not necessarily healthy. Fat has at least twice as many calories as carbs or sugar. A low-fat diet is very high in calories by virtue of being high in carbohydrates. Equally, a low-carb diet is very high in calories by virtue of being high in fat.

A low-calorie diet is by definition a diet that restricts ***both fats and carbs***. It has been falsely assumed for many years that if you consume less calories than you burn you will lose weight; this is simply not so because a lot depends on what is wrapped around the calories going into your mouth. A cookie will be more fattening than a sweet potato, even if both have exactly the same amount of calories. A lump of chocolate will be more fattening than a banana even if both have exactly the same amount of calories.

"Everything you have been told about diet and exercise for the past 30 years may be wrong. No amount of exercise will reverse the obesity epidemic if the modern food system is not fixed. [It is] a Flawed Formula: You've heard it now for 50 years. When it comes to your weight, 'calories in must equal calories out.' 'Eat less and exercise more.' 'A calorie is a calorie is a calorie.' The problem is that this formula doesn't work, as evidenced by America's ever-expanding waistline". Source: J. Mercola, M.D., Documentary Exposes How Sugar and Our Food System Fuels Obesity, November 2014, www.mercola.com.

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"Recent studies show that fructose-induced uric acid generation causes mitochondrial oxidative stress that stimulates fat accumulation independent of excessive caloric intake. These studies challenge the long-standing dogma that 'a calorie is just a calorie' and suggest that the metabolic effects of food may matter as much as its energy content". Source: Johnson RJ, et al, Sugar, uric acid, and the etiology of diabetes and obesity, Diabetes, 2013 Oct; 62(10):3307-15.

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"Study after study showed that reducing calories did NOT lead to weight loss. But it has never worked. The failure rate is 98%. Practical personal experience shows that this is likely to be true. So, whatever else you may believe, caloric reduction DOES NOT WORK. This is a proven fact. Proven in the bitter tears of a million believers. But, no matter how many times I tell a calorie enthusiast, I get the uncomprehending gaze of an anxious monkey. Patient after patient tried to lose weight by restricting calories with consistent failure. Increased calories did not cause obesity so reducing calories didn't cause weight loss. Exercise didn't work either.... So what was the real aetiology of obesity: insulin.

A low calorie strategy for weight loss is guaranteed to fail. It has been proven by science long ago. The huge 50,000 woman randomized trial (Women's Health Initiative) of the low fat low calorie diet proved to be an utter failure for weight loss. The problem with this strategy is that it does not address the long term problem of insulin resistance and high insulin levels. Since the insulin sets the 'body set weight thermostat' – the body keeps trying to regain the lost weight.

Here's the bottom line. As you reduce calories, appetite goes up, and [fat burning] goes down. You reduce Calories In, but Calories Out goes down, too. This is failure guaranteed 100%. It's as stupid as cracking the safe of your own bank".

Source (abridged extract): Dr Jason Fung, Insulin Causes Weight Gain, www.intensivedietarymanagement.com.

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The traditional belief that a calorie restricted diet extends life is based on the idea that food consumption ages the body generally, and that by consuming less food you age the body less. This outdated concept ignores the human biological consequences of calorie restriction such as the real and harmful stress of being in a semi-permanent state of hunger, the biological 'starvation response' which makes the body store more fat, the harmful consequences of inadequate nutrition and so on. It is now generally recognized that calorie restriction is counter-productive and in terms of life extension it simply does not work.

The only way to restrict calories is to eat less carbs ***and*** less fat. But this galvanizes hormones that make you store more body weight. Losing weight is not about eating less food or fewer calories. Rather, it's a hormonal issue. And by eating the ***right*** kind of food your hormones will look after you and keep you slim, regardless of food quantity or calories.

When the body receives junk food, bereft of nutrition, it doesn't feel satisfied or satiated. When the body receives nutritious food, it is satisfying, filling and non-fattening. Junk food my fill you up for a moment, but it is superficial and short-lasting.

Nutritious food prevents hunger, over-eating and food cravings. Nutritious food fills you up so as to make you much less likely to fall prey to junk food. Anybody who gives up junk food and begins to just eat nutritious food can testify to this.

This begs the question: what is 'nutritious food'? Nutritious food is real, whole food, whether cooked or raw. Examples include, fruit, vegetables, legumes, salads, nuts, seeds, sprouted seeds, and (in moderation) eggs.

The point here is that by keeping to a highly nutritious diet, you will gradually avoid or minimize junk food, and food-cravings will disappear. You will feel much more energetic and soon you will experience a dramatic improvement in health. By default you will lose weight and maintain a slim body at your optimum body weight. And you will live a healthier and longer life.

When you eat less or when you try to restrict calories (or when you go hungry or go without food for more than about 5 hours during waking hours) alarm bells ring inside the body. Any kind of significant food deprivation makes the body 'think' that there is a risk of famine. The body doesn't know that you may have ample food available; it just knows it must take emergency measures to ensure survival.

Restricting calories means severely restricting just about all foods, since virtually all foods contain calories in the form of carbs and/or fat. As a consequence of significant food deprivation, the body switches into a fat-saving mode (this biological attribute is well known to medical science as the 'starvation response'). When you eventually eat, more fat than otherwise will be stored by the body, and it will not switch out of its fat-saving mode very quickly. In fact, the body will not switch out of its fat-saving mode until you are fatter than when you first started to deprive yourself of food!

Severe calorie restriction is totally counter-productive. This is why so-called 'yo-yo dieting' and calorie-counting diets never work. The blunt truth is that eating less actually makes you fatter!

"After completing the [food deprivation diet] the dieter is likely to experience the body's starvation response, leading to rapid weight gain of only fat". Wikipedia.

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"It's not only your waistline that suffers from yo-yoing. Repeated crash dieting increases insulin and estrogen. These changes cause you to start putting on weight around your middle, which research has linked to insulin resistance, diabetes, high blood pressure, and heart disease." Source: Andrea Pennington, MD, The Pennington Plan for Weight Success, ISBN 978-0578064994, Amazon.com.

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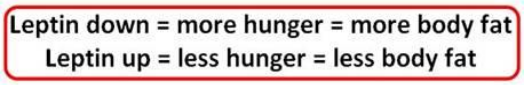
In the context of weight loss there is another good reason to not eat less and not restrict calories: the effect of leptin.

We all have white fat and brown fat. White fat stores just that: fat. And brown fat stores muscle energy for everyday activities. Leptin is a powerful hormone produced by the body to control feelings of hunger. It is always circulating in the blood and its role is to keep body weight within a healthy narrow range. If your body-fat falls below the norm (the 'baseline level') leptin levels in the blood will go down to make you eat more by increasing feelings of hunger. If your body-fat goes above the norm, leptin levels in the blood will go up to make you eat less by reducing feelings of hunger.



Being on a very low calorie diet can bring a decrease in leptin which in turn makes you hungry and have food cravings, and will make you overeat or eat junk food when you eventually give up the low calorie diet. Conversely, eating a healthy nutritious diet will provide satiety and keep leptin at higher levels, promoting easier fat loss by not causing over-eating or making you fall prey to junk food.

What about long-term calorie restriction as opposed to temporary crash-diets?

Much has been made of 'Caloric Restriction' and how it is the one true life-extension strategy currently available. In many articles and videos it has been given much attention and you may be disappointed to learn that this strategy is flawed.

"The anti-aging strategy known as caloric restriction may be a pointless, frustrating and even dangerous exercise. Today there are a lot of very healthy people who look like skeletons because they bought into this. Our study questions the paradigm that caloric restriction is universally beneficial. Contrary to what is widely believed, caloric restriction does not extend the lifespan of all strains of mice. Your energy expenditure and your energy intake should be in balance. It's as simple as that. And how do you know that? By gain or loss of weight. The whole thing is very commonsensical. For humans of normal weight we strongly caution against caloric restriction, it can actually shorten lifespan". Source: 1. Rajindar S. Sohal, et al, Lifespan Extension in Mice by Food Restriction Depends on an Energy Imbalance, J. Nutr. March 2009 vol. 139 no. 3 533-539. 2.

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"Measurements of animal responses when they cease restriction indicate that prolonged calorie restriction does not diminish hunger, even though the animals may have been in long-term energy balance. Neuroendocrine profiles support the idea that animals under calorie restriction are continuously hungry. The feasibility of restricting intake in humans for many decades without long-term support is questionable". Source: John R. Speakman , et al, Starving for Life: What Animal Studies Can and Cannot Tell Us about the Use of Caloric Restriction to Prolong Human Lifespan, J. Nutr. April 2007 vol. 137 no. 4 1078-1086.

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A long term study (over several years) published in The Lancet on weight loss showed that virtually all the weight was regained. The study looked at two groups, one on a

severe calorie restriction diet and the other on a not so severe calorie restriction diet. The first group lost weight more quickly than the second group. But both groups later regained their lost weight equally quickly. *"At the end of the three year follow-up period the researchers found that most of the participants had regained most of their weight"*. Source: Martin CK, et al, Weight loss: slow and steady does not win the race, Lancet Diabetes Endocrinol, Volume 2, No. 12, p927–928, December 2014.

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Some past research into mice shows that calorie restriction reduces obesity and extends life. But such studies tend to be flawed for two reasons:

1. Clearly if you restrict calories, an obese mouse will eventually lose weight. But the research usually does not say what happens when a normal diet is resumed for such a mouse. All the research into calorie restrictions in humans shows unequivocally that the body quickly recovers the lost weight (and more) when an unrestricted diet is resumed. The body's survival mechanism kicks in and you end up storing more surplus body fat than you had before.

2. As for extending life, virtually all the latest research is saying that severe calorie restriction and a permanent state of hunger stresses and harms the body, and that in fact calorie restriction shortens lifespan. There are no long-term studies showing that calorie restriction in ***humans*** extends lifespan. Some past studies using mice have shown that low-calorie diets with optimal nutrition protect against disease and extend lifespan. But these studies cannot deny the confounding fact that any protection against disease and extended lifespan may be due to optimal nutrition rather than calorie restriction per se.

Quite apart from the strong possibility that long-term severe calorie restriction is counter-productive to good health, to live a life in which you are permanently feeling hungry (in the hope that you may live a few extra years) is simply not practical or even feasible for virtually all human beings.

However it is fully recognized that *'temporary controlled calorie restriction*' for a specific medical condition in which you avoid over-consumption, you avoid fasting, and you eat regular nutritious meals so as not to go hungry, can indeed be beneficial. There is a world of difference between severe (uncontrolled) calorie restriction and temporary controlled calorie restriction.

In summary, severe calorie restriction galvanizes hormones that make you store more body weight. Furthermore, such calorie restriction stresses and harms the body and is counter-productive and unnecessary in terms of losing surplus body fat. In any event, no kind of calorie restriction diet that always leaves you feeling hungry is sustainable in the long run. The solution to losing weight and improving health is to eat nutritious food and not go hungry.

The ideal diet for optimum health and a lean body should be high in carbs, high in fat and high in calories, provided that sugary foods and processed carbs are avoided. For a detailed look at this subject please see our sister book "The Lipo Diet".

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The takeaway message: avoid low-calorie diets, they are counter-productive, they make you ill and they don't help you lose weight or live longer.

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The Protein Myth

How protein causes cancer and shortens life

It is argued by some that we need animal protein in the diet for healthy body growth, repair and cellular maintenance. This is not so. What we need in the diet is amino acids which the body can use to make its own protein as required. A varied diet of fruit, vegetables, nuts, seeds, legumes, sprouted seeds, and occasional eggs will provide plenty of amino acids for optimum health.

In fact, we need very little protein in our diet, and such protein is best obtained from amino acids in plant-based foods. When you eat 'ready-formed protein' from animal-based foods some of that protein always results in waste protein that the body has to get rid of in the form of ammonium and nitrogen. It's much better to let the body make its own protein from the amino acids that you consume in a nutritious plant-based diet. We simply don't need animal-protein from meat or fish ***at all***.

Here is a simplified scientific explanation of how ready-formed (animal) protein is digested:

The cells in your intestine can't absorb whole proteins, only single amino acids or very small chains of two or three amino acids – called peptides. So digestive enzymes (specialised proteins themselves) break down the 'ready-formed proteins' into their component amino acids. The amino acids and peptides are absorbed into the bloodstream and safely delivered to different parts of the body where they are required, either to make new proteins or to be used to release energy. Most arrive first at the liver, where many new proteins are made, and where excess protein is broken down ready for burning as a fuel for metabolism, ***or for storing as body fat****, or for excreting as ammonium and nitrogen.*

Note the above underlined sentence "***or for storing as body fat.***" It is well known to medical science that animal protein always provides the body with a degree of excess protein (i.e. protein that is not assimilated or used by the body). It is also well known that such excess protein is readily converted and stored as body fat, i.e. as triglycerides.

This is what Dr. J. Mercola, M.D., has to say about consuming animal protein (abridged extract from *'The Very Real Risks of Consuming Too Much Protein'*, www.mercola.com):

Quote

"With the popularity of 'high-protein' diets, you might be tempted to believe you simply can't over-eat protein. But the truth is that consuming excessive protein can actually be quite detrimental to your health.

Eating more protein than your body needs can [cause] weight gain, extra body fat, stress on your kidneys, dehydration, yeast overgrowth, shortened life-span, cancer and leaching of important bone minerals. Granted, your body needs protein for your

muscles, bones, and many hormones. You cannot live without it. [But] there is an upper limit to how much protein your body can actually use.

Excessive protein can have a stimulating effect on an important biochemical pathway called the mammalian target of rapamycin (mTOR). This pathway has an important and significant role in many cancers. When you reduce protein to just what your body needs, mTOR remains inhibited, which helps minimize your chances of cancer growth.

Additionally, when you consume too much protein, your body must remove more nitrogen waste products from your blood, which stresses your kidneys. New studies [show that] methionine intake which happens to be high in meat protein [may shorten life-span]".

Unquote

There is no shortage of evidence showing that when food is heated/cooked it creates harmful substances that cause illness and cancer. This applies particularly to meat and fish. For example, heating food that contains cholesterol (e.g. meat and fish) creates harmful unnatural oxysterols in the food eaten. This can cause digestive problems, a weakened immune system, vascular diseases, and more importantly it creates oxidized LDL which contributes to clogged arteries, illness, and a shortened life.

Here are three further compelling reasons for giving up animal-based protein:

A. Phosphate.
B. Antibiotics.
C. Insulin resistance.

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A. Phosphate

Phosphate is high in most kinds of meat, poultry, fish and seafood (whether raw or cooked). It is common practice throughout the world to add phosphate to such products to improve the colour, act as a preservative, and retain moisture so as to provide bulk. When such meat is consumed "*phosphate is thought to cause damage to blood vessels, to accelerate the aging process, and even, potentially, to hurt our bones by contributing to osteoporosis via a disruption of hormonal regulation. Nearly 100 percent of the phosphate is absorbed into the human body*". Source: Michael Greger, M.D., What Do Meat Purge and Cola Have in Common? Oct. 2014, www.nutritionfacts.org.

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"People living near phosphate fertilizer plants are twice as likely to develop lung cancer and osteoblastic leukemia". Source: George Glasser, Death in the air (Air pollution from phosphate fertilizer production), www.cqs.com/death.htm.

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Do not confuse 'phosphate' with 'phosphorous'. Phosphate is a harmful inorganic chemical. Phosphorous is a healthy organic compound found naturally in plants. Phosphate is an essential ***plant*** nutrient (not human nutrient), so it is used in fertilizers. But such phosphate is converted into organic phosphorous by the plant as it grows. When we eat plant-based foods we assimilate organic phosphorous, not phosphate. So the phosphate injected into meat and poultry is very different because it is assimilated into the human body as harmful phosphate, not as organic phosphorous.

The meat and fish industries do their best to justify the use of phosphates by stating that "*Phosphates occur naturally in all forms of life and are therefore present in almost all food*". This is a deliberate attempt to confuse harmful 'added phosphates' with organic phosphorous (which is indeed found in almost all food). The avoidance of inorganic phosphates is reason enough to avoid all kinds of commercially sold animal-based foods.

B. Antibiotics

Antibiotics are prescribed by doctors to help your body fight or prevent bacterial infection. In this way, modern antibiotics save millions of lives each year and greatly help prevent disease. But each time your body receives antibiotics it makes your body more resistant to the future medical effect of such antibiotics. This puts your health and even your life at risk. If and when you become ill and your doctor prescribes antibiotics, they will have little or no effect and your illness can get worse or even kill you.

Antibiotic resistance kills about 10 million people every year throughout the world. A UK report estimates that by the year 2050 antibiotic resistance will have killed about 300 million people. Source: Jim O'Neill, Review on antimicrobial Resistance, a study commissioned by David Cameron, UK Prime Minister, July 2014, http://amr-review.org.

Throughout life you always want to minimize the use of antibiotics so that your body does not become immune to them when they are really needed. Also, if you are antibiotic resistant, you are more vulnerable to catching infections and your immune system will be less capable of fighting bacterial diseases. In most parts of the world you cannot buy antibiotic medicines over the counter precisely because their indiscriminate use is harmful. Like most people you may already be a little resistant to antibiotics, in which case it is even more important to avoid unnecessary antibiotics going into your body.

The meat industry has been giving animals regular doses of antibiotics since their discovery decades ago. They do it to prevent illness in farmed animals raised in filthy conditions, and to reduce veterinary bills and thus improve profits. But the antibiotics

stay in the meat that you consume, so you receive antibiotics indirectly, through the animal-based products that you eat.

Stuart B. Levy, M.D., who has studied the subject for years, estimates that 15 to 17 million pounds weight of antibiotics are used on animals in the United States each year.

You are urged to see the short video about the use of antibiotics in animals at youtube:

Fish and seafood are also beset with antibiotics. They are heavily used in farmed fish and seafood such as shrimp. Antibiotics are simply added to the water. Fish and seafood caught in rivers and at sea also contain antibiotics as a result of water pollution.

"Farmed fish are often raised in pens in the ocean.... the antibiotics can also spread to wild fish (via aquaculture and wastewater runoff) and that's exactly what recent research has revealed". Source: mercola.com.

Antibiotics are not affected by food processing or cooking. So when you eat meat/poultry/fish the antibiotics go into the tissues of your body. This is how so many people in the world become antibiotic resistant, causing much illness and millions of deaths.

C. Insulin Resistance

Now we come to a main reason for avoiding animal and fish protein. In the context of food, this counts among the biggest hidden secrets of the modern age, a secret that the animal-food industry does not want the public to contemplate.

Put simply, animal-protein significantly makes your insulin go up on a par with eating sugary foods, and this can lead to insulin resistance and diabetes. Indeed, regular meat consumption is a principal, yet hidden, cause of diabetes (more about this in a moment).

Note: if you are not convinced that fish and seafood increases the risk of diabetes, you are urged to see our sister book "Fish Oil Myth" at: www.fish-oil.info.

Coming back to insulin resistance, the research shows that when you eat animal-protein this elicits a big insulin response on a par with eating spoonfuls of sugar.

Clearly, you are never going to eat spoonfuls of sugar! But the point here is that animal-protein puts you at greater risk of diabetes than even junk food (i.e. processed carbs) such as cookies, sweets and waffles.

The insulin increase in response to the consumption of animal-protein is a result of incretins rather than an increase in blood glucose. Incretins such as GLP-1 and GIP have a powerful effect on raising insulin.

"Proteins and their constituent parts – the amino acids raise insulin without any effect on the blood sugar. Carbohydrates are not the only stimulator of insulin. Proteins also cause an insulin increase....the incretin effects....are felt to be responsible for the increase in insulin. Blood glucose does not drive weight gain and diabetes. Increased insulin does. Type 2 Diabetes is a disease of too much insulin resistance, so it's just a matter of controlling your blood insulin. This cannot be done effectively with medication, but it can be done through the diet.... medications aimed at controlling blood sugar do not help. You need to control blood insulin rather than blood sugar. Diabetes is not a disease of too much blood sugar, it's a disease of too much insulin resistance". Source: Dr. Jason Fung, Canadian nephrologist, The Incretin Effect – Hormonal Obesity XXII, intensivedietarymanagement.com.

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"Incretins are a group of metabolic hormones that stimulate a decrease in blood glucose levels by causing an increase in the amount of insulin released from pancreatic beta cells...after eating" (Wikipedia).

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"Overall, a low-carbohydrate high-fat diet resulted in greater impairment in glucose tolerance. Our results do not support the recommendation of [such a diet] for use in prediabetes; rather interventions aimed specifically at reducing obesity and improving insulin sensitivity should be pursued". Source: B J Lamont, et al, A low-carbohydrate high-fat diet increases weight gain and does not improve glucose tolerance, insulin secretion or β-cell mass in NZO mice, Nutrition & Diabetes (2016) 6, e194.

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The very significant increase in insulin explains how regular meat or fish consumption can make you diabetic even if you are not overweight and even if you avoid sugary foods and processed carbs. But regular animal-protein consumption does indeed make you fat just as much as processed carbs because they both raise insulin, they both inhibit fat loss by turning off lipolysis, and they both increase the body's propensity to store more fat. High insulin is high insulin, however it may be caused.

So meat is indeed fattening, but not because it may contain fat or be high in calories; it is fattening because of the protein incretin effect that pushes up insulin, and this in turn makes you store more of what you eat as body fat than otherwise.

Here is the science showing a direct link between animal-protein consumption and insulin resistance:

Animal-protein consumption greatly increases blood cortisol. This increase in blood cortisol is triggered by the hypothalamus. When cortisol goes up in the blood, it counteracts insulin. It does this by contributing to gluconeogenesis, i.e. by galvanizing the body into making its own glucose from non-carb substances, including the protein consumed. This has the effect of preventing insulin from delivering glucose to body-cells: it does this by inhibiting the peripheral utilization of glucose by decreasing the translocation of glucose transporters (especially GLUT4) to the cell membrane. The net result is insulin resistance.

Several studies show that high levels of cortisol within the bloodstream (from the digestion of animal protein) can contribute to the development of insulin resistance. Additionally, animal protein, because of its high content of purine, causes blood pH to become acidic. Research shows that high uric acid levels, apart from other contributing factors, by itself may be a significant cause of insulin resistance.

"In summary, diets high in animal protein are associated with an increased risk of incident diabetes....The consumption of energy from protein, at the expense of the same percentage of energy from either fat or carbohydrate, increased diabetes risk by about 30%.... These results underline the importance of taking into account the protein content of diet in dietary recommendations to prevent diabetes". Source: Sluijs, I, et al, Dietary intake of total, animal, and vegetable protein and risk of type 2 diabetes in the European Prospective Investigation into Cancer and Nutrition, January 2010, Diabetes Care 33 (1): 43–48.

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"We've known for half a century that carbs make your insulin go up, but so does protein. In fact meat elicits an insulin response greater than, for example an apple, a bowl of oats, a plate of white spaghetti or a serving of fish. Beef, chicken and pork all produce an insulin spike that is equally high. In fact, meat-protein causes as much insulin release as pure sugar. Those who eat meat have up to fifty percent higher insulin levels. Insulin levels can be reduced by eating [unprocessed] high-carbohydrate plant foods....Put people on a plant-based diet and with moderate exercise such as just walking, within three weeks they will drop their bad cholesterol 20 percent and their insulin levels 30 percent, despite a 75 or 80 percent carbohydrate diet". Source: Michael Greger, M.D., Paleo Diets May Negate Benefits of Exercise, Volume 22, December 19th 2014, http://nutritionfacts.org.

The risk of type 2 Diabetes, closely related to obesity, was examined in a 2011 study in relation to red meat consumption. The study found a strong correlation between diabetes and the consumption of processed and unprocessed red meat. For every extra 100 grams of unprocessed meat (steak, pork chop etc), there was a 20% increase in risk of diabetes. For every extra 50 grams of processed meat (bacon, sausages, luncheon meats etc) there was a 50% increase in the risk of diabetes. The study concluded that "*red meat consumption, particularly processed red meat, is associated with an increased risk of type 2 diabetes*". Source: Pan A, et al, Red meat consumption and risk of type 2 diabetes: 3 cohorts of US adults and an updated meta-analysis, Am J Clin Nutr, 2011 Oct; 94(4):1088-96.

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As stated, processed red meat products are much more likely to cause diabetes and health problems because of their protein content ***and*** because of their higher toxicity. The toxicity arises from farming practices and commercial processing.

Diabetic associations tend to be very cagey about the advice they give regarding meat & fish consumption. They are reluctant to say outright '*avoid meat because it aggravates insulin resistance and diabetes*'. Instead, they advise diabetics to get their protein mostly from plant based foods. Remember that diabetic associations are often sponsored directly and indirectly by the food industry so they cannot blatantly tell people to stop eating animal-based foods.

On average, the protein content of fish and sea-food is as high as that of meat. This is why all fish and sea food should be avoided to minimise the risk of diabetes. In a very comprehensive study of 36,328 women carried out over sixteen years, it was shown that fish consumption increases the risk of diabetes. This randomized, double-blind, placebo-controlled trial concluded the following:

"This was a study of 36,328 women.... who were followed from 1992 to 2008. We showed that dietary marine Omega-3 fatty acids (EPA and DHA) were individually associated with an increased risk of incident diabetes....Furthermore, fish consumption was positively related to incident diabetes, and this association was attenuated after further adjustment for DHA. In contrast, the plant-based Omega-3 fatty acid (ALA) was not associated with incident diabetes in this cohort. Marine but not plant-based Omega-3 fatty acids were positively associated with incident type 2 diabetes".

Source: Luc Djoussé, et al, Dietary Omega-3 fatty acids and fish consumption and risk of type 2 diabetes, Am J Clin Nutr. 2011 Jan; 93(1): 143–150.

Note: for more information about the effects on health from fish consumption, see our sister book: The Fish Oil Myth (www.fish-oil.info).

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Can it get worse? Yes, there are three further reasons for avoiding animal protein: IGF-1, mTOR and leucine.

IGF-1

Animal protein is very high in IGF-1, a hormone that promotes cellular division and growth. So when you eat animal protein, you increase the concentration of IGF-1 in the blood. Research shows that this increases the risk of cancer because IGF-1 feeds the growth of cancer cells.

By inhibiting IGF-1 you can boost lifespan and reduce your risk of cancer (remember, cancer is an out of control proliferation of malignant cells). By allowing the body to make its own IGF-1 for growth, maintenance and repair, you minimize the risk of over-burdening the body with IGF-1 and you minimize the risk of cancer and a shorter life.

m-TOR

There is now strong and growing evidence that low-protein diets extend lifespan and the underlying reason is improved mitochondrial function and mTOR inhibition. mTOR is a kind of protein that orchestrates all the available nutrient sensors in your body, and decides whether cells should replicate now or stay alive to replicate at a more opportune time in the future when nutrients are more plentiful. But when you eat animal protein (meat, poultry, fish, seafood) you greatly activate mTOR inside your body.

This increases the risk of cancer and other serious illness as evidenced by many studies. Here are just two of the many studies on this subject:

"Virtually all cancers are associated with mTOR activation, so activating mTOR is something you'll definitely want to avoid". Source: Ron Rosedale, M.D. www.drrosedale.com.

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"Many experts in the biology of ageing believe that pharmacological interventions to slow ageing are a matter of....inhibiting of [the mTOR] pathway [so as to] extend lifespan and confer protection against a growing list of age-related pathologies". Source: Simon C. Johnson, et al, ,mTOR is a key modulator of ageing and age-related disease, Nature 493, 338–345, January 2013.

To summarize, inhibiting mTOR is important, indeed vital for longevity. We can extend our lifespan and be healthy by allowing our body to make just as much IGF-1 and mTOR as it needs (not too much, not too little), and avoid animal protein as this overburdens the body with IGF-1 and mTOR, thus increasing the risk of cancer and a shorter life.

Leucine

It is less well known that an amino acid found in animal protein called 'leucine' also promotes cancer and body aging. Leucine is used by the body to make sterols which play an important role in human biology. But too much leucine makes mTOR proliferate. By avoiding animal protein you avoid having too much leucine.

Several studies show that leucine is also implicated in obesity and diabetes. Here is one such study:

"Epidemiological evidence points to increased dairy and meat consumption as major risk factors for the development of type 2 diabetes (T2D). This paper presents a

comprehensive review of leucine, [showing that] type 2 diabetes and obesity are caused by leucine stimulation of mTOR." Melnik BC, et al, Leucine signalling in the pathogenesis of type 2 diabetes and obesity, World J Diabetesk, March 2012, 15;3(3):38-53.

As with mTOR, you avoid too much leucine by avoiding animal protein; it really is as simple as that.

*

Don't get caught up in trying to work out which types of meat or fish are best to eat. Or which formulas can calculate how much lean meat is appropriate to eat for your body mass. Or how best to cook meat/fish to avoid carcinogens. Or which types of seafood have the least mercury. Or whether you're eating enough protein in your diet. Or whether organic, grass fed meat is okay to eat. Forget all that. Also don't get caught up in fad diets that exhort you to consume regular amounts of animal protein such as the Paleo diet, the Atkins diet, and others.

If you want to extend your life into a healthy old age simply give up all kinds of meat and fish to optimize your health and stay slim. You will not go hungry and your body will make all the protein it needs from plant-based foods. But if you are still concerned about not getting enough protein, eat one or at most two eggs a day as egg-whites are very high in protein; more than this may cause health problems similar to those associated with high meat/fish consumption.

So what is the ideal proportion of animal protein in the human diet? You guessed it: none. Some health gurus argue that you should think Low-Carb, Moderate-Protein, High-Fat. This is wrong for the reasons explained in this book. The ideal diet for optimum health and longevity is: High-Carb, High-Fat, High-Calories (but excluding animal-protein and processed carbs).

Saturated fats such as cream, cheese and butter (preferably organic) should form a regular part of your diet. Also saturated fats and healthy oils from coconut milk, avocados, nuts & seeds should be consumed regularly, plus occasional eggs. This provides vital nutrients such as vitamins B12, D and K2. Do not skimp on saturated fats but make sure to exclude harmful fats that have been heated or hydrogenated.

*

The takeaway message: avoid meat, poultry, fish, and seafood because animal protein promotes bad health and shortens life. For optimum health follow a high-carb, high-fat, high-calorie diet as explained in this book.

***

The Saturated Fat Myth

The oils and fats that you eat do not make you fat or clog your arteries, or cause heart disease. This is one of the biggest health-related myths of all time. Scientists who study this subject have known the truth about fats for several years but such knowledge has barely percolated through to the general public.

More to the point, a high-fat diet is absolutely essential for good health, avoiding obesity and living longer. By appreciating and understanding this truth you will be much better equipped to optimize your health and extend your lifespan.

When we eat fats (any kinds of oils and fats) the digestive system breaks such fats down to smaller components that the body can handle. The fats go through various stages while being digested. Eventually most of the fats digested are converted into triglycerides and go into the blood stream as such. These triglycerides are wrapped up in protein wrappers (called lipoproteins) for transportation throughout the bloodstream to all parts of the body.

We need to understand that fat is a structurally integral part of every single cell membrane in our bodies. To repeat: Fat is structurally essential in EVERY SINGLE CELL in our bodies. So those triglycerides that we just mentioned (the end product of digesting fat) are fed by the bloodstream to all our body cells.

Fats (i.e. triglycerides) are required for many vital functions. Here are just some of those functions:

1. Fats enable the body to assimilate many kinds of vitamins.
2. Fats enable the body to use protein.
3. Fats are a vital source of energy for our many metabolic functions, such as keeping the blood warm, keeping the heart beating and so on.
4. Fats (while being digested) slow down food absorption, thus preventing glucose and insulin spikes in the blood. This in turn helps you lose weight and prevent diabetes.
5. Fats provide a feeling of satiation, fullness, and sustained energy thus preventing over-eating or tiredness.
6. Fats are key players in managing inflammation in your body.

These are just 6 of the many health benefits of a diet high in healthy fats. But you may be wondering why fats don’t end up as surplus body fat?

The answer is that when fats go into the bloodstream as triglycerides for distribution around the body, they get used by body cells everywhere (in many different biological ways) instead of being stored as surplus body fat. But this begs a question: what about the triglycerides that get delivered to fat cells? Don't these triglycerides end up being stored as body fat?

The answer is yes, some of the triglycerides arising from fat consumption do indeed end up as stored-body fat inside fat cells, and this is why the myth that fat is fattening persists. But there are three considerations:

1. The triglycerides from fat consumption are distributed to all parts of the body where they are used up in a variety of ways. Hence, they are 'shared' between body cells everywhere. Consequently, relatively few triglycerides go into fat storage.

2. The triglycerides from fat consumption that go into fat cells are recycled out again (as free fatty acids) to fuel our many metabolic functions. Our fat cells are continually receiving new fat and releasing old fat so to speak. This allows the body to always have some degree of fat in storage (vital for life) while simultaneously maintaining the body at a healthy steady weight.

3. The triglycerides from fat consumption that go into fat cells mostly do not go into visceral fat. They go into other types of fat cells that are continually turning over fat. Visceral fat is stored in fat cells around the waist, tummy, thighs and buttocks (the body's 'warehouse' for fat). Such fat is very stubborn to get rid of because there is little if any 'fat turnover' (these fat cells are for storing fat rather than turning over fat). Furthermore, it is well established that the greater your visceral fat, the greater the chances of diabetes and heart disease.

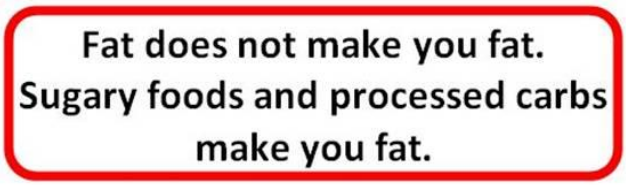
For these three reasons, fat consumption does not make you fat. So how do you get fat? You get fat by consuming sugary foods and processed carbs. These foods galvanize hormones that convert such foods into triglycerides (a well known process called 'lipogenesis') that are then stored as visceral fat.

When you consume sugary foods and processed carbs they make your glucose shoot up. This in turn makes insulin go up to bring down the level of glucose, and then store such glucose as visceral fat. The glucose is fully converted into fat and then stored.

Furthermore, the hormone insulin is 'programmed' to store glucose in fat cells located in visceral fat. Insulin is compelled to bring down blood glucose quickly, so the glucose is stored in visceral fat cells ***as fat*** because it offers a quick and easy place to store fat. This is the body's biggest reservoir of fat storage offering an immediate 'home' for the excess glucose in the blood. This is what the body is designed to do.

Sugary foods and processed carbs are also high in fructose since many foods and drinks contain added fructose. Unlike glucose, fructose does not trigger an insulin response, but even so it is much more fattening than glucose.

As explained in another part of this book, added fructose is truly your enemy number one in terms of the diet because it overwhelm the liver, forcing the liver to get rid of fructose by converting it into triglycerides which are then stored as visceral fat. Remember that regular sugar is half glucose and half fructose.



If you ***under-eat*** fat, you can become seriously ill (not to say obese) and eventually this can be fatal. If you ***over-eat*** fat (but avoid sugary foods and processed carbs), the stored fat will eventually be released as free fatty acids for fuelling our metabolic functions. However much fat you may consume, it will not make you put on weight provided you avoid sugary foods and processed carbs.

To clarify this vital point further, if you eat oils/fat with a sugary food (or with a processed carbohydrate), the sugar/carbs that you eat will make the body store more of the dietary fat than otherwise, thus making fat cells store more fat than the amount they release. So never combine dietary fat with dietary sugar/carbs. If you must consume sugar/carbs, avoid or minimize oils/fat in the same meal. And vice-versa: when you consume a high-fat meal, minimize or avoid sugar/carbs.

Providing you avoid (in the same meal) the consumption of sugar/carbs, the actual fat that you eat will not be fattening and will not end up as surplus body fat. The problem is that many high-fat foods are combined with sugar/carbs, such as pastries, bread & butter, waffles, chocolate, cookies, and many processed foods contain both fat ***and*** sugar in one form or another. These are fattening foods because of their sugar/carb content, not because of their fat content.

You are not being urged to follow a high-fat low-carb diet such as the Atkins diet. This is fatal because the high content of animal protein in such diets is very unhealthy. Furthermore, 'atkins-type' diets typically include a high consumption of heated (i.e. unhealthy) fats that cause illness.

Rather, you are being urged to follow a high-fat, high-carb diet. But such carbs must exclude sugary foods and processed carbs. There are many high-carb foods that are super healthy and will not make you fat such as beans, lentils, sweet potatoes and many other legumes and starchy vegetables.

Also, a high-fat diet must exclude unhealthy fats such as processed polyunsaturated oils, all kinds of fat spreads and margarines, and any oils or fats that have been heated. Healthy fats include steam rendered lard, and good-quality organic cream, butter & cheese. Salad dressings made with extra-virgin olive oil that has been refrigerated is non fattening and healthy. Other examples of healthy fats include coconut oil, palm oil and other nut/seed oils providing they are cold-pressed, have not been heated at any point and have been refrigerated at all times from factory to mouth.

An argument that is usually put forward by those who favour low-fat diets (or the avoidance of saturated fat) goes like this: *"saturated fat makes your VLDL and LDL cholesterol go up and this is bad for health".* Well guess what, this is total baloney! Saturated fat has a zero harmful impact on VLDL and LDL cholesterol levels in the body.

This is so because it has been shown time and again in countless studies that dietary fat has no impact on blood cholesterol levels. Even foods high in cholesterol have no impact on blood cholesterol levels. Furthermore, a high level of blood cholesterol is healthy and not conducive to heart disease.

All the recent research shows that *"eating fat significantly lowers VLDL cholesterol and has no impact at all on LDL in the blood,* [thus greatly protecting against clogged arteries and heart disease]*"*. Abridged extract from the book The Great Cholesterol Con, by Malcom Kendrick, ISBN: 1844546101.

To summarize, the oils and fats that we eat do not end up as surplus body fat and do not clog arteries or cause heart disease. This does not mean that you can eat oil/fat with great abandon! Think of oils and fats as condiments for adding to your food. Moderation in all things is a wise saying.

The so-called 'good fats' are super-healthy and indeed essential for losing weight and avoiding heart disease - they should be consumed daily in generous but not excessive amounts. The so-called 'bad fats' may not be fattening but they can cause cancer, heart disease and other serious illnesses and should be completely avoided.

The best possible diet for human biology is a high-fat, high-carb diet so long as you avoid sugary foods, processed carbs & unhealthy fats. There is a world of difference between good fats and bad fats, and knowing the difference is life-saving knowledge that will greatly improve your well-being and help you live longer.

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The takeaway message: follow a high-fat diet for optimum health and longevity, but avoid unhealthy fats (know the difference).

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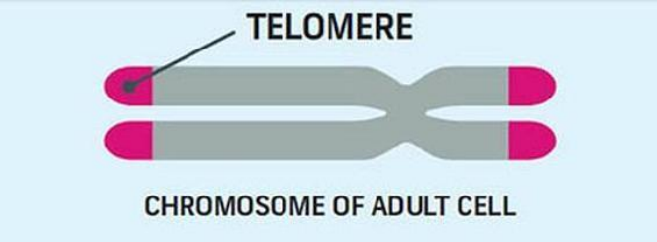
Telomere Immortality

Throughout this book we talk about optimizing health so as to extend life and remain healthy. But why exactly does better health help you live longer? Put another way, what exactly makes the body grow old and die?

The answer in a word is "telomeres". This is the holy grail for some longevity scientists. Inside the nucleus of a cell, our genes are arranged along twisted, double-stranded molecules of DNA called chromosomes. At the ends of the chromosomes are stretches of DNA called telomeres, which protect our genetic data, make it possible for cells to divide, and hold some secrets to how we age and get cancer.

Telomeres have been compared with the plastic tips on shoelaces, because they keep chromosome ends from fraying and sticking to each other, which would destroy or scramble an organism's genetic information.



Yet, each time a cell divides, the telomeres get shorter. When they get too short, the cell can no longer divide; it becomes inactive or "senescent" or it dies. This shortening process is associated with aging, cancer, and a higher risk of death. So telomeres have also been compared with a bomb fuse because once the telomere gets too short the body cell no longer divides and dies.

In white blood cells, the length of telomeres ranges from 8,000 base pairs in newborns to 3,000 base pairs in adults and as low as 1,500 in elderly people. (An entire chromosome has about 150 million base pairs.) Each time it divides, an average cell loses 30 to 200 base pairs from the ends of its telomeres.

Cells can normally divide only about 50 to 70 times, with telomeres getting progressively shorter until the cells become senescent or die.

Telomeres do not shorten in tissues where cells do not continually divide, such as heart muscle.

Without telomeres, the main part of the chromosome — the part with genes essential for life — would get shorter each time a cell divides. So telomeres allow cells to divide without losing genes. Cell division is necessary for growing new skin, blood, bone, and other cells.

Without telomeres, chromosome ends could fuse together and corrupt the cell's genetic blueprint, possibly causing malfunction, cancer, or cell death. Because broken DNA is dangerous, a cell has the ability to sense and repair chromosome damage. Without

telomeres, the ends of chromosomes would look like broken DNA, and the cell would try to fix something that wasn't broken. That also would make them stop dividing and eventually die.

An enzyme named telomerase adds bases to the ends of telomeres. In young cells, telomerase keeps telomeres from wearing down too much. But as cells divide repeatedly, there is not enough telomerase, so the telomeres grow shorter and the cells age.

As a cell begins to become cancerous, it divides more often, and its telomeres become very short. If its telomeres get too short, the cell may die. But very often these cells escape death by making more telomerase enzyme, which prevents the telomeres from getting even shorter.

Too much telomerase can help confer immortality onto cancer cells and actually increase the likelihood of cancer, whereas too little telomerase can also increase cancer by depleting the healthy regenerative potential of the body. To reduce the risk of cancer we need an ideal level of telomerase, with not a whole lot of room for error.

This clarifies that “telomerase shots” are not the magical anti-aging potion that Faust and so many other humans have sought throughout history.

Accelerated telomere shortening increases the pace of aging

Many cancers have shortened telomeres, including pancreatic, bone, prostate, bladder, lung, kidney, and head and neck.

Measuring telomerase may be a way to detect cancer. And if scientists can learn how to stop telomerase, they might be able to fight cancer by making cancer cells age and die. In one experiment, researchers blocked telomerase activity in human breast and prostate cancer cells growing in the laboratory, prompting the tumour cells to die. But there are risks. Blocking telomerase could impair fertility, wound healing, and the production of blood cells & immune-system cells.

Geneticist Richard Cawthon and colleagues at the University of Utah found shorter telomeres are associated with shorter lives. Among people older than 60, those with shorter telomeres were three times more likely to die from heart disease and eight times more likely to die from infectious disease.

If telomerase makes cancer cells immortal, could it prevent normal cells from aging? Could we extend lifespan by preserving or restoring the length of telomeres with telomerase? If so, would that increase our risk of getting cancer?

Scientists are not yet sure. But they have been able to use telomerase in the lab to keep human cells dividing far beyond their normal limit, and the cells do not become cancerous.

If we used telomerase to "immortalize" human cells, we may be able to mass produce cells for transplantation, including insulin-producing cells to cure diabetes, muscle cells for treating muscular dystrophy, cartilage cells for certain kinds of arthritis, and skin cells for healing severe burns and wounds. An unlimited supply of normal human cells grown in the laboratory would also help efforts to test new drugs and gene therapies.

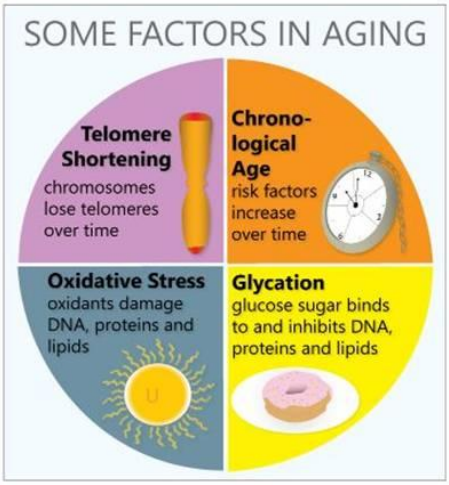
Cawthon's study found that when people are divided into two groups based on telomere length, the half with longer telomeres lives an average of five years longer than those with shorter telomeres. This study suggests that lifespan could be increased five years (or more) by increasing the length of telomeres in people with shorter ones.

People with longer telomeres still experience telomere shortening as they age. How many years might be added to our lifespan by completely stopping telomere shortening? Cawthon believes 10 years and perhaps 30 years.

After age 60, the risk of death doubles every 8 years. So a 68-year-old has twice the chance of dying within a year compared with a 60-year-old. Cawthon's study found that differences in telomere length accounted for only 4% of that difference. And while intuition tells us older people have a higher risk of death, only 6% is due purely to chronological age. When telomere length, chronological age, and gender are combined (women live longer than men), those factors account for 37% of the variation in the risk of dying over age 60. So what causes the other 63%?

As discussed in the next chapter, a major cause of aging is "oxidative stress." It is the damage to DNA, proteins, and lipids (fats) caused by oxidants, which are highly reactive substances containing oxygen. These oxidants are produced normally when we breathe, and also result from inflammation, infection, and consumption of alcohol and cigarettes. In one study, scientists exposed worms to two substances that neutralize oxidants, and the worms' lifespan increased an average 44%.

Another factor in aging is "glycation." It happens when glucose, the main sugar we use as energy, binds to some of our DNA, proteins, and lipids, leaving them unable to do their jobs. The problem becomes worse as we get older, causing body tissues to malfunction, resulting in disease and death. Glycation may explain why studies in laboratory animals indicate that restricting calorie intake extends lifespan. Their extended life is likely to be a result of eating less sugary foods rather than overall calorie restriction.



It is likely that oxidative stress, glycation, telomere shortening, and chronological age (along with various genes) all work together to cause aging.

What are the prospects for human immortality?

Human lifespan has increased considerably since the 1600s, when the average lifespan was 30 years. By 2012, the average US life expectancy was nearly 79. Reasons for the increase include sewers and other sanitation measures, antibiotics, clean water, refrigeration, vaccines and other medical efforts to prevent children and babies from dying, improved diets, and better health care. Life expectancy varies considerably in different parts of the world.

Some scientists predict that average life expectancy will continue to increase, although many doubt the average will ever be much higher than about 90. But a few say vastly longer lifespans are possible. Geneticist Richard Cawthon says that if all processes of aging could be eliminated and oxidative stress damage could be repaired, *"one estimate is people could live 1,000 years."*

Although we cannot slow down the degradation of our telomeres as a result of aging (the passage of time), there are two very effective things we can do straight away to preserve our telomeres. As already touched upon, we can reduce oxidative stress and we can reduce glycation in our body. These are the two biggest things we can do to extend longevity and remain healthy, as explained in the next two chapters.

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Takeaway message: preserving the finite telomere capacity of the body is the key to staying healthy and living longer. This is not beyond our control. We do it by minimizing oxidative stress and glycation.

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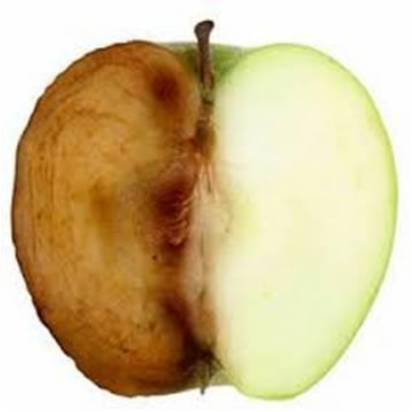
Live Longer By Reducing Oxidative Stress

Oxidative stress occurs when certain lifestyle factors damage our body cells, and is at the route of most serious diseases, including cancer. *"Oxidative stress is likely to be involved in age-related development of cancer"* (source: Wikipedia). It is widely accepted by medical scientists that oxidative stress is a major cause of premature aging and a shortened lifespan.

Oxidation occurs when oxygen damages (oxidizes) the molecular components of body cells. Antioxidants are molecules made inside the body that inhibit (prevent) the damaging oxidation of other molecules such as free radicals.

So put simply, oxidative stress occurs when our body cells are damaged by free radicals. Oxidative stress is a fact of life. It's estimated that our bodies' cells are "hit" by free radicals up to 10,000 times a day, every day. What causes oxidative stress? Daily living – breathing, eating, exercise, and exposure to environmental toxins.

As we breathe, we take in oxygen which our cells require. Our cells then naturally produce unstable molecules as a by-product, and these are known as 'free radicals'. When these free radicals are not stabilized they can cause oxidative damage to our cells and to our DNA (similar to the oxidative damage that rusts metal, or causes the browning of a cut apple).



Oxidative stress also occurs from exposure to tobacco smoke, the sun, poor diet, processed meats, transfats, pollution, drugs, toxins, herbicides, body trauma, and some medical tests and procedures such as x-rays, surgeries and chemotherapy. Antioxidants inside the body protect cells by stabilizing free radicals, thus preventing and repairing the damage that they can cause.

Every time oxidative stress damages a body cell, the telomere associated with that cell is shortened as explained in the previous chapter. So long-term you always want to minimize your telomere damage, and short-term you always want to avoid oxidative stress so as to avoid illness and bad health.

Our natural antioxidant defences generally do a great job in keeping infection at bay and combating a host of diseases such as heart disease, stroke, macular degeneration, diabetes and cancer.

We can give our antioxidant defences a helping hand by following a healthy diet and by avoiding unhealthy lifestyles that generate free radicals inside the body. Antioxidants are abundantly found in brightly coloured fruits and vegetables, as well as in nuts, seeds, sprouted seeds and green tea. They are also present in small amounts in just about everything we eat: all fruits, vegetables, and legumes contain antioxidants, and some grains, meats, poultry and fish contain smaller amounts.

Until recently, the thinking had been that antioxidants can only be good for you and that free radicals can only be bad. But that thinking has changed.

Drs. Cleva Villanueva and Robert Kross published a 2012 review titled *'Antioxidant-Induced Stress'* in the International Journal of Molecular Sciences. Their research and other recent studies show that free-radicals are not all bad and that antioxidants are not all good. It's not a black and white picture.

For example, free-radicals are a natural by-product of energy production inside the body. Such free-radicals signal our body cells to make their own home-made antioxidants of many types. These antioxidants then work together synergistically in a kind of cascade effect to protect the whole body.

If there is only one overwhelming type of antioxidant present, say as a result of taking a high-dose vitamin C supplement, then our body's natural antioxidants 'don't get a look in' to provide that protective cascade effect. You could end up with a bunch of reactive vitamin C, which itself can cause what is called “antioxidant stress.”

We do need these endogenous antioxidants that our own body makes. They are very important for good health generally. But we don't need antioxidants from the food we eat and we certainly don't need antioxidant supplements.

"Evidence gathered over the past few years shows that, at best, antioxidant supplements do little or nothing to benefit our health. At worst, large doses could have the opposite effect, promoting the very problems they are supposed to stamp out. Time and again antioxidant supplements have failed the test. True, they knock the wind out of free-radicals in a test tube. But once inside the human body, they seem strangely powerless". Source: Readers Digest Canada, www.readersdigest.ca/food/diet-nutrition/antioxidant-myth.

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"A trial in 2011 with 35,500 men found that men older than 50 years of age had a 17% higher risk for prostate cancer when given large doses of the antioxidant vitamin E. Due

to these disturbing studies, conclusions point to the possibility that antioxidants at least at high doses may protect cancer cells from free radicals. A recent study gave the antioxidant N-acetylcysteine (NAC) to mice genetically susceptible to melanoma. In this trial, the dose was similar to those found in human consumption of antioxidants. The treated mice developed more tumors in lymph nodes that suggested a higher rate of metastasis (spread of cancer). In addition, they added NAC or vitamin E to cultured human melanoma cells and found that antioxidants aided the cell's ability to invade nearby tissues (a sign of increased metastasis). Do not fall for the hype of supplement sellers and manufacturers who ignore the science". Source: Sally J. Feltner, PhD, RDN (University Professor and PhD degree in nutrition science), Antioxidant Supplements and Cancer Cells, article at foodworkblog, Jan. 2016.

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"Diets containing foods [naturally] high in antioxidants have been shown to improve health. However, in supplement form, the prevention of diseases such as cancer or coronary heart disease and the general promotion of health have not been confirmed experimentally. Trials including supplements of beta-carotene, vitamin A, and vitamin E singly or in different combinations found no effect on mortality or might increase it. Randomized clinical trials of taking antioxidants including beta-carotene, vitamin E, vitamin C and selenium have shown no effect on cancer risk or have increased cancer risk. Supplementation with selenium or vitamin E does not reduce the risk of cardiovascular disease." Source: Wikipedia.

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"The conclusion is becoming clear: whatever is behind the health benefits of a diet rich in fruit and vegetables, you can't reproduce it by taking purified extracts or vitamin supplements. Just because a food with a certain compound in it is beneficial to health, it does not mean a [pill containing the same compound] is." Source: Paul Coates, Office of Dietary Supplements, National Institutes of Health, https://ods.od.nih.gov.

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"The truth is that there are no studies that prove that plant antioxidants work as antioxidants in our non-plant bodies. After all, they were made for plants, and many of them are destroyed by digestion or transformed by the liver into completely different chemicals. Luckily, Nature, in its infinite wisdom, provided us with our own built-in antioxidants, designed especially for our animal bodies, such as cholesterol, melatonin, urea, and uric acid". Source: Georgia Ede, MD, www.diagnosisdiet.com

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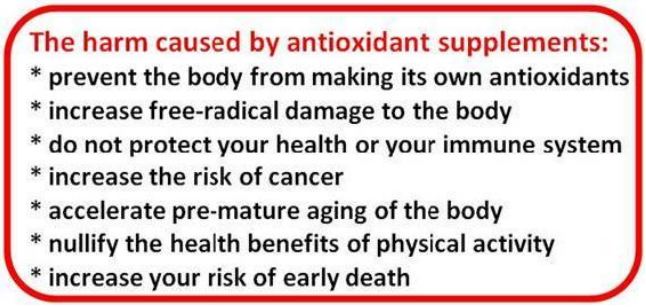
The fact is our own human body makes all the antioxidants that it needs for good health. It could be that some of the antioxidants contained in our food can give the body a helping hand in making its own antioxidants (but there is no scientific evidence to back this up). The latest research is showing that the body does not use the antioxidants contained in the food we eat to combat free-radicals. The body makes its own antioxidants for such battles. But this does not mean or imply that foods naturally high in

antioxidants are not healthy to consume (they typically contain a wide range of nutrients that are good for you).

When it comes to antioxidant supplements, a dire picture is emerging from the research. A 2014 review published in '*Nutrition and Food Science'* concluded that high-dose antioxidant supplements can effectively snatch up all the free-radicals naturally produced by the body before they have a chance to trigger the synthesis of those beneficial endogenous antioxidants.

Barbara Demmig-Adams, professor of ecology and evolutionary biology at the University of Colorado in Boulder, and one of the authors of the 2014 paper wrote in an email:

"I think it's a really important realization that the much-maligned [free] radicals have a job to do in our bodies and that a single high-dose supplements can do more harm than good".



In particular you should avoid the antioxidant supplements A, C, and E. These vitamins are easily obtained from the food you eat, particularly fruit, vegetables and salads. Taking these vitamins as supplements causes nothing but ill-health.

Put simply: taking antioxidant supplements puts your health at risk. Our cells practice an elegant balancing act, each component playing an important part: vitamins, minerals, electrolytes, water, free-radicals, other metabolites, and antioxidants (both endogenous and dietary). When we figure out a specific beneficial role that any one of these serves, it's tempting to say: *"Wow, look how important this thing is, let's make sure folks get a whole bunch of it!"* But that can throw off the whole delicate system, leading to some serious consequences.

For example, research is now showing that antioxidant supplements may actually speed up the spread of the potentially deadly skin cancer melanoma. Such supplements can prevent oxidation (i.e. prevent efficient energy production) which in turn can damage cells, leading to cancer.

What about taking other vitamin and mineral supplements? In general you should avoid taking such supplements unless prescribed for a specific medical condition. A healthy diet will provide all the vitamins and minerals needed for optimum health and longevity. The only exception to this is as follows: it is recommended that you take three daily vitamins B12, D3 and K2(MK7) as research shows that however good the diet, these three vitamins are lacking in most people.

Note: take both D3 and K2(MK7), or neither. The body needs D3, but it also needs K2 (MK7) to tell the body where to put the D3. If you take D3 without K2(MK7) you risk a build-up of harmful arterial calcification plus insufficient D3 where it is needed.

"Without Vitamin K2, the body cannot direct calcium to the bones where it's needed; instead, the calcium resides in soft tissue (like the arteries)—leading to a combination of osteoporosis and atherosclerosis". Source: Kate Rheaume-Bleue, Vitamin K2 and the Calcium Paradox: How a Little-Known Vitamin Could Save Your Life, Wiley, ISBN: 978-1118065723, 2011.

It is well known that free-radicals can damage healthy body cells. But free-radicals can also damage harmful microorganisms like viruses and bacteria which have invaded our bodies. We need the free-radicals that our body naturally produces when we burn energy; they are part of our natural defences against illness and disease. If we wipe them out with antioxidant supplements, we also wipe out a major part of our natural defences.

Furthermore, it is becoming clear that the free-radicals that we ***naturally*** produce cause minimum damage to healthy body cells, just enough to make such cells produce vital 'home-made' antioxidants.

Clearly, it is important to avoid smoking, air pollution, sun burn, harmful drugs, alcohol, and other substances that give the body an overdose of harmful free-radicals. They can cause cellular damage associated with ageing, heart failure, cancer, Alzheimer's, and many other health problems. But it doesn't follow that taking antioxidant supplements will help combat such free-radicals. You combat such free-radicals by avoiding the harmful substances (and unhealthy behaviours) in the first place.

While some studies show that antioxidant supplements in the laboratory can prevent cancer, others show that they keep cancer cells alive so as to proliferate. Cells alone on a plate in a lab respond consistently well to antioxidants, but cells in the body are more complicated.

Let us not forget that there is a huge multi-billion dollar food and supplement industry that is always pushing us to buy their antioxidant pills, potions, and health foods. Don't be conned into buying a health-food processed and packaged as being 'high in antioxidants'. We simply don't need these snake-oil remedies.

You don't want to (and don't need to) boost the antioxidant capabilities of your body with antioxidant supplements. But you do need to keep your natural immunity strong so as to fight off disease and illness. You do this by adopting a wholly nutritious diet that equips the body to make its own endegonous antioxidants. So-called 'superfoods' high in antioxidants such as blueberries are indeed good for you, but they can't be used as a cancer-fighting antioxidant weapon.

Strengthen the antioxidant capacity of your body in two ways:

1. Follow a healthy diet and avoid junk food.

2. Avoid lifestyle factors that cause oxidative stress.

A major review published in 2012 looked at over 60 studies associated with oxidative stress and its effect on health and longevity, and came to the conclusions that follow. Note: Comments in brackets [ ] are the author's.

Source: Masood A. Shammas, et al, Telomeres, lifestyle, cancer, and aging, Curr Opin Clin Nutr Metab Care. 2011 Jan; 14(1): 28–34.

1. There has been growing evidence that lifestyle factors may affect the health and lifespan of an individual by affecting telomere length. Recent studies indicate that telomere length, which can be affected by various lifestyle factors, can affect the pace of aging and onset of age-associated diseases. Telomere length shortens with age. Better choice of diet and [healthier lifestyle] activities have great potential to reduce the rate of telomere shortening, leading to delayed onset of age-associated diseases and increased lifespan. Several studies indicate that shorter telomeres are a risk factor for cancer.

2. Coronary heart disease and premature aging: shorter telomeres and is associated with premature greying, predisposition to cancer, vulnerability to infections, progressive bone marrow failure, and premature death in adults.

3. Smoking increases oxidative stress, expedites telomere shortening, and may increase the pace of the aging process.

4. The excessive loss of telomeres in obese individuals was calculated to be equivalent to 8.8 years of life, an effect which seems to be worse than smoking. Together these data indicate that obesity has a negative impact on telomeres and may unnecessarily expedite the process of aging.

5. Environment, nature of profession, and stress can also affect the rate of telomere shortening and health.

6. Stress increases the pace of telomere shortening and aging. [The research shows that] women exposed to stress in their daily life [have] increased oxidative pressure, reduced telomerase activity, and shorter telomeres relative to the women in the control group. Importantly, the difference in telomere length in these two groups of women was equivalent to 10 years of life, indicating that the women under stress were at a risk for early onset of age-related health problems.

7. What we eat and how much we eat can significantly affect our telomeres, health, and longevity. Consistently, the highest life expectancy of Japanese is associated with low [dietary] protein and high-carbohydrate intake in diet.

8. Dietary intake of antioxidants reduces the rate of telomere shortening [this refers to the food you eat (not supplements) and the beneficial effect is likely to be from the overall nutritional content of the food rather than from the antioxidants in the food per se].

9. Dietary restriction [rather than calorie restriction] reduces the pace of aging. It has been shown that dietary restriction in rodents delays the onset of age-associated diseases and increases the lifespan. Rats subjected to a protein-restricted diet early in life displayed a long-term suppression of appetite....and increased lifespan.

10. Exercise may preserve telomeres and reduce the pace of aging. [Research shows that] the duration of exercise inversely correlates with biomarkers for damage to DNA and telomeres. Exercise can reduce harmful fat and help mobilize waste products for faster elimination, leading to reduced oxidative stress and preservation of DNA and telomeres. Consistently, athletes had elevated telomerase activity and reduced telomere shortening relative to non-athletes. [This research shows that sedentary people - couch potatoes - have shorter telomeres compared to those who are physically active in some manner].

11. Exercise seems to be associated with reduced oxidative stress and elevated expression of telomere stabilizing proteins and may therefore reduce the pace of aging and age-associated diseases. [This conclusion is drawn from research that involved testing subjects who did three weeks of voluntary, unsupervised exercise].

Author's note relating to above point 11: Another meta review concludes that non-intense exercise and physical activity reduces the rate of telomere shortening and that in contrast, intense exercise can lead to transient increases in single stranded DNA breaks in peripheral blood cells, thus shortening telomeres. Source: Zhangfa Song, Lifestyle impacts on the aging associated expression of biomarkers of DNA damage and telomere dysfunction in human blood, Aging Cell, 2010 Aug; 9(4): 607–615).

12. Telomeres shorten with age and progressive telomere shortening leads to [body cell death]. Older people with shorter telomeres have three to eight times increased risk to die from heart and infectious diseases. Rate of telomere shortening is therefore critical to an individual’s health and pace of aging.

13. Smoking, exposure to pollution, a lack of physical activity, obesity, stress, and an unhealthy diet increase oxidative burden and the rate of telomere shortening.

14. Key points [made by this Masood A. Shammas review]: Telomere length shortens with age. Rate of telomere shortening may indicate the pace of aging. Lifestyle factors such as smoking, lack of physical activity, obesity, stress, exposure

to pollution, etc. can potentially increase the rate of telomere shortening, cancer risk, and pace of aging. [A healthy] diet and regular exercise [i.e. physical activity] can potentially reduce the rate of telomere shortening, disease risk, and pace of aging.

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To finish on the subject of oxidative stress, there is a strong and well-researched link between sleep and oxidative stress. When you get enough sleep, this greatly restores the body from the previous day's oxidative stress and minimizes the oxidative stress in the coming day. You are urged to search Internet for the term "sleep well" for ideas and tips on how to improve your sleep quota.

Takeaway message: avoid oxidative stress in your body so as to be healthy and live longer. Limit nutritional supplements to vitamins D3, K2 and B12, unless other supplements medically prescribed.

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Live Longer By Reducing Glycation

The harm caused by glycation inside your body is very underrated and very overlooked when it comes to general good health and longevity. In fact, glycation is at the root of many diseases, pre-mature aging and a shorter life, yet glycation is easily prevented. Here is a quote from Wikipedia:

"Glycation is implicated in many age-related chronic diseases such as cardiovascular diseases (the endothelium, fibrinogen, and collagen are damaged), Alzheimer's disease (amyloid proteins are side-products of the reactions progressing to AGEs), cancer (acrylamide and other side-products are released), peripheral neuropathy (the myelin is attacked), and other sensory losses such as deafness (due to demyelination). This range of diseases is the result of the very basic level at which glycations interfere with molecular and cellular functioning throughout the body and the release of highly oxidizing side-products such as hydrogen peroxide.

Long-lived cells (such as nerves and different types of brain cell), long-lasting proteins (such as crystallins of the lens and cornea), and DNA may accumulate substantial damage over time. Cells such as the retina cells in the eyes, and beta cells (insulin-producing) in the pancreas are also at high risk of damage from glycation. Damage by glycation results in stiffening of the collagen in the blood vessel walls, leading to high blood pressure, especially in diabetes. Glycations also causes weakening of the collagen in the blood vessel walls, which may lead to strokes".

What exactly is glycation?

When you eat food some of it converts to glucose molecules in the blood, and then some of those glucose molecules will bond with proteins that are also circulating in the bloodstream. These blood proteins can be chains of amino acids or they can be protein capsules containing lipids. For simplicity we will refer to them both as 'proteins' or 'blood proteins'.

Glycation occurs when glucose molecules bond with proteins in the blood, forming what is known as AGEs (Advanced Glycation End-products). Put simply glycation causes damaged proteins.

These AGEs (damaged proteins) then circulate in the blood and generate very harmful free radicals known as ROS (Reactive Oxygen Species) that affect all parts of the body. These ROS free radicals bump into body cells just about everywhere the blood stream goes, causing cellular damage. Once damaged, the cells become susceptible to oxidative stress and mutate or die. Hence, glycation and oxidative stress very much go hand in hand.

"AGEs block nitric oxide activity in the endothelium and cause the production of reactive oxygen species". Source: Alison Goldin, et al, Advanced Glycation End Products, Basic Science for Clinicians, http://circ.ahajournals.org.

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"AGEs affect nearly every type of cell and molecule in the body and are thought to be one factor in aging and some age-related chronic diseases" (Wikipedia).

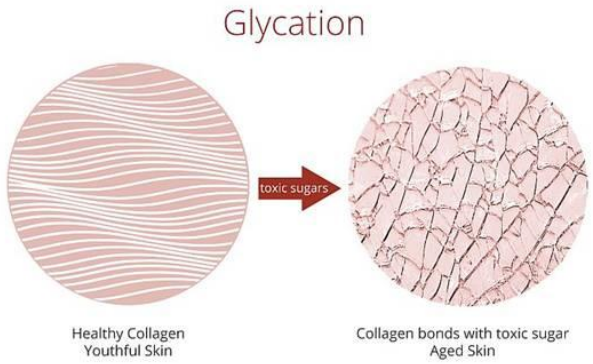
*

The sequence of events is roughly as follows:

Food consumption ► blood glucose ► blood proteins ► glycation of proteins ► AGEs ► ROS free radicals ► cellular damage ► oxidative stress ► cellular death/mutation ► disease ► poor health.

Glycation is also the main reason your skin becomes old and wrinkled, and more susceptible to skin cancer. What happens is that glucose molecules come into contact with protein molecules (i.e. collagen) contained in the scaffold below the skin.

Incidentally, taking collagen supplements that you swallow have no effect on improving your skin. Nor do they help with healing and repairing damaged bones. They should be completely avoided as they increase the risk of harmful calcification in your body.



We cannot avoid glycation in our lives because when we eat, this creates proteins in the blood that become a target for glycation. We need to minimize the chances that a glucose molecule will bump into a protein molecule and bond. We do this by minimizing the amount of proteins and/or glucose molecules circulating in the blood.

In a healthy body this low level of glycation is mostly nullified by our natural defenses. The small amount of glycation that escapes such nullification is responsible for our gradual aging with the passage of time.

We always want to minimize glycation so as to optimize good health and live to a ripe old age. We can do this quiet easily by adopting a healthy diet. Some health professionals say that glycation can be minimized by following a low-carb diet so as to reduce blood glucose. The reasoning is that if blood glucose is reduced there will be fewer glucose molecules to cause glycation.

This is false reasoning because the body is compelled to always maintain a given level of glucose in the blood, regardless of what is eaten or not eaten. In other words, glucose is always present in the blood within a very narrow range (not too much, not too little), otherwise we would die. Without glucose, the brain would shut down, red blood

cells would die and so on. So the body is compelled to always have a certain level of glucose in the blood regardless of the type of diet.

Adhering to a low-carb diet does not reduce the default level of blood glucose that we must always have. If we over-eat carbs and sugary foods, blood glucose will go up above the default level temporarily but the body quickly brings the level down in a matter of minutes using insulin for the task. In this scenario, the rise in glucose is too brief for any significant increase in glycation to occur.

If we avoid eating carbs and sugars such as in fasting regimes or a ketogenic diet, the body makes its own glucose by stripping protein from muscles and internal organs (including heart muscle). Then, like an alchemist, the body mixes the stripped protein with other materials found inside the body to produce its own 'home made' glucose (a well-known process called gluconeogenesis).

Note: this is a major reason for never following a ketogenic diet; it weakens your muscles and organs, greatly speeding up the aging process. More about this in the chapter "The Biggest Hidden Cause of Aging".

If we cannot blame glucose for the ravages of glycation, what can we blame? We can blame a poor diet that increases the number of proteins circulating the blood. The bigger the number of blood proteins, the bigger the chances that some of them will be glycated by the ever presence of glucose.

So the question is: ***what aspect of a diet causes the biggest rise in blood proteins?*** In a word: fructose. The regular consumption of fructose increases blood proteins more than anything else you could consume.

There is endless confusion over this subject because fructose is a kind of sugar. Because of this it is mistakenly thought by some people that fructose enters the blood as a sugar to cause glycation. This is not so. Even Wikipedia is wrong to state that *"Glycation is the result of the ...bonding of a protein or lipid molecule with a sugar molecule such as fructose or glucose".* This is scientifically incorrect and here is why.

When you consume fructose it doesn't go into the bloodstream directly as does glucose; it must first go to the liver where some of it is converted into glycogen. Any excess fructose in the liver is then converted and sent into the bloodstream as lipids (not as a sugar). These fructose lipids are encapsulated inside protein wrappers. It is these protein 'packages' that offer a target for becoming glycated. It is therefore incorrect to think that fructose sugar enters the blood and bonds with lipids to form AGEs.

Remember that the greater the presence of blood proteins, the greater the likelihood that some of those proteins will bump into glucose molecules and bond (i.e. glycate) to form harmful AGEs.

As glycation is a major cause of harmful free radicals, minimizing glycation is a major key to good health and longevity.

Minimizing or avoiding consumption of fructose is easier said than done. All kinds of sugar, syrups, and honey are 50% fructose. And fructose is added to many processed

and packaged foods as a sweetener. Yet fructose is your enemy number one in the context of a long and healthy life.

When you eat food, the carbohydrates and sugars in the food mostly convert to glucose in the bloodstream. This is fine and healthy provided you avoid sugary foods and ***processed*** carbs (e.g. cookies, waffles, pastries, etc.) as such foods make your blood glucose shoot up and this is bad for health. Stick to non-processed whole foods as much as possible as this trickle-feeds glucose into your blood, without shooting up and triggering an insulin response.

As explained in the next chapter, glucose is non-fattening, natural and mostly gets used up as muscle energy instead of ending up as body fat. But fructose is another story. The rest of this chapter explains how most glycation can be avoided by the simple expedient of avoiding or minimizing fructose consumption.

Here are the main metabolic differences between fructose and glucose to show how fructose can wreak such havoc with your health, and why it's considerably worse for you than glucose:

1. When you consume fructose, the burden of assimilating that fructose rests mainly on the liver. This overwhelms the liver forcing it to overwork and become vulnerable to liver disease. But with glucose, your liver is not overworked as most glucose can bypass the liver and go straight into the bloodstream.

2. Every cell in your body, including your brain, uses glucose. Therefore, much of it is "burned up" immediately after you consume it. By contrast, fructose is primarily converted into free fatty acids (FFAs), VLDL (the damaging form of cholesterol), and triglycerides (all collectively known as 'lipids'). These lipids are put into the blood stream by the liver (once it has stored enough glycogen) where they become a target for glycation and consequent illness.

3. Fructose Lipids that escape glycation end up as stored body fat or accumulate as fat droplets in your liver and skeletal muscle tissues, causing insulin resistance and non-alcoholic fatty liver disease (NAFLD). Insulin resistance progresses to metabolic syndrome and type II diabetes. This harmful effect caused by fructose is very well studied because of the plague of diabetes throughout the world.

4. Fructose is more fattening than anything else you could consume. Technically this is so because fructose is the most lipophilic carbohydrate. In other words, fructose converts to activated glycerol (g-3-p), which is directly used to turn FFAs into triglycerides. The more g-3-p you have, the more fat you store. Glucose does not do this.

5. When you eat 120 calories of glucose, less than one calorie is stored as fat. But when you eat 120 calories of fructose this results in 40 calories being stored as fat. Fructose is forty times more fattening than glucose. Consuming fructose is like 'consuming body fat' as most of it is converted into fat! Regular sugar is half glucose and half fructose; sugar is fattening because of the fructose, not because of the glucose.

"Anyone who still insists that "sugar is sugar" is way behind the times... There are in fact major differences in how your body processes different sugars, and it's important to understand that when you consume fructose, your body packs on pounds at a much higher rate than it does when you consume glucose". Source: Dr. J Mercola, M.D., Avoid Sugar to Help Slow Aging, mercola.com.

6. The metabolism of fructose by your liver creates a long list of waste products and toxins, including a large amount of uric acid, which triggers your "fat switch," causing you to gain more weight. Glucose does not do this, as it suppresses the hunger hormone ghrelin and stimulates leptin, which suppresses your appetite. Fructose has no effect on ghrelin and interferes with your brain's communication with leptin, resulting in overeating. Put simply, fructose makes you hungry, glucose does not.

7. Cholesterol in your body is not harmful and is carried around the bloodstream in LDL and VLDL wrappers for delivering to parts of the body that need cholesterol. But when these wrappers become damaged by free radicals caused by glycation, the wrappers and their cargoes of cholesterol get caught up in arterial plaque. So the cholesterol 'unwittingly' gets caught in plaque as a result of glycation caused by fructose.

"The recognition that LDL glycation is at least as important as oxidation in atherogenesis may lead to improvements in our understanding of its mechanism and how to prevent it". Source: Younis N, Glycation as an atherogenic modification of LDL, Curr Opin Lipidol. 2008 Aug; 19(4):378-84.

8. Fructose causes more glycation than anything else you could eat. As already mentioned, glycation is the process by which blood glucose molecules bond with blood proteins to form advanced glycation end products, or AGEs. This process causes a cascade of harmful ROS free radicals throughout the body that can cause inflammation, cancer, aging, many types of serious illness and a shorter lifespan.

Note: some studies of worms have tentatively concluded that the oxidative damage theory of aging in humans is not a black and white scenario. That ROS free radicals may not be a major cause of aging in humans. But such studies are in the minority; the general scientific consensus is that ROS causes DNA damage to body cells and that the greater this damage the greater the chances of serious illness and a shorter lifespan.

9. Macrophages are scavenger cells that are part of our immune defence system, and as such they have special receptors for AGEs, aptly called RAGEs (think: raging inflammation). These RAGEs bind to the AGEs in our body and get rid of them. Unfortunately, this defensive process can also cause its fair share of damage. Inside your arteries, for example, the scar tissue created from this process is called plaque. So fructose indirectly creates arterial plaque in two ways: by creating scar tissue that promotes plaque and by creating damaged VLDL and LDL particles that get caught up in such plaque.

For these nine reasons and others you really want to limit the consumption of fructose in your life. Minimizing fructose consumption is absolutely a key factor in optimizing your heath and living longer. *But what about fruit and fruit juice I hear you ask?* Fruit is high in fructose and we are always being told to eat plenty of fruit for good health.

Here is the answer: when you eat fresh whole fruit and chew it well the fructose content is trickle-fed to the liver without overwhelming it. As a result most or all of such fructose is converted and stored in the liver as glycogen. This glycogen is then gradually used up as cellular and muscle energy.

But when you consume fructose that is ***added*** to the food you eat (or concentrated in fruit juice) the fructose is said to be 'unbound' or 'free'. It is this unbound fructose that is so harmful because it overwhelms the liver and ends up as a target for glycation in the form of proteins circulating in the bloodstream.

There is a world of difference between the way the human body treats bound and unbound fructose molecules, i.e. the way it treats the fructose in whole fruit and the way it treats the ***free*** fructose in fruit juice and processed foods. A regular modest consumption of fresh whole fruit (chewed well) is excellent and indeed essential for good health.

Metabolically, consuming unbound fructose is very similar to consuming alcohol. The by-products are similar, which is why the effects on the liver are similar. *"It is my belief that fructose is the largest dietary factor behind the rising rates of fatty liver disease among today's youth."* Source: Dr. Joseph Mercola, MD, Fructose is the Leading Dietary Culprit in Childhood Obesity, mercola.com, August 2011.

Although fructose is found naturally in all fruit (and many vegetables), eating small amounts of whole fruit does NOT provide concentrated amounts of harmful unbound fructose that overwhelm the liver. When the fruit is consumed intact and whole, its fibre will somewhat moderate (control) the release of fructose into your bloodstream, as well as somewhat moderate insulin release. Furthermore, the act of chewing the fruit in the mouth allows the fructose to be released into the body much more slowly than gulping it down as juice.

The importance of chewing fruit properly cannot be overemphasized. You should always eat slowly, taking extra time to masticate the food well with every mouthful. This gives enzymes in your mouth time to do their job and greatly improves digestion. Also it gives the body more time to say *'I am satiated, stop eating, enough is enough!'* If you eat quickly you will overeat before any feelings of satiation become apparent, thus leading to greater stored body fat.

"Human saliva is composed of 98% water, while the other 2% consists of other compounds... and various enzymes. Enzymes break down large molecules (starch or proteins, respectively) into smaller ones, so they can be absorbed by the intestines. Mastication is the process by which food is crushed by teeth. It is the first step of digestion...and allows a more efficient breakdown by enzymes. During mastication...the enzymes in saliva begin to break down carbohydrates [e.g. the sugars in fruit] in the food" (source: Wikipedia).

Humans have evolved over millions of years on a diet of raw nuts, seeds, berries, grubs, roots, flowers, tender leaves, herbs, birds eggs, insects, and from occasional meat and seafood. Humans were never predominantly fruitarians. This is why the human body cannot digest fructose safely unless consumed in moderation and in the form of whole fruit that is chewed well.

When you drink fruit juice, even if you only sip it slowly, you don't get the benefit of allowing the enzymes in your mouth to do their job to aid digestion, and you don't get the satiation message that says "enough is enough". Worse still, if you drink fruit juice during a meal you will store a greater amount of fat from the meal than otherwise. This happens because the fructose interacts with the molecules of the food being consumed and a greater proportion of the glucose derived from the food ends up as surplus body fat. Avoid drinking fruit juice, particularly with a meal!

Fruit juice contains little to no fibre – but most kinds of sweet-tasting fruit juice typically contain about eight full teaspoons of fructose sugar per eight-ounce glass (just think of it: about one full teaspoon of fructose sugar per fluid ounce!). This fructose is brought rapidly into your body, promoting obesity, glycation and other health problems. Drinking a glass a freshly squeezed orange juice for example, even if diluted with a little water, may give you some nutrients, but is super-bad for health because of the concentrated fructose.

Dr. Robert Lustig, Professor of Pediatrics in the Division of Endocrinology at the University of California in San Francisco, is a distinguished authority on fructose. He says: "fructose is poison, out and out, and it is every bit a poison in excessive quantities

as is alcohol. It's metabolized exactly the same way, and it's what's giving even children fatty liver disease, a precursor to cirrhosis."

Dr. Lustig raises an interesting aspect about the myth of obesity being *"no more complicated than a lack of activity combined with excessive caloric intake."* If that's true he asks, then how is it that he sees so many obese 6-month old infants in his practice? Is a 6-month baby lacking in exercise? No it's not – infants become obese because they are given baby foods high in fructose, not because they lack physical activity.

To summarize, here briefly is the difference between consuming whole fruit and consuming fruit juice (or products with added fructose):

Whole fruit

When we eat whole fruit, the sucrose (sugar) is broken down to fructose and glucose slowly and calmly inside the body. This happens for two reasons:

1. As the fruit is chewed well, the sucrose in the fruit combines with enzymes in the mouth. This starts the process of good digestion.
2. The sucrose is composed of glucose and fructose bound together. As such it is digested slowly and calmly in the upper small intestine until it is broken down to unbound glucose and fructose and sent to the liver.

As this is going on, any small amounts of unbound glucose and fructose that was always in the fruit will go directly to the liver. But this will not be enough to overwhelm the liver (assuming that only a modest amount of fruit was consumed and chewed well). Hence the glucose and fructose from the whole fruit will end up as healthy glycogen stored in the liver.

Fruit juice and unbound fructose

When fruit juice (or products containing added fructose) are consumed, the high concentration of unbound fructose will bypass the digestion process and go straight to the liver. Any high amounts of glucose that may also be in the food will pass into the bloodstream and cause a temporary excess of glucose in the blood. This in turn will create an insulin spike so as to bring down the level of glucose to a default level. Over time, this constant demand for insulin can weaken the body's capacity to produce insulin, leading to insulin resistance and diabetes.

The unbound fructose in the fruit juice (or product containing added fructose) will most likely overwhelm the liver, leading to an over-production of lipids in the blood, harmful

glycation, rampant free radicals, serious illness, obesity, pre-mature aging and a shorter life.

Regarding fructose digestion, for those who want the science verbatim, here it is:

Upon gastric absorption both fructose and glucose are delivered via the portal vein to the liver. It is believed that the ability of the liver to metabolize high doses of fructose is responsible for the disruption in energy stores and fuel metabolism observed. In the liver, fructose is metabolized into glyceraldehyde and dihydroxyacetone phosphate. These particular fructose end products can then readily converge with the glycolytic pathway. Of key importance is the ability of fructose to by-pass the main regulatory step of glycolysis, the conversion of glucose-6-phosphate to fructose 1,6-bisphosphate, controlled by phosphofructokinase. Thus, while glucose metabolism is negatively regulated by phosphofructokinase, fructose can continuously enter the glycolytic pathway. Therefore, fructose can uncontrollably produce glucose, glycogen, lactate, and pyruvate, providing both the glycerol and acyl portions of acyl-glycerol molecules. These particular substrates, and the resultant excess energy flux due to unregulated fructose metabolism, will promote the over-production of triglycerides.

According to Gary Taubes, a nutritional author, "The fructose is mostly, about 90-95 percent metabolized in your liver. The pathway by which it's metabolized is fundamentally different. The place at which it's metabolized is different to that of glucose. It makes the liver do more work than just assimilating say a starchy food."

Diet apart, glycation can also be caused to a lesser extent by poor lifestyle factors such as smoking, alcohol abuse and drugs, as these factors affect the bloodstream.

"Certain components of mainstream cigarette smoke can react with [blood proteins] to form covalent adducts with many of the properties of advanced glycation end products (AGEs)". Source: Nicholl ID, et al, Advanced glycation end products and cigarette smoking, Cell Mol Biol (Noisy-le-grand). 1998 Nov; 44(7):1025-33.

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"AGEs fluorescence [the severity of AGEs] *was significantly higher in chronic alcoholic patients than in healthy subjects".* Source: Kalousová M, et al, Advanced glycation end-products in patients with chronic alcohol misuse, Alcohol Alcohol, 2004 Jul-Aug; 39(4):316-20.

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To an extent, glycation is a fact of life. It's happening right now, to all of us. It can even be measured: The cross-links formed between sugars and proteins emit a fluorescence, which scientists can capture using Visia complexion-analysis cameras. *"If you take a fluorescent image of children, their faces will come out very dark,"* says Procter & Gamble biochemist Greg Hillebrand, PhD, *"but with each decade, the AGEs, and therefore the brightness, will accumulate more and more."*

This means that by the time we reach our dotage, we can expect our fluorescent images to resemble those of the incandescent aliens in Cocoon! The external signs of glycation show up around the age of 30 or 35, when a perfect storm of built-up sun

damage, environmental oxidative stress, hormonal changes, and the development of AGEs begins to result in, well, a-g-e. *"When you're younger, your body has more resources to ward off damage, and you're producing more collagen,"* says dermatologist Fredric Brandt, MD. *"When you reach a certain age, these sugar by-products [AGEs] begin to build up at the same time that your threshold for damage is getting lower."*

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The takeaway message: avoid glycation by minimizing or avoiding fructose consumption and by avoiding harmful lifestyle factors such as smoking and alcohol that also promote glycation.

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The Best Kind of Sugar

We have seen how important it is to avoid fructose. This means avoiding all kinds of sugary foods that contain sugar since it is half glucose and half fructose. So we must either minimize sweet things or give up all kinds of sugars entirely. Whatever your decision, it helps greatly to have an alternative sweetener that contains no fructose or harmful substances. In this chapter you will discover this alternative sweetener - the best kind of sugar.

Stevia is often proposed as an ideal alternative sweetener as it is not artificial and is derived from the stevia plant. However, the regular use of stevia is worse for health than regular table sugar and should be completely avoided.

Our bodies are not designed or evolved to handle a calorie-free sweetener such as stevia. Experiencing a sweet taste from a food that is not going to provide glucose confounds our body's sugar-handling process. When you consume stevia, this 'tricks' the body into a state of hypoglycemia, however mild and temporary.

Stevia is "sweet" on the palate, so the body assumes it is receiving sugar and primes itself to do so. Glucose is cleared from the bloodstream and blood sugars drop, but no real sugar/glucose is provided to the body to compensate. When this happens, adrenaline and cortisol surge to mobilize sugar from other sources (liver and muscle glycogen, or protein, or body tissue) to bring blood glucose back up.

If there is insufficient glucose from food (or from stored glycogen) this triggers 'gluconeogenesis'. And this in turn cannibalizes muscle tissue to make urgently needed glucose. If you consume stevia regularly and follow a low-carbohydrate diet, there is a possibility that you will lose muscle as a result of consuming stevia.

Furthermore, the frequent release of the stress hormones (adrenaline and cortisol) in response to the stevia-induced hypoglycemia is damaging to our adrenal glands and overall health.

These stress hormones are designed to be utilized when we need to be in a flight-or-fight response–not when we are eating a meal. The consequences of excess stress hormones means a suppressed immune system, increased inflammation, and lower thyroid function… just to name a few! Regular sugar does not cause these harmful stress hormones, albeit it is bad for health for many other reasons.

Of course, stevia isn't going to affect everyone's blood sugar in the same way or to the same degree, because a lot depends on how much is consumed, your state of health and your kind of diet. It may even be that some people do not experience a significant drop in blood glucose from stevia, but why take the risk?

There are other reasons for avoiding stevia which may or may not apply to the particular type/brand that you are using. Stevia additives such as glycerine, xylitol, and flavourings can cause health problems, depending on how much is consumed. This is not the case with sugar.

What about candida, you may ask? It is widely believed that stevia can help combat candida. In fact there is no research specifically showing this to be so. It is known that sugar can feed yeast microbes inside the body and hence exacerbate candida. But stevia does not feed yeast microbes, so it has been falsely assumed that it does exacerbate candida. In fact, it is now thought that stevia can indirectly encourage candida by starving the body of glucose.

"Stevia may not feed Candida, but going sugar free to address Candida overgrowth is a big mistake because it can lead to systemic candida overgrowth and severely impaired metabolism". Source: Lauren Geertsen, author and certified Nutritional Therapy Practitioner (NTP), Why I Quit Stevia, http://empoweredsustenance.com.

Ironically, stevia can contribute to weight gain around the tummy and waist. Here is what happens:

Stevia provides no glucose, and hence no stored muscle energy (known as glycogen). As a result, if sugar is not immediately ingested to raise blood sugar levels, the body releases extra adrenaline and cortisol to convert muscle protein and fat into glucose. If this pattern is repeated, the frequent release of these stress hormones takes a toll on the body, and one of the most manifest symptoms of excess cortisol is abdominal weight gain.

Additionally, the body cannot convert inactive thyroid hormone T4 into active thyroid hormone T3 without adequate glycogen. The resulting hypothyroidism leads to slowed metabolism. That means a host of symptoms such as weight gain, hair loss and lack of energy. Without adequate dietary sugars, the body cannot create and store glycogen.

Another consideration is that stevia may inhibit fertility in men and women. Sarah Ballantyne, a nutrition scientist, explains that as stevia contains 'steviol glycosides', these can have contraceptive effects in both males and females. In particular, one specific steviol glycoside, called stevioside, has been shown to have potent contraceptive properties in female rats, implying that stevia may have an impact on estrogen, progesterone or both.

Perhaps a main reason for avoiding stevia is that it increases your desire for sweetness. Throughout life, we always want to minimize consumption of sugar in all its guises

because it causes many health problems. By consuming stevia you make it more difficult to wean yourself off the desire for sweetness and you maintain your sugar cravings.

Stevia is as addictive as regular sugar

Now we come to diabetes. Many people need to prevent insulin spikes in the blood. In fact, insulin spikes are bad for you, whether or not you have diabetes. We always want to prevent insulin spikes for general good health.

If you're diabetic or pre-diabetic it is particularly important to avoid insulin spikes. When it comes to stevia, confusion arises because stevia is shown to not cause insulin spikes. Consequently, stevia is sometimes recommended as a sugar replacement for those who may be diabetic. But this is bad advice.

Consider the following: if John has a bacterial infection he is likely to be advised to take an antibiotic to kill the infection. But if John does not have a bacterial infection, then taking an antibiotic is bad for health.

The same goes for stevia: if John is diabetic he is likely to be advised to use stevia rather than sugar to prevent insulin spikes. But if John is not diabetic, then using stevia is bad for health.

Put another way, for a diabetic, stevia is the lesser of two evils compared to sugar. Stevia is not healthy, even for a diabetic, but compared to sugar it is less likely to cause insulin spikes.

For the various reasons mentioned in this chapter, diabetics should not be urged to use stevia in their lives. It is better to urge diabetics to do the following:

"You should always endeavour to avoid glucose spikes by avoiding processed carbohydrates and sugary foods/drinks. Instead, eat a high carbohydrate diet based on unprocessed starchy foods such as lentils, sweet potatoes and many others. This keeps you energised without causing insulin spikes. If you absolutely must sweeten your tea or some other food (not recommended if you are diabetic) use just a tiny amount of pure glucose (also known as dextrose). But remember, always strive to avoid any kind of sweetening agent altogether. The most important thing for a diabetic is to wean yourself off any kind of sweet food or sweetening agent".

Here is what Belinda (a reader of our sister book **The Lipo Diet** and a diabetic) had to say about using stevia:

"I am giving Stevia up for the last time I hope. I keep going back to this sweetener because I don't want to use artificial sweeteners. However each time I do, I experience some effects from stevia I don't like. First of all, I find that it messes up my taste buds. Foods start to taste sour in my mouth when I eat them. Also when I do use another sweetener, I have to use so much more of it because the stevia has gotten my taste buds used to so much sweetness. The other thing I experience with stevia is that it increases appetite. That I didn't expect at all. I thought I was alone until I read on the

internet that others are also having this problem. The one thing that I really don't like either is that when I stop stevia I start craving it again. It sets up a craving for sugar. I don't want to be a slave to anything, especially food".

*

It is well established that artificial sweeteners such as Splenda, Saccharin, Aspartame, Acesulfame-K, Sucralose and others are truly bad for health and should be completely avoided. We won't dwell on this subject as there is ample research showing this to be so. Simply do an Internet search for "avoid Splenda" or "avoid Aspartame", etc. and you will find lots of information. You are strongly urged to avoid such sweeteners for the sake of your health.

Also, avoid sugar alcohols (also known as polyols), including sorbitol, isomalt, lactitol, maltitol, mannitol, xylitol, erythritol and hydrogenated starch hydrolysates. They should be completely avoided in the human diet. This is so for the following reasons:

1. Indigestion. Polyols are highly indigestible. Indigestibility is not necessarily a problem when the source is a whole food like plantains or potatoes which contain resistant starch. But polyols are bad news because the body cannot breakdown and assimilate sugar alcohols and they create a gut imbalance.

2. Gastric distress. As a result of gut imbalance caused by polyols, this can trigger gastric distress, bloating and diarrhea. For those who suffer from any sort of gut disorder or autoimmune disease, sugar alcohols and processed foods containing them should most especially be avoided.

3. Disruption of gut lining. Polyols have the potential to disrupt the functioning of the lining of the gut, that very tissue that is already compromised for those suffering from autoimmune and gastrointestinal disorders.

4. Proliferation of pathogens. The body's inability to effectively break down sugar alcohols causes them to arrive for the most part intact when they reach the intestines. At that point, a process called "passive diffusion" takes place whereby the sugar alcohol that was consumed draws water into the bowels. This results in only partial breakdown. The non-metabolized portion begins to rot, creating the perfect environment for undesirable bacteria and pathogens to feed, thrive, and grow.

5. Autoimune disease. An imbalanced intestinal environment where pathogens and other undesirable microbes have a favourable place to exist is exactly the set of conditions that eventually compromise the gut lining, damage the critical

enterocytes that line the gut wall, and promote the development of autoimmune disease symptoms.

6. Harmful yeast. While it is true that sugar alcohols do not feed pathogenic yeasts such as Candida Albicans (whereas sugar does), the undesirable fermentation of undigested sugar alcohols has the potential to exacerbate yeast problems.

7. Leaky Gut Syndrome. Leaky Gut Syndrome (LGS) refers to a condition in which undigested food particles can pass through the "leaky" bowel wall and into the rest of body, leading to a large number of conditions ranging from migraines to autism. Although it has not been proven medically that LGS causes specific illnesses, it is thought that LGS is very common in the population at large. Polyols are known to cause or exacerbate LGS, and for this reason alone they should be avoided.

8. Acid reflux. Polyols can contribute to acid reflux problems so those who have issues in this area should avoid it for that reason alone. Chronic acid reflux is a serious problem that can lead to cancer of the esophagus and larynx.

9. Epilepsy. Those who suffer from seizures of any kind should stay away from polyols as they are known to increase the frequency of epileptic attacks.

Note: It is widely believed that xylitol is beneficial, in spite of it being a polyol. This is not so. Xylitol is very much a sugar alcohol, and is as unhealthy as any other polyol. Even the idea that xylitol is a 'natural' product is incorrect. Commercial xylitol is made by hydrogenating sugar with powdered nickel-aluminum, a toxic metal. If xylitol can kill your dog or cat (which it can), you just have to wonder if it can be good for you!

In conclusion, don’t fall for the lure of sugar alcohols, and avoid products containing such alcohols, such as 'sugar free' chewing gum. While it may seem like a good idea in the short term to wean yourself off sugar, the long term risks to gut health, the potential for autoimmune disease by unbalancing the gut environment, and the damage to the gut wall aren’t worth it.

There are two other alternative sweeteners that you may wish to consider: Mannose and Luo Han Kuo, both derived naturally from plants.

Mannose (also known as D-mannose and other names) is sometimes prescribed to combat urinary infections; it is sweet but tends to leave a bitter aftertaste. Mannose is closely related to glucose and is considered safe for long term use. Mannose supplements should be used with caution if you have diabetes as it may make it harder to control your blood sugar.

Luo Han Kuo has been used as a sweetener in China for centuries, and is about 200 times sweeter than sugar. It received the USA FDA GRAS (i.e. safe) status in 2009. Luo Han Kuo is somewhat expensive and is difficult to find in the form of powder or crystals for use as a sugar substitute. Like Mannose, it can sometimes leave a bitter aftertaste. Luo Han Kuo can be a good sugar alternative for a diabetic who is just wanting to sweeten tea or coffee.

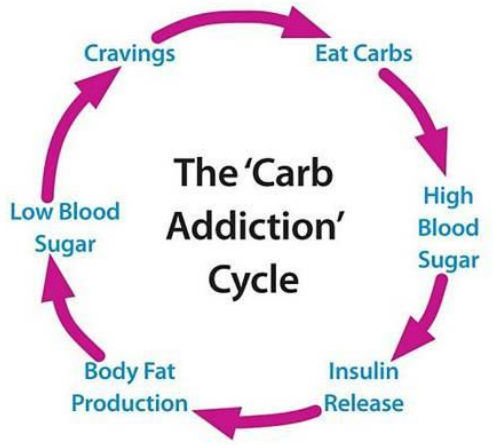
Now we come to sugar itself and the importance of avoiding glucose spikes in the blood. Whole books have been written on the subject of glucose, insulin and diabetes (not to mention thousands of research papers over the years). This is what it all boils down to: ***the more insulin sensitive you can remain throughout life, the better your health & well-being, and the longer your lifespan.***

Please do read that sentence again as it is probably the most important sentence in this book in relation to optimizing your health and living longer. By just remaining insulin sensitive (the opposite to insulin resistance) you will be doing the best thing possible to remain healthy, avoid illness, and extend your lifespan.

"If you can be as insulin sensitive as possible, for you as an individual, you reduce your risk [of serious diseases such as Alzeimer's]*"*. Source: Dr. Peter Attia, M.D., macronutrient thresholds, https://youtu.be/Fne3Dq3z0yQ.

The way you remain insulin sensitive in your life is to avoid glucose spikes in the blood. When glucose shoots up, this triggers an insulin response to bring down the level of glucose. When this happens on a regular basis, the body gradually loses it sensitivity to insulin, i.e. you become insulin resistant. When this happens, you're on the road to diabetes, a host of health problems, and a shortened lifespan. I make no apology for repeating this very important message several times in this book.

Another disadvantage of glucose spikes is that it creates sugar and food cravings, leading to binging and junk food consumption. This happens because when insulin goes up it is a 'knee jerk' reaction (a kind of 'panic' measure) to bring down glucose quickly. As a result, glucose goes down temporarily to ***below*** the default level. This in turn makes you desperate for energy and hence food cravings and the temptation to eat junk food as a quick fix.



How do you avoid glucose spikes in the blood? You do it by avoiding foods that make your glucose shoot up. Foods that do this are: sugary foods, processed carbohydrate foods, refined flour and grain foods, sodas, sweetened drinks, fruit juice, any processed foods high in sugar and/or carbs, and last but not least meat & fish. Examples are: desserts, sweets, candies, cookies, waffles, cakes, pizza, bread, carbonated drinks, orange juice, stake and fish (animal protein pushes up insulin).

Realize that processed carbs (cakes, doughnuts, white bread, pies, etc) convert quickly to blood glucose. Instead, focus on slow-digesting starchy carbohydrates such as sweet potatoes, yams, beans and legumes. They give you plenty of energy and fill you up without giving you a glucose spike or making you fat.

Throughout life you always want to avoid glucose spikes by avoiding foods that make your glucose shoot up. This is the most important takeaway message in this book in the context of good health and longevity.

Sugar is widely available in many guises and goes under many names such as: regular table sugar, brown sugars, molasses, honey, syrups (e.g. agave syrup, maple syrup, etc), beet sugar, sucrose, fructose, glucose, dextrose, maltose, and many other kinds of liquid, powdered and crystallized sugars. These are said to be 'real sugars' because they're extracted and processed from plants as opposed to being synthetic concoctions like artificial sweeteners and polyols.

Ideally you should avoid all kinds of sweeteners and sugars in your life (whether natural or synthetic). But if you absolutely must use a sweetener, then consider two things:

1. A 'real sugar' extracted from a plant (in whatever form) is better than artificial sweeteners or polyols.
2. Whatever kind of sugar you may decide to use it should not contain fructose.

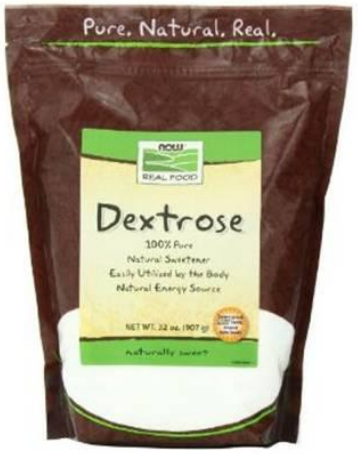
Given these two considerations, the ***best kind of sugar*** to use is glucose. Unlike regular sugar, pure glucose does not contain harmful fructose so it's an ideal sugar substitute. Furthermore, pure glucose does not cause liver disease and is mostly burnt up as muscle and cellular energy so it does not make you fat.

But use pure glucose in moderation so as to avoid glucose spikes in the blood. As mentioned, whatever kind of sugar or sweetener you may use, and whatever your diet, always strive to avoid glucose spikes so as to remain insulin sensitive.

Note: consider using a glucose monitor, even if you are healthy and not at all diabetic. This enables you to monitor your blood glucose so that you can tweak and refine your eating habits so as to avoid glucose spikes. Advances in technology, such as the Apple Watch, now allow easy ways to monitor your blood glucose. Here is an image of the Apple Watch showing its glucose monitor:

Pure glucose is available from health food stores and online suppliers. It can be obtained as syrup, as tablets, in crystallized form and as a powder. When buying, it is important to ensure that it is just pure glucose. It should not contain any additives and not be combined with any other sweeteners such as fructose, maltose or lactose. It does not matter whether the glucose is made from corn, beet or sugarcane, provided it is just 100% pure glucose.

Note that pure glucose is also sold as 'dextrose' (they are both the same thing). Here is an example of a pure glucose product in powder form, taken from Amazon.com (but there are many other glucose products to choose from):



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The takeaway message: avoid all kinds of added sugars and sweeteners for optimum health and longevity. If you absolutely must use an added sweetener, use just a little pure glucose, but not enough to make your blood glucose shoot up. Remain as insulin sensitive as possible throughout life.

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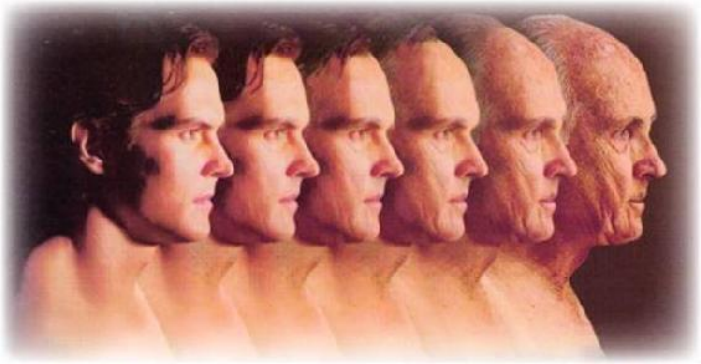

The Exercise Myth

Is all exercise really bad for you? Absolutely, all kinds of exercise are bad for health. Furthermore, regular exercise actually makes you fat.

To clarify the terminology, *'exercise'* is defined as any physical exertion that is sufficiently vigorous and sustained as to make you breathless and/or sweaty. This is the common understanding of the word 'exercise'. If you don't pant and/or sweat, even a little, it is usually not considered as 'exercise'.

You become breathless when you are forced to pant for air by mouth. The medical term for being breathless is 'hyperventilation'. Even breathing ***in*** through the nose and ***out*** through the mouth is bad for you if the exercise makes you sweaty and drains you of energy.

On the other hand physical activity is super healthy. The term *'physical activity'* in this book refers to just that: physical activity ***that is not*** sufficiently vigorous and sustained as to make you breathless and/or sweaty (and you are ***not*** forced to mouth-breathe). As you will see, exercise is bad for health and physical activity is good for health.

Clearly, a brief moment of exertion that makes you a little breathless or that causes a momentary spot of perspiration will cause no lasting harm as the body is quite resilient and is able to recover from such stress. Here, we are talking about exercise that is carried out regularly (several times a week) and that is sufficiently vigorous to make you breathless and/or sweaty; this leaves you drained of energy and exhausted, however temporary. As you will see, exercise stresses the body at a molecular level and is unhealthy in several ways, even if you enjoy such exertion and are used to doing it.

Exercise oxidises and ages the body before its time, causing a multitude of illnesses and chronic bad health. You simply don't need to exercise to stay physically fit, healthy, and slim.

If you already do regular exercise that makes you breathless and/or sweaty, you will discover that within days of switching to physical activity you will feel like a new person, full of energy and well-being. You will feel better physically and emotionally, and after reading this book, you will wonder why on earth you ever did exercise.

If you are a true couch potato and you never even go for a walk, you will know that your health is suffering. You will know that your muscles are not as firm as they could be and you will know that you are overweight. The solution is simple (and will please you): become physically active as explained in this chapter but stay away from exercise. Build physical activity into everything you do and make a point of going for a long walk every day. As you become more physically active (but without doing exercise) you will feel invigorated, your health will improve dramatically and your life will change for the better.

By being 'physically active' we are only talking about doing the usual daily activities your body is used to (and that your body is meant to do) such as walking, swinging the arms, going up steps, pulling, pushing, lifting, etc. But in fact virtually any kind of exercise can,

with a little imagination, be adapted so as to ***not*** make you breathless and /or sweaty. For example cycling, swimming, floor exercises, weight lifting, and many other activities can easily be carried out without becoming breathless and/or sweaty and without mouth-breathing.

The latest research is clearly showing that exercise shortens life expectancy, is bad for health in general, and causes a host of problems, such as osteoarthritis, osteoporosis, diabetes, heart disease, cancer, obesity, premature aging of the body, and weaker bones to name just a few of the issues.

These health issues arise from six specific factors which are examined briefly in what follows. **Note:** A detailed examination of the effects of exercise on health and the full supporting evidence are beyond the scope of this book; for this please see our sister publication: Why You should Avoid Exercise.

1. Exercise and Malnourishment.
2. Exercise and Energy depletion.
3. Exercise and the Cortisol Factor.
4. Exercise and the Leptin Factor.
5. Exercise and Oxidative Stress.
6. Exercise and the CO2 factor.

1. Exercise and Malnourishment. Exercise causes severe malnourishment, and this in turn makes you over-weight however nutritious the diet.

Exercise robs the body of valuable vitamins and minerals (the loss is very significant). This in turn causes malnourishment. You cannot lose surplus body weight in a sustained or healthy manner if you are malnourished. If you do this, you will become ill and lose all motivation to lose weight.

Growing research is now clearly showing that you lose significant amounts of vitamins and minerals in your sweat. It contains a rich mix of many minerals, such as sodium, potassium, calcium, magnesium, zinc, copper, iron, chromium, and nickel, plus many

other less-abundant trace minerals. You also lose the B vitamins and vitamin C in sweat because these are water soluble vitamins.

You are urged to see this youtube video in which Dr. Peter Glidden describes why athletes die young as a result of mineral depletion through exercise: http://youtu.be/DB5A8TtyRpE.

Now we come to a crucial point in terms of obesity: deficiency of vitamins and minerals causes obesity. Many studies clearly show that a lack of minerals in particular prevents the body from losing weight and staying slim.

"Obese individuals are more likely to have either lower blood concentrations or lower bioavailability of minerals and/or vitamins. However, there are limited data on the effects of nutritional supplementation on body weight (BW) control." Source: Li Y, et al, Effects of multivitamin and mineral supplementation on adiposity, energy expenditure and lipid profiles in obese Chinese women, Int J Obes (Lond). 2010 Jun; 34(6):1070-7.

When the body 'thinks' it is being starved from insufficient nutrition it triggers a 'starvation response' and the body tries to save as much fat as possible as a survival mechanism. So the regular loss of nutrients through sweat puts the body into a regular starvation response.

You don't need to be under-weight to be malnourished. Indeed, most obese people are malnourished; the consumption of junk food bereft of vitamins and minerals makes you fat and leaves you malnourished. Such people are fat mainly ***because*** they are malnourished.

There is ample and incontrovertible evidence that a malnourished body is much more prone to accumulate surplus body-fat. Here is just one of the many studies on this subject:

"Malnourishment is one of the major reasons many people are overweight and could be why you are carrying more body-fat than you'd like or you have stubborn fat you can't get rid of. I'm referring to micronutrients like minerals, vitamins and enzymes, etc. ...the small stuff that is required to make the metabolic processes of the body actually work. When you don't get the nutrients your body needs to sustain your metabolic processes, this sends a hunger signal to your brain to eat more food...which you then satisfy by eating more nutrient-poor food...which then repeats the signal that your body is lacking nutrients...so you eat more food...and so on. When you're in a nutrient deficient state, your body sees that as a famine situation, and the metabolic rate gets slowed down. Fat-burning grinds to a halt as your body fights to hang onto all the resources it has in order to survive. Eating more healthy foods is a HUGE step in the right direction, especially focusing on organic foods and unprocessed foods". Source: Nick Nilsson, degree in Physical Education and Psychology, with more than 20 years physical training experience. Nilsson is the author of a number of bodybuilding books.

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You may consider that fat people are malnourished because of their poor diet rather than because of sweaty exercise. This no doubt is so in most cases because most fat

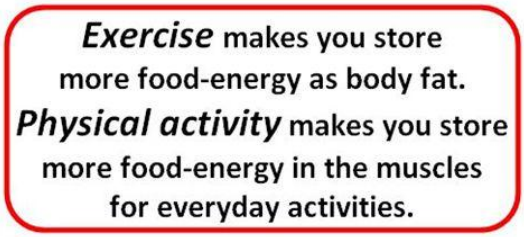
people are not in the habit of doing regular sweaty exercise. But equally, most people who do regular sweaty exercise suffer chronic malnourishment, become overweight, and face a life-long battle against obesity.

2. Exercise and Energy depletion. Exercise drains your muscle energy and greatly increases your propensity to store body-fat.

When you exercise to the extent of becoming sweaty and breathless you make the body think that it is facing some kind of emergency, known medically as the 'fight-or-flight response'. This is so however much you may enjoy the exercise. What happens is this:

Exercise quickly drains your muscles (and liver) of energy, leaving you exhausted and feeling weak and hungry. Note: The energy stored in muscles for all our everyday activities is known as glycogen

As a result, you will inevitably eat food (at some point) following exercise, and the body will use energy from the food you eat (instead of using surplus body-fat) to replenish muscle energy. In doing so, no surplus body-fat will be lost because, to replenish muscle energy, the body always gives priority to taking energy from the food you eat rather than taking it from body-fat.



Going without food after exercise in the hope that body-fat will be 'burnt' is a forlorn hope. You would have to fast for at least three whole days before the body even begins to use up stored fat for muscle energy.

Once you have eaten and fully replenished the glycogen that was drained from the muscles and liver, the body will switch out of the fight-or-flight response because it will 'think' the danger is over. But switching out of the fight-or-flight response is not quick; it can typically take a day or so providing you cease exercising. If you exercise everyday you stay in a semi-permanent state of 'fight-or-flight' as you don't give the body a chance to fully switch out of survival mode.

You may not feel hungry the moment you finish exercising, but you can be sure that at some point later on during the day or evening you will need to eat to replace the lost energy. And when you do eventually eat, the body will be primed to store as much of that food-energy as body-fat once the muscles have been replenished with glycogen.

3. Exercise and the Cortisol Factor. Exercise significantly increases the level of cortisol in the blood as a result of the physical stress imposed on the body. Even at mild or moderate levels of exercise, it is known that this increases the amount of cortisol in the bloodstream, and this in turn increases obesity. Here are just two of the many studies showing how exercise greatly increases blood cortisol and body fat:

"Collectively, the cortisol findings support the view that moderate to high intensity exercise provokes increases in circulating cortisol levels." Source: Hill EE, et al, Exercise and circulating cortisol levels: the intensity threshold effect, J Endocrinol Invest. 2008 Jul; 31(7):587-91.

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"Cortisol affects fat distribution by causing fat to be stored centrally—around the organs. Cortisol exposure can increase visceral fat—the fat surrounding the organs—in animals." Source: Elissa Epel, et al, Stress May Cause Excess Abdominal Fat In Otherwise Slender Women, Psychosomatic Medicine, Sept. 2012.

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When cortisol in the blood rises, this has the direct effect of increasing body-fat. This is why athletes and those who exercise regularly are much more prone to being overweight. It is ironic that most people who go running *do so to be slim*, yet that same exercise only serves to make them fatter.

Worse still is the fact that the surplus body-fat gained from exercise is of the worst kind. The higher levels of cortisol gained from exercise pre-dispose the body to store fat around the midriff. In women this means around the waist, hips, thighs and buttocks. In men it mostly means around the abdomen, giving men a pot belly or 'spare tire'. This type of surplus body-fat is particularly unhealthy and very difficult to get rid of.

"One of the interesting but 'paradoxical' observations in my clinical practice is the rather large number of patients presenting with severe obesity, who have histories of successful competitive sports careers." Source: - Dr. Arya Sharma, MD/PhD, FRCPC, Prof. of Medicine & Chair in Obesity Research and Management at the University of Alberta, Canada, www.drsharma.ca.

When cortisol pushes up the level of glucose in the blood it is a very temporary condition to get you out of trouble. Then soon afterwards the body uses insulin to bring down the level of glucose. This is when surplus glucose is stored as body-fat.

But cortisol is not your enemy; it fulfils several vital functions and is used by the body as a survival mechanism when faced with danger (the body 'perceives' exercise as a danger). Your enemy is the exercise that stresses the body - this is what triggers cortisol. Equally, glucose is not your enemy (in the context of body weight); your enemy is surplus body-fat.

To summarize: exercise pushes up blood cortisol and blood glucose. After the exercise, insulin brings down the level of glucose in the blood by storing excess glucose as body-fat around the hips, thighs, buttocks and stomach. Hence, cortisol has a direct effect on increasing the body's propensity to store surplus body-fat.

4. Exercise and the Leptin Factor. Exercise reduces the level of leptin in the blood, and this causes hunger, over-eating and junk-food consumption.

Leptin is a powerful hormone produced by the body to control feelings of hunger. It is always circulating in the blood and its role is to keep body weight within a healthy

narrow range. If your body-fat falls below the norm (the 'baseline level') leptin levels in the blood will go down to make you eat more by increasing feelings of hunger. If your body-fat goes above the norm, leptin levels in the blood will go up to make you eat less by reducing feelings of hunger.

"Leptin circulates in blood and acts on the hypothalamus to regulate food intake and energy expenditure. When fat mass falls, plasma leptin levels fall stimulating appetite and suppressing energy expenditure until fat mass is restored. When fat mass increases, leptin levels increase, suppressing appetite until weight is lost". Source: Wikipedia.

So in general the lower the level of leptin in the blood the fatter you become. The higher the level, the thinner you become. For those wishing to lose weight, leptin is truly the most important hormone to know about.

You may wonder how this relates to exercise?

As already mentioned, a major cause of obesity is a lack of underlying nutrition. We must remember that the body considers malnutrition as much a threat as starvation. To put it crudely: famine makes you fat. Over-eating does not make you fat if you stick to nutritious food. But if you eat junk food this deprives your body of good nutrition, and this is perceived by the body as 'famine' so leptin goes down to increase feelings of hunger. This is why fat people who always consume junk food are always hungry. Western society, especially the United States, is full of people who are severely overweight but who are also suffering from extreme malnourishment.

Regular exercise puts you into a vicious circle: exercise causes malnourishment, which pushes down leptin, which makes you hungry, which makes you overeat, which makes you fat. But this brings to light a paradox that causes great confusion: most fat people have high amounts of leptin circulating in the blood. If high leptin makes you eat less (from less hunger), how is it that most fat people are usually hungry and over-eat?

Leptin down = more hunger = more body fat
Leptin up = less hunger = less body fat

The answer to this paradox is that obesity causes leptin resistance, and this in turn causes the body to NOT take notice of the continuously high level leptin circulating in the blood. As a result, the on-going high level of leptin does not reduce feelings of hunger. To be absolutely clear on this vital point: the body is not taking any notice of the high leptin - it is ***resisting*** from taking action to make you eat less, hence leptin ***resistance***.

Many studies show that leptin resistance is caused by obesity: "leptin resistance is extremely common in obese individuals which suggests it may simply be an adaptation to excess body weight. The major physiological role of leptin is suggested to be not as a "satiety signal" to prevent obesity in times of energy excess, but as a "starvation signal" to maintain adequate fat stores for survival during times of energy deficit, and leptin resistance in overweight individuals is the standard feature of mammalian physiology, which possibly confers a survival advantage." Source: Wikipedia.

Coming back to exercise. There is overwhelming evidence that exercise reduces levels of leptin circulating in the blood. When blood leptin goes down, feelings of hunger go up and you generally eat more. Study after study shows that exercise makes leptin go down. Here is just one such study among the many:

"*Our research showed that short-term exercise lowers leptin levels in coronary patients....physical exercise of any type contributes to achieving lower leptin plasma levels*". Source: Dana Pop, et al, The Response of Circulating Leptin Levels to Exercise Stress Testing in Subjects Diagnosed with Metabolic Syndrome, Endocrinology, Volume 2014 (2014), Article ID 689260, 5 pages.

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"Leptin level is chronically reduced by physical exercise training". Source: Wikipedia.

It is clear that exercise causes a drop in leptin and that the greater the exercise, the greater the drop in leptin in the blood. Why does leptin go down when you exercise? Quite simply, when the body detects serious stress it triggers the fight-or-flight response. When you exercise you hyperventilate and sweat and this tells the body it is under serious stress.

The body doesn't know that you are deliberately causing this stress by exercising - the body only knows that it is under some kind of threat. This triggers a hormonal response inside the body to save as much energy (i.e. to save as much body-fat) as possible in the event of food shortage. Among the many hormones that are galvanised in a fight-or-flight response, the body lowers leptin so as to increase hunger and food consumption. The end result is more body-fat.

So exercise gives you a 'double whammy': it makes you overeat and it makes you store excess body-fat. If you exercise daily you will be permanently fighting a tendency to overeat and put on weight. And the excess body-fat that accumulates around the stomach, hips and thighs is notoriously difficult to get rid of.

But it gets worse (can it get worse?): when exercise causes leptin resistance, this can dramatically increase the risk of diabetes. The sequence of events is as follows:

1. Exercise makes you fat for a variety of reasons as explained in this chapter.

2. Surplus body-fat creates leptin resistance (the incidence of leptin resistance in the overweight is very high, almost universal).

3. Leptin resistance prevents body cells from producing insulin in a timely manner (not too much, not too little).

4. Leptin resistance indirectly increases the risk of diabetes. The link is obesity. Leptin resistance goes hand in hand with obesity. And obesity goes hand-in-hand with insulin resistance. And insulin resistance leads to diabetes. This is a well studied subject due to the growing epidemic of diabetes in the world.

The solution, of course, is to simply switch from exercise to physical activity. The body craves physical activity that does not make you breathless or sweaty because this is super-healthy, and this is how the body has evolved, it is what the human body is

designed to do. Physical activity does not drain you of energy, does not invoke the fight-or-flight response and does not drive down leptin levels in the blood. Physical activity helps you lose excess weight by allowing the body to store less fat than the amount of fat that is always melting away as part of your normal metabolic rate.

5. Exercise and Oxidative Stress. Exercise stresses the body adversely (however much you may enjoy the exercise) and this makes you gain surplus body-fat.

Perhaps the greatest harm caused by exercise is that it forces you to pant as the body tries to gain more oxygen. Exercise by definition makes you breathless. And when you become breathless, you breathe more quickly (the medical term for this is 'hyperventilation').

The irony is that the greater the hyperventilation, the less oxygen you receive. The slower and lighter the breathing, the more oxygen you receive. Throughout life, you want to breathe as little air as possible. Many studies show this to be true (for a comprehensive list of the studies into this area, please see the excellent website 'normalbreathing.com').

Another myth is the widely held belief that the air we exhale (carbon dioxide or CO2) is a waste gas that is toxic. Having a normal level of CO2 in the lungs and arterial blood (40 mm Hg or about 5.3 percent at sea level) is essential for normal good health.

"This myth that CO2 is a toxic and poisonous gas is one of the greatest modern superstitions. Thousands of medical studies have proven that reduced carbon dioxide levels in cells, tissues, organs, and fluids of the human organism cause numerous adverse effects." Source: www.normalbreathing.com/CO2.php

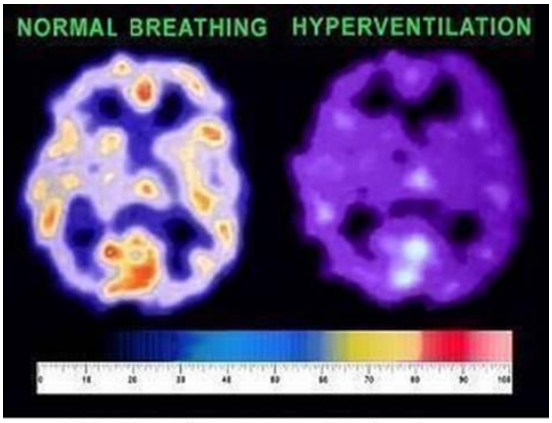
Normal gentle breathing, as any medical textbook will tell you, provides the arterial blood with nearly ideal or maximum possible oxygenation: about 98-99 percent. Therefore, breathing more deeply or quickly will not increase oxygenation of the blood; as mentioned, it has the opposite effect - it reduces oxygenation of the blood. So-called 'deep breathing exercises' should, of course, always be avoided; rather, it would be much better to do 'exercises' that *reduce* the amount of air breathed in, as this is beneficial to health.

We know instinctively that when we pant for air and become breathless through physical exertion, we are doing this from a lack of sufficient oxygen. So it may seem contradictory to say that when you breathe more quickly and deeply this results in receiving *less* oxygen. The explanation is threefold:

1. With hyperventilation, each breath of air is held inside the lungs for much less time compared to normal breathing. As a result, less of the air is processed into carbon dioxide and oxygen.

2. With hyperventilation, the lining of the airways dries out, concentrating the contents of the cells in that area. This is called increased osmotic load. The airways cool rapidly because of evaporative heat loss. The dryer and cooler airways results in less of the air being processed into carbon dioxide and oxygen.

3. As a result of points 1 and 2 above there is less carbon dioxide in the blood and this causes blood-vessels to constrict. As a consequence, the bloodstream feeds less carbon dioxide and less oxygen to the brain, to body cells, and to organs.



Effects of 1 minute of voluntary hyperventilation on brain oxygen levels (vasoconstriction due to a lack of CO2)

In the above image we see that within just a minute of being breathless the brain is starved of oxygen as a result of arterial constriction which reduces oxygen supply to all parts of the body.

Slower and shallower breathing is best (this is how we breathe automatically) as this allows the body to fully process the air so as to give the body the required level of oxygen and carbon dioxide for optimum health and well-being. In fact, the less air that we breathe throughout life (and the less we mouth-breathe), the healthier we will be.

There is zero scientific evidence supporting the myth that deep breathing is beneficial, and hundreds of published studies have clearly shown that hyperventilation (or breathing more than the tiny medical norm) ***reduces*** oxygen supply to the brain, heart, liver, kidneys, and all other vital organs due to losses in CO2. In fact, being breathless (as for example when we exercise) is unnatural for humans - we have not evolved to breathe in this way, and the body (metaphorically) does not like it, hence the consequent health problems.

The point here is that exercise greatly reduces oxygen supply to your body cells and this causes significant oxidative stress (just think how stressful it is when you cannot breathe!).

"It is now clear that mitochondrial defects [cellular damage] are associated with a large variety of clinical phenotypes.... among which low oxygen levels (hypoxia) are certainly prominent. Cells exposed to hypoxia respond acutely.... if low oxygen levels are prolonged, [there is an] overproduction of free radicals.... [leading] to mutations and tumours such as phaeochromocytoma and paraganglioma". Source: Giancarlo Solaini, et al, Hypoxia and mitochondrial oxidative metabolism, Biochimica et Biophysica Acta (BBA) - Bioenergetics, Volume 1797, Issues 6–7, June–July 2010, Pages 1171–1177.

A Great Myth of Our Age:

It is commonly believed that exercise combats harmful free radicals.

The myth goes like this: When you exercise you breathe in more air, and hence more oxygen reaches body cells. This in turn helps combat or reduce free radicals.

The reality goes like this: When you exercise you do in fact breathe in more air, i.e. you hyperventilate. But many studies clearly show that hyperventilation greatly reduces CO2 in the blood, which in turn constricts blood vessels. This in turn restricts blood flow, and this ***reduces*** the amount of oxygen that reaches body cells. As a result of reduced oxygen, the mitochondria inside body cells cannot function properly, and the result is an increase in free radicals. Exercise ***causes*** free radicals. This is how exercise ages the body before its time, increases the risk of cancer and shortens your life-span.

There are many studies clearly showing that body cells deprived of oxygen can become cancerous and cause free radical damage to other surrounding cells. Here are just three of the many studies relating to this subject:

"Cell Oxygen Levels are controlled by CO2 and breathing. Hyperventilation....causes CO2 deficiency, which leads to low cell-oxygen concentrations. Free radicals generation takes place due to cell hypoxia [low cell-oxygen concentrations]". Source: www.normalbreathing.com.

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"The mitochondria in the cells are what produce energy. But when they are unable to receive oxygen into the cells, they rely on sugar fermentation. That eventually turns the cells cancerous; then these cancerous cells produce lactic acid which infects the surrounding cells with toxins and destroy them as well. This is the basis behind the spread of cancer in the body. Cells which are receiving 35 percent less oxygen will become cancerous and start creating energy using damaging sugar fermentation. These cancerous cells stop doing anything for the body or communicating to any other part of it; they just multiply". Source: Lucille Femine, Cancer Caused by Oxygen Starvation? (October 15, 2013), www.guardianlv.com.

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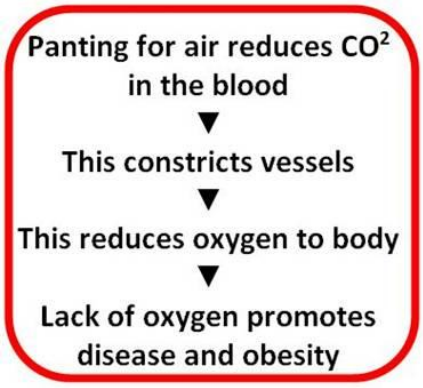
"Regular exercise workouts age you faster. Exercise produces free radicals. In small quantities your body can rid itself of free radicals and prevent excess damage. However, when you do long, extended workouts free radical damage is out of control; you'll start aging faster than you can imagine. You don't want that". Source: Steve and

Becky Holman, professional fitness coaches and fitness magazine editors, www.steveholman.com.

6. Exercise and the CO2 factor. Exercise greatly prevents fat loss by reducing CO2 exhalation.

When you become breathless through exercise you are forced to mouth breathe, either partially or entirely. As mentioned, this panting for air drastically reduces CO2 (carbon dioxide) in the blood. This constricts blood vessels which in turn reduce blood supply and hence oxygen supply to all parts of the body.



"Over-breathing sets in train a host of physiological disturbances that range from respiratory problems such as asthma, through behavioural problems due to poor oxygen delivery to the brain, to serious health problems in later life such as hypertension, panic attacks, and sleep apnoea. Professor Konstantin Buteyko clearly demonstrated these matters from his research in Russia almost half a century ago, and a remarkable American artist published a book on this subject over a century ago titled Shut Your Mouth and Save Your Life." Source: Michael Lingard, BSc DO BBEC, The Breath Connection, www.buteykokent.co.uk/blog.

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"As Mrs Michelle Obama (wife to Barak Obama) demonstrates, breathing through the nose is imperative for good heath, alertness and productivity. Conversely, mouth breathing has the opposite effect often resulting in stress, fatigue, respiratory complaints and poor concentration. Mouth breathing causes a disturbance of blood gases resulting in less oxygen been delivered to the brain". Source: Patrick Mckeown, Clinical Director of the Buteyko Clinic International, www.buteykoclinic.com/MichelleObama.php.

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It used to be thought that when you exercise and hence hyperventilate, this has the effect of increasing the respiratory rate so as to match the increased oxygen demand and increased carbon dioxide production. But many studies show this not to be so since it has been shown conclusively that hyperventilation restricts blood circulation and hence restricts oxygen supply to all parts of the body.

Worse still, regular exercise causes chronic hidden hyperventilation (CHHV). CHHV has been described as a hidden 21st century health-plague. What happens is that regular

exercise leads to a regular loss of carbon dioxide. Receptors in the brain then begin to accept this lowered carbon dioxide level as the norm and the individual's breathing is then controlled to maintain such a lowered level. This can become a serious chronic problem if there are repeated similar incidences such as regular exercise.

Note: the combination of sweating (which causes malnutrition and hence obesity) plus hyperventilation (which inhibits fat loss and causes fatigue and over-eating to replace lost energy) is devastating. This combination makes exercise a major cause of obesity.

It is commonly believed that when you exercise you burn body fat because such fat is being used up as fuel for energy or heat. And that the burnt fat is excreted or lost in sweat. In fact the myth that exercise burns body fat is just that, a myth. It is well established biologically, that exercise drains the muscles of stored energy called glycogen. As mentioned, this glycogen is replenished from the food you eat, not from stored body fat. Furthermore, no fat is lost through sweat, whether 'burnt' or not burnt.

This begs the question: when you lose weight (by whatever means), where does the lost fat go?

This question can at last be answered by science, and the answer may surprise you. When stored body fat is released by fat cells, such fat is released into the blood as triglycerides. Then, when we breathe in air, the oxygen in the air breaks down the triglycerides into atoms of carbon, hydrogen and oxygen using a process known as 'oxidation'. This oxidation is how fat cells are 'burnt' by mitochondria. This has been known to science for many years.

But the latest research is now showing exactly how those atoms of carbon, hydrogen and oxygen leave the body. Put simply, the carbon, hydrogen and oxygen atoms emanating from burnt triglycerides are converted to water and carbon dioxide (CO2). So the triglycerides that came from stored body fat end up being converted into water and CO2. The harmless water element is simply used or excreted by the body, and the CO2 is eliminated in the air that we breathe out.

In fact about 84 percent of the fat that is lost by the body is lost through CO2 exhalation. And about 16 percent of such fat is lost by being converted into water.

What's new to science is that the process of triglycerides being broken down and excreted from the body does not occur as a direct result of energy expenditure, i.e. as a result of exercise. According to the research you basically exhale 84 percent of your lost fat. The remaining 16 percent is metabolized into harmless water. Source: Ruben Meerman and Andrew Brown, '*When somebody loses weight, where does the fat go?*' BMJ 2014; 349:g7257.

Now we come to a crucial point:

We have already seen that when you become breathless this causes a dramatic reduction in CO2 in the blood and in the amount of CO2 breathed out. This reduction in CO2 constricts arteries and reduces oxygen supply to the body, and this in turn reduces the oxidation (breakdown) of tryglycerides. Any triglycerides that are not oxidized are simply put back into fat storage.

So exercise inhibits fat loss in two ways: Firstly it inhibits the oxidation and breakdown of free fatty acids and secondly it reduces the amount of CO2 breathed out which in turn reduces the amount of fat that is lost through CO2 exhalation.

On the other hand when you do physical activity that does not make you breathless (often referred to as 'moderate exercise' or 'aerobic exercise' in scientific literature), you allow full oxidation of triglycerides (because oxygen supply is not restricted) and you allow full excretion of the triglycerides in the form of CO2 exhalation. Put simply, physical activity 'burns' body fat rather than exercise.

When you see fit, slim people doing exercise, they are fit and slim ***in spite of*** doing exercise. They are fit and slim because they are young or because they follow other healthy lifestyle factors. But you are looking at people who are on the road to obesity and illness in their future lives. You are looking at people who will always be fighting a losing battle with body weight for as long as they exercise on a regular basis.

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The takeaway message: to avoid ill-health, obesity and a shortened life-span switch from exercise to physical activity.

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Hormesis Debunked

Hormesis is often referred to in the context of longevity, so no book on this subject would be complete without mentioning hormesis. In the fields of biology and medicine hormesis is defined as an adaptive response of cells and organisms to moderate (usually intermittent) stress. Examples include ischemic preconditioning, exercise, dietary energy restriction and exposures to low doses of certain phytochemicals.

In plain English, hormesis is said to be the adaptation to a stimulus or stress which in a bigger dose is toxic. This stress exposure is said to be central to, and even essential for, wellbeing. Hormesis is all about adaptive responses to stressors.

Hormesis is most widely referred to in the toxicology field where investigators use it to describe a dose response with a low dose stimulation (or beneficial effect) and a high dose inhibitory or toxic effect. The response of the cell or organism to the low dose of the toxin is considered an adaptive compensatory process following an initial disruption in homeostasis. Thus, a short working definition of hormesis is: a process in which exposure to a low dose of a chemical agent or environmental factor that is damaging at higher doses induces an adaptive beneficial effect on the cell or organism.

The problem with hormesis is that it attempts to apply a universal premise to different types of phenomena. For example, when you stress your legs through physical activity, the hormesis premise is that the stress imposed on the bones may be tiring and may even hurt, but when repeated long term the bones will become stronger.

In reality, the leg bones in this example become stronger because of microfractures, not because of some universal underlying hormesis effect. When you move or exercise or stress the muscles, this creates microfractures on the surface of the bones that are filled in with new bone material (calcium influx); so over time the bones become stronger/denser. Similarly, the movement of muscles creates microscopic tears which get repaired with new protein, thus strengthening the muscles.

Your legs become stronger as a result of a specific cause-and-effect, not because of any underlying 'hormesis' effect common to various types of phenomena.

Here's another example. One of the most widely studied types of experimental hormesis, called preconditioning ischemia (cutting off the blood supply), occurs when an organ such as the heart or brain is subjected to brief mild ischemia. Having been exposed to the mild ischemia, the cells are said to become resistant to being killed by a full-blown heart attack or stroke.

When blood supply is briefly cut off from a cell it forces the cell to 'defend' itself, i.e. to adapt or die. As a consequence, the cell undergoes small molecular changes so as to survive the temporary lack of blood supply. When blood supply is resumed, those molecular changes stay changed so that next time it will be more resistant to a sudden lack of blood. The point here is that a specific biological cause-and-effect is responsible for the molecular change in the cell (there is no mysterious universal underlying hormesis effect in play).

Clearly, the term 'hormesis' may be used to describe a specific scientific cause-and-effect. But to imply that there is some kind of underlying 'hormetic' force of nature common to different phenomena is sheer bunkum and even dangerous to expostulate.

For example, it is argued by some that hormesis can protect you against harmful radiation. The reasoning is that small doses of radiation strengthen the body against the harm caused by higher doses of radiation. This of course is nonsense, and the theory of hormesis in regard to radiation has been fully debunked.

“From an evolutionary point of view, from a fundamental genetics point of view, it [hormesis] makes no sense… Our genetic systems have been refined and optimized… the truth is most mutations that occur in all organisms either have no effect because of the redundancy in the basic genetic code, or they have a slightly deleterious effect“. Source: Dr. Timothy Mousseau, professor of biological sciences, University of South Carolina, USA.

Dr. John Peterson Myers, CEO of Environmental Health Sciences and co-author of 'Our Stolen Future' rightly argues that hormesis is a flawed (and dangerous) theory. He states:

"A researcher from the University of Massachusetts, Edward Calabrese, has been promoting the theory of hormesis, saying that chemicals with harmful effects at high doses can have beneficial effects at low doses. He then argues that this means health standards can be relaxed because if low doses are beneficial, then there is no need to achieve stringent cleanup standards...Traditional high dose testing will miss many low dose adverse effects. Calabrese's recommendations that clean-up standards be relaxed are dangerous".

It could well be that a given phenomenon shows a precise dose-response curve, i.e. that harmful effects are reduced by first giving small doses. But such 'strengthening' will be due to the cause-and-effect applicable to that particular phenomenon, not to some universal underlying hormesis effect.

To argue that as a general rule a small dose of a poison or stressor is good for you because it 'strengthens' you is absurd. Hormesis is based on the same principles as homeopathy, a pseudoscience that is incorrectly presented as scientific.

Homeopathy is based on treating 'like-cures with like treatments' by repeatedly diluting them in water. Modern homeopaths believe that this 'potentiating' process allows the water to retain the 'memory' or 'vibrations' of the original substance, long after it has been diluted away to virtually nothing. Of course, there is no good scientific evidence to suggest that water has such properties, nor any indication of how it might be able to use this 'memory' to cure a sick patient.

"Homeopathic preparations are not effective for treating any condition" (Wikipedia).

Continued homeopathic practice, despite the evidence that it does not work, has been criticized as unethical and even dangerous because it discourages the use of effective treatments. If you are not convinced that homeopathy is complete nonsense, you are

urged to see an excellent youtube video on the subject at: https://youtu.be/E0-NaImRSl8 (Homeopathy - con or cure).

Hormesis springs from homeopathy: they both contend that tiny doses of a particular chemical can cause a greater biological response than small or moderate doses. "Hormesis, while stemming from within the rationalist tradition, has yet to be explained according to current pharmacological theory. Both [homeopathy and hormesis] share in common sub-threshold doses of toxic substances and an initial semi-toxicological insult followed by a greater compensatory (or healing) response. We question whether the differences between these fields may be amenable to scientific research". Source: Oberbaum M, et al, Hormesis and homeopathy: bridge over troubled waters, Hum Exp Toxicol. 2010 Jul; 29 (7):567-71.

Coming back to the theme of this book, some people have tried to argue that hormesis promotes longevity. That minor stresses (including weak oxidative stress, heat shock, cold shock, hypoxia, etc) can extend lifespan.

The generally accepted view is that aging is a decline and deterioration due to an accumulation of random molecular and cellular damage caused by free radicals (particularly ROS free radicals), radiation, stresses, pathogens, toxins, carcinogens, mistakes in replication/translation, protein misfolding and other causes. **Note:** the subject of ROS free radicals is examined in the chapter 'Live Longer By Reducing Glycation').

The hormesis view is that aging is indeed caused by these factors, except that increased doses of ROS free radicals increases resistance to ROS, thus extending lifespan. More specifically, those who advocate hormesis argue that ROS leads to a condition of mild stress, which in turn enhances vitality by increasing oxidative stress resistance, cumulating in extension of lifespan.

The problem with this hormesis argument is that it is paradoxical to decrease damage by causing damage. There is no similar example in medicine. If one wishes to prevent stroke due to high blood pressure, one needs to decrease blood pressure not to increase it. Examples are endless including weight control to prevent diabetes and quitting smoking to prevent lung cancer. No one will advocate “mild and repeated” smoking to prevent lung cancer even though it might activate the defences.

Furthermore, cell DNA damage caused by ROS is not reversible (the cell affected does not recover), so it is difficult to see how these damaged cells can become more resistant to ROS unless they somehow procreate undamaged cells or transfer greater resistibility to undamaged cells - very unlikely and not proven.

The point here is that ROS, smoking and radioactivity all precipitate irreversible DNA cellular damage which in turn promotes cancer. It is well established scientifically that DNA cellular damage is a cause of aging. Given this, it cannot also be argued that small doses of DNA damage act to delay aging through some kind of hormetic effect.

Here is a 2010 study that supports the theory of hormesis (and is often quoted by hormesis advocates):

"The findings discussed in this review indicate that ROS free radicals are essential signalling molecules which are required to promote health and longevity. Hence, the concept of mitochondria hormesis provides a common mechanistic denominator for the physiological effects of physical exercise, reduced calorie uptake, glucose restriction, and possibly beyond". Source: Michael Ristow, et al, How increased oxidative stress promotes longevity and metabolic health: The concept of mitochondrial hormesis (mitohormesis), Experimental Gerontology 45 (2010) 410–418.

This Ristow review looked at the so-called hormetic effects relating to exercise, calorie restriction and glucose restriction. Here is a summary of the findings.

Physical exercise

The Ristow review states that longevity-promoting physical exercise induces mitochondrial metabolism and ROS formation. Although "*Longevity-promoting physical exercise*" is not defined precisely, it is nevertheless concluded that such exercise *"results in increased mitochondrial metabolism and ROS formation, inducing an adaptive response that culminates in increased stress resistance, antioxidant defence and extended lifespan"*. In other words, that exercise increases mitochondria energy production (this is a given as a result of energy expenditure) and that such energy production increases the formation of ROS free radicals (also a given). This increased ROS formation is said to have a hormetic effect on body cells, making them more resistant to damage, thus extending lifespan.

There are no peer-reviewed credible studies specifically showing that an increase in ROS free radicals in humans has the effect of making body cells more resistant to damage and hence extending lifespan. On the contrary, the research clearly shows that increased ROS formation causes cellular damage and can shorten lifespan by increasing the risk of cancer.

"Under oxidative stress conditions, excessive ROS can damage cellular proteins, lipids and DNA, leading to fatal lesions in cell that contribute to carcinogenesis" (Wikipedia). Note that breathless/sweaty exercise causes oxidative stress as explained in other parts of this book. Hence, such exercise is particularly conducive to increased ROS formation and a shorter lifespan.

To conclude that a hormetic effect (the exercise) extends life by increasing ROS formation (thus increasing cell resistance against ROS damage) is contradictory and goes against the scientific research in this area.

Calorie restriction (CR)

The Ristow review readily admits that "*unequivocal evidence for the effectiveness of CR in primates and especially humans is missing*". It is argued that CR promotes increased stress defences against ROS free radicals by making cells more resistant to damage. In other words, by following a low calorie diet it is thought that this makes cells more resistant to DNA damage. The study attributes this effect to hormesis. In other words, that the stress of eating less food (the stress of hunger) somehow makes the body more resistant to ROS).

However, it is more likely that any observed benefits of a CR diet come from a lower consumption of fructose, and hence a lower production of ROS, which in turn can result in less free radical damage and a longer lifespan.

Glucose

The Ristow review concluded that increased intracellular glucose availability exerts detrimental effects on longevity, whereas decreased glucose availability promotes oxidative metabolism and extends lifespan. Other studies also show this to be the case. It is now known that mitochondria not only “feel” the change in circulating glucose levels, they also make adaptive changes crucial to the body’s ability to handle sugar in the blood.

But there is no mysterious hormetic effect at play here; it is simply that mitochondria are very sensitive to circulating glucose molecules in the blood, and it is reasonable to think that this affects how mitochondria react. The way that glucose can overwhelm mitochondria is well known to science. See for example a study titled *"Chronically elevated glucose compromises myocardial mitochondrial DNA integrity by alteration of mitochondrial topoisomerase function"* (S. Medikayala, et al).

To argue that restricting glucose can extend life by having some kind of universal hormetic effect on mitochondria is disingenuous to say the least. In reality it is nothing more than a straight-forward proven biological cause-and-effect phenomenon.

Hormesis is also put forward by those who believe that hot saunas and cold water plunges have a common hormesis denominator that can promote longevity and good health. The idea is that temperature shocks to the body can elicit a beneficial response that protects against illness and disease (that it 'toughens' the body). The evidence for this is both weak and scarce to say the least.

However, even if an ice-bath is shown to be healthy it does not prove any kind of underlying hormetic effect common to other phenomena. For example, it is argued that ice bathing is shown to increase oxidative stress markers in swimmers, and that this increases the body's natural production of antioxidant protection. And that this in turn increases the body's anti-tumor immunity.

Some research shows this to be so. "Changes in uric acid and glutathione levels during ice-bathing suggest that the intensive voluntary short-term cold exposure of winter swimming produces oxidative stress....The repeated oxidative stress in winter swimmers results in improved antioxidative adaptation". Source: Siems WG, et al, Improved antioxidative protection in winter swimmers, QJM. 1999 Apr; 92(4):193-8.

The adaptive response in this study may well be so, but it occurs as a result of a ***scientifically explained cause-and-effect***. The cause is the repeated ice bathing, the effect is the body's adaptation to the cold shock by incorporating changes in uric acid and glutathione levels. The study did not look at whether long term ice bathing is detrimental to health in other ways. Nor did it consider whether winter bathers are more health-conscious than the population at large, and hence more likely to enjoy better health.

Similarly, it is argued by hormesis advocates that extreme heat stress (such as a sauna) helps activate genes that are important for optimizing heat shock proteins (HSP) inside your cells. The heat itself is said to be a stressor on the body that creates reactive oxygen species (ROS). These ROS then act as a signalling molecule to make more mitochondria and hence boost good health.

However, there is no credible peer-reviewed research specifically showing this to be so. In fact, the evidence that regular sauna bathing is beneficial is scarce. Most research indicates that sauna bathing is, if anything, detrimental and should be avoided by the infirm, children, the elderly, pregnant women, people with high blood pressure or a heart condition, etc.

About the only study in favour of sauna-bathing concluded that *"Increased frequency of sauna bathing is associated with a reduced risk of SCD, CHD, CVD, and all-cause mortality. Further studies are warranted to establish the potential mechanism that links sauna bathing and cardiovascular health".* Source: Tanjaniina Laukkanen, MSc, et al, Association Between Sauna Bathing and Fatal Cardiovascular and All-Cause Mortality Events, JAMA Intern Med. 2015; 175(4):542-548.

This Laukkanen study is full of confounders, and the study readily admits that "the potential for residual confounding remains". Here are some of the confounders:

1. Only men were studied, so it is not known whether the same 'beneficial' effects also apply to women.
2. No controls were used in the study. In the follow-up period, the sauna bathers were compared with the population at large, using records obtained from hospital documents, health center wards, and death certificates. It is not known whether such deaths applied to sauna bathers or non-sauna bathers, whether they smoked, etc.
3. The study excluded participants who died in the first 5 years of follow-up, thus greatly skewing the statistical data in relation of all-cause-mortality reduction.
4. It is well established that sauna bathers are more health-conscious than non-sauna bathers, and hence more likely to enjoy better health as a result of lifestyle factors rather than sauna-bathing per se. Furthermore, it is known that when you know you are part of a health-related study you are more likely to look after your health; this can greatly confound the study's conclusions particularly when the comparison is made against people unrelated to the study.
5. The study was solely focused on Finland where the use of saunas is very high (at least once a week in the general population) compared to other countries. Yet life expectancy in Finland is mediocre compared to other countries. Finland is ranked 42 (source: USA 2012 CIA list), with a life expectancy much worse than countries like Greece, Spain and Italy where the incidence of smoking for example is much higher.
6. Over the 10-year period of the study no comparison was done between sauna bathers and non-sauna bathers from a similar cohort (i.e. the same age, economic status, etc).

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"There's no hard data to suggest that the use of saunas or hot tubs has any bearing on your overall health". Source: Dr. Thomas Allison, M.D. an exercise physiologist at the Mayo Clinic in Rochester, Minn.

The bottom line on saunas is that they should be avoided for the simple reason that they make you sweat out a rich mix of minerals and water-soluble vitamins. You are urged to see the following video on this subject, titled "*Why athletes die young with Dr. Joel Wallach*" published in November, 2015:

To summarize, the hormesis claim is that heat-shock and cold-shock improve health and longevity by making the body more resistant to damage caused by ROS free radicals. This could well be, but such effects are likely to be due to straightforward cause and effects, rather than some kind of underlying hormetic law of nature.

It should be noted that a brisk walk provides the same kind of health & longevity benefits as those claimed by heat-shock and cold-shock advocates. In fact, there are hundreds of studies clearly showing how physical activity promotes many health benefits, including greater resistant against free radical damage. Here are just two such studies from the many:

"The biological link between exercise and coronary heart disease protection has been attributed to improved antioxidative protection, changes in mitochondrial metabolism, favorable lipid changes (increase high-density lipoprotein, decrease low-density lipoprotein), and control of known atherosclerotic risk factors". Source: Sunny Intwala, MD, et al, Physical Activity in the Prevention of Heart Failure, Circulation, 2015; 132: 1777-1779.

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"Thus ROS free radicals act as signals in exercise [and] result in an upregulation of powerful antioxidant enzymes.... exercise itself can be considered an antioxidant". Gomez-Cabrera MC, et al, Moderate exercise is an antioxidant: upregulation of antioxidant genes by training, Free Radic Biol Med. 2008 Jan 15; 44(2):126-31.

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Note that the term 'exercise' in the above two studies refers to 'moderate exercise' (i.e. physical activity that is not intense or exhausting). Other research shows that intense exercise produces ROS free radical damage that ages the body and shortens life.

So as with most thing in life, physical exertion needs to be ***just enough*** (not too much and not too little). How do you gage what is "just enough"? You simply become physically active in your daily life and avoid breathless/sweaty exercise.

In the context of good health, there is nothing offered by heat & cold shocks that is not offered by a brisk walk. Given the doubtful, limited and risky health-benefits offered by heat & cold shock treatments, and given the many health-benefits offered for example by walking, you have to ask yourself whether any kind of heat & cold shock treatment is worthwhile.

You also have to ask yourself whether there is an unconscious element of masochism at play in those who fervently promote hormesis as some kind of universal panacea. When you read comments like *"Hormesis is a process through which moderate stress induces a body response that is protective against insults, confers health and possibly even longevity benefits"*, you are reading about a process that does not exist

To summarize, there are no universal underlying mechanisms behind hormesis. There is no mysterious force at play, yet to be discovered. The term 'hormetic effect' should only be used (if at all) to refer to a specific cause-and-effect; do not fall into the trap of thinking it is some kind of universal law of nature as this leads to misdiagnosis and dangerous conclusions.

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The takeaway message: do not deceive yourself about hormesis. There is no hormetic law of nature at play. Instead, focus your understanding on the particular cause-and-effect of the phenomenon or issue of interest. Avoid heat-shock and cold-shock treatments.

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The Biggest Hidden Cause of Aging

In this book we have looked at various causes of aging and longevity, and we see that by far the best way to extend life is to optimize health.

And the best way to optimize health is to follow a healthy diet, follow a healthy lifestyle (physical activity, sleep well, social support, avoid stress, etc), and avoid polluting your body with smoke, drugs, traffic pollution, alcohol, etc.

An examination of the socio-economic aspects of aging and longevity is beyond the scope of this book, but the three aforementioned factors (diet, lifestyle, pollution) all point to a common cause of aging: the deterioration/failure of biological systems in the body.

A healthy diet will do more than anything else to keep you healthy and extend lifespan. A healthy diet equips the body to fight off illness and minimize the failure of biological systems. More specifically, a healthy diet greatly protects body organs and muscle tissue from deteriorating.

As you age you lose muscle. Remember that all our organs (including the heart) have muscles, so we're not just talking about arm and leg muscles. When you lose muscle as a result of aging, ***every organ*** in your body suffers, and just about every aspect of your health is affected, making you much more prone to illness and premature death.

One of the best yet 'hidden' ways to optimize your health is to minimize muscle-loss throughout your life. ***But how do you do this?*** Conventional advice tells you to do muscle-strengthening activity and eat more protein.

Lifting weights, push-ups, squats, etc. can be good for general health, and may strengthen your arm and leg muscles if persevered with. But such activities have little or no effect on the many organ muscles throughout your body.

Equally, eating more protein has little effect (if any) on your muscles. This is so because of the following reasons:

1. Virtually none of the protein you eat ends up fortifying your muscles. Protein is very much a building block for our muscles, bones, cartilage, skin, hair, and blood. The body makes its own protein from a 'pool' of amino acids that is always maintained. It is these amino acids that provide protein for all the cells in the body, including muscle cells.

Some of the amino acids derived from the diet do go into this pool of amino acids maintained by the body. But many amino acids from the diet are excreted since they are surplus to requirements.

2. Amino acids are shared around the body to all our cells, not just to muscle cells. So our muscle cells receive a tiny portion of the amino acids shared around the body.

3. Muscles are made of muscle cells. And muscle cells are made of strings of amino acids that we call protein or protein fibres. Muscle cells don't divide or multiply. So whatever muscle cells you are born with you won't get any more and you're stuck with them for life. Muscles grow stronger when muscle cells acquire more strings of amino acids, i.e. more protein. With regular physical activity that puts a greater stress on the muscles than what they are used to, the muscles can be made stronger (or be prevented from becoming weaker).

But much research shows that the effect of exercising specific muscles is very marginal, and to be effective such exercise must be consistent and long-term to have any significant effect. Furthermore, such exercise has virtually no effect on organ muscles.

"Rapid muscle growth is unlikely with exercise. It takes time and is relatively slow for the majority of people." Source: How Do Muscles Grow? The Science of Muscle Growth, March 2016, www.builtlean.com.

4. The body cannot put amino acids into your muscles unless such muscles are stressed through regular strength-training activity. This creates microscopic tears in the muscles that are then filled with new protein, causing such muscles to become bigger or stronger. Hence, eating more protein without such strenuous long-term physical activity will have no effect on your muscles.

When we talk about 'losing muscle' we don't lose muscle cells as such, we only lose chains of amino acids inside the muscles, making the muscles thinner.

The point here is that exercise and protein consumption have a minimal effect on our arm and leg muscles, and probably no effect on our many organ muscles.

The argument in favour eating more protein to strengthen muscles usually goes like this:

"Exercise burns muscle by oxidizing amino acids. Therefore, a slight increase in protein intake may be beneficial to endurance athletes by replacing the protein lost in energy expenditure and protein lost in repairing muscles".

The reality is more like this:

"Exercise does not burn muscle by oxidizing amino acids. Exercise drains the muscles of energy - such energy is not replenished from muscle protein or from body fat. Muscle energy is replenished from the food you eat. A slight increase in protein intake does not

benefit endurance athletes by replacing the protein lost in energy expenditure (this is biologically incorrect). We do indeed need protein from the diet as this provides the body with essential amino acids that enable the body to maintain a pool of amino acids that are fed to all our body cells, including the maintenance and repair of muscles".

If exercise and protein consumption does so little for our leg and arm muscles (and virtually nothing for our organ muscles), what is the solution? How can we at the very least minimize the gradual loss of muscle as we grow older? How can we best protect our organ muscles? These questions are fully answered in what follows.

With the passage of time we gradually lose muscle which not only affects our arms and legs, it affects ***all our organs,*** including heart muscle. General muscle loss is a principle cause of age-related illness and a shortened lifespan. By minimizing muscle loss throughout life we can greatly optimize health and live a longer and better life. In brief, weak organs caused by muscle deterioration is a major cause of premature death.

But when we talk about protecting our muscles we are not talking about any kind of body-building activity or acquiring bulging muscles. Here we are just talking about minimizing the gradual erosion of our muscles as we grow older. You will be pleased to know that there is an easy and simple way to do this which can be summed up in two words: minimize gluconeogenesis.

By simply minimizing gluconeogenesis in your life you will greatly minimize muscle loss more than anything else you could do. Gluconeogenesis is defined by Wikipedia as follows:

"Gluconeogenesis is a metabolic pathway that results in the generation of glucose from certain non-carbohydrate carbon substrates. These substrates include amino acids, glycerol, pyruvate and lactate".

Put simply, gluconeogenesis is a biological process in which our bodies make glucose when there is insufficient glucose from the diet. Our blood stream must always carry a certain level of glucose ***at all times*** or we will die. Our brain, nervous system, red blood cells and other parts of the body totally depend on a continuous supply of glucose from the blood.

So when we eat insufficient carbohydrates (and when we sleep), our blood glucose level goes down below the norm. This compels the body to make its own glucose so as to push up the level of blood glucose. To do this the body strips amino acids from muscle tissue. Then like an alchemist, the 'cannibalized' amino acids are mixed with other ingredients found inside the body and the end result is much needed 'home made' glucose.

When gluconeogenesis ensues, it mainly strips protein (amino acids) from skeletal muscle. But it also strips protein from organ muscle, albeit at a lower rate. Just about any organ (including the heart) can be affected by gluconeogenesis.

"A catabolic or tissue breakdown state [i.e. gluconeogenesis] can affect any organ or body system, depending on one's particular weaknesses. For example, if excessive tissue breakdown occurs in the joints, the result may be painful joints or arthritis. If

excessive tissue breakdown occurs in the stomach, the result may be an ulcer. If it is in the heart muscle, cardiomyopathy can result. Similarly, tissue breakdown can affect any organ or system". Source: Protein Catabolism, Analytical Research Labs, www.arltma.com.

By understanding that gluconeogenesis is triggered by low blood glucose, we can appreciate why we lose muscle at night when we sleep rather than during waking hours. It happens because in the absence of food during the night our blood glucose goes down, thus triggering gluconeogenesis. This is perfectly normal and this is how we gradually lose muscle as we age.

Within a few hours of sleeping the liver is almost depleted of its glycogen stores as the central nervous system (and in particular the brain), has a great demand for glucose as an energy source.

As the night progresses towards the end of the sleep, insulin and glucose levels drop to their lowest and gluconeogenesis is in full swing.

The Big Body-Building Myth

The myth: to build strong muscles you should eat plenty of protein as this fortifies muscles, provides energy, and prevents muscle loss.

The reality: to build strong muscles you should minimize gluconeogenesis by eating plenty of non-processed carbs. Do not over-eat protein as it does not fortify muscles, or provide energy or prevent muscle loss.

The fact is that dietary protein in whatever form does not provide energy or convert into glucose unless it is processed through gluconeogenesis. In other words, the protein you eat must first end up as amino acids stored inside muscle tissue. And then such protein must be stripped from the muscles and be mixed with other ingredients (using a process known as gluconeogenesis) to form glucose that can be used as energy.

Even then, the amount of glucose that is made available to muscles through gluconeogenesis is negligible because such glucose is mostly used up in more urgent requirements (the brain, the nervous system, etc) before getting to the muscles.

"Virtually none of the glucose produced from gluconeogenesis enters into the general blood circulation [for feeding to the muscles, whether or not you are diabetic]*"*. Source: Marion J. Franz, MS, RD, LD, CDE, et al, Protein Controversies in Diabetes, Diabetes Spectrum, Volume 13 Number 3, 2000, Page 132.

So when body builders are told to eat protein for energy they are being deluded, usually by those with an interest in peddling protein supplements. As explained in the chapter "The Protein Myth", the over consumption of protein has been shown to be bad for your liver and kidneys, it promotes vitamin and mineral deficiencies, and it is linked to osteoporosis and some forms of cancer. For optimum health we should, if anything, ***reduce*** protein consumption because we need very little. If you are not entirely convinced about this please click the image below to see a You Tube video on the subject:

What about protein preventing muscle loss? The theory is that bedtime snacks should always contain protein as it will be converted to blood glucose more slowly than carbohydrates and will keep blood glucose levels from dropping too low during the night. This is sheer bunkum. Here is why.

As already explained, dietary protein does not convert to blood glucose at all, unless it is through gluconeogenesis. Hence, dietary protein does nothing for keeping blood glucose levels from dropping too low, and it does nothing for minimizing muscle loss.

Gluconeogenesis actually occurs constantly in the background day and night, but it increases in intensity when blood glucose levels drop. So when we talk about minimizing gluconeogenesis, we are in fact talking about minimizing the intensity of gluconeogenesis as this minimizes the intensity of muscle loss. The role of gluconeogenesis is to act as an emergency so as to prevent blood glucose going below the norm.

In medical terms being in a state of gluconeogenesis is sometimes referred to as being in a 'catabolic state'. This is a well studied subject because of the plague of diabetes in the world and because of the huge body-building and sports industries.

In these industries, the usual advice is to eat a lot of protein and carbohydrates so as to avoid a catabolic state and hence avoid muscle loss. But this is bad advice because a quick carb fix such as a sugary food or a sports drink gives you a glucose & insulin spike, which is bad for health. And as we have seen, eating more protein (in whatever form) can be unhealthy and does little for preventing muscle loss.

But if we can minimize the incidence of gluconeogenesis in our life we have a powerful way of minimizing muscle loss throughout our body. Our objective then is to minimize the incidence of gluconeogenesis in our day-to-day life without causing glucose/insulin spikes and without resorting to unhealthy amounts of protein consumption.

In a previous chapter it was explained that all forms of exercise should be avoided for a variety of reasons. Yet another reason for avoiding exercise is that it triggers gluconeogenesis. Exercise has the effect of quickly draining the muscles of glycogen and hence leaving you drained of energy. When you eventually eat, the lost glycogen will be replenished from the food you eat (not from stored body fat). And if you fail to eat sufficient carbs having drained your muscles of energy, the body will be forced to make

its own glucose by triggering gluconeogenesis and stripping protein from your muscles. In fact, the quickest way to weaken your muscles is to fast, to go on a low-carb diet, or to exercise and not eat.

"In the absence of adequate carbohydrate for fuel, the body initially uses protein [from] muscle…. the initial phase of muscle depletion is rapid, caused by the use of easily accessed muscle protein for direct metabolism or for conversion to glucose (gluconeogenesis) for fuel.

Loss of muscle causes a decrease in your basal metabolic rate (metabolism). Metabolism happens in the muscle. Less muscle and muscle tone means a slower metabolism which means fewer calories burned 24 hours-a-day. The percentage of people that re-gain the weight they've lost with most methods of weight loss is high. A loss of muscle during the process of losing weight is almost a guarantee for re-gaining the lost weight, and more". Source: MaryAnn Koval (Registered Nurse), article on ketosis posted in Feb. 2006 at www.doctorslounge.com.

Another tip for minimizing gluconeogenesis relates to the number of meals consumed each day. It is better to eat, say, six small meals rather than three large meals a day.

Grazing is the way our body has evolved to eat. Large meals burden the digestive system, often causing bloating and lowered energy while the body struggles to digest the food.

By eating smaller meals you avoid digestive disorders and loss of energy, and the body functions more efficiently throughout the day. When we eat a big meal, the sugar level in our blood rises, but once that meal is digested that blood sugar level falls below the norm, taking your energy and mood with it (and triggering gluconeogenesis).

The problem is that the bigger the meal, the bigger the blood glucose crash - and the higher your need for sugary snacks to refuel your body. This explains why fewer larger meals rev up the incidence of gluconeogenesis and muscle loss.

The regular influx of food with a little-and-often approach keeps your energy level stable and makes it easier for you to cope with your day-to-day living. Such an eating pattern is less fattening because energy levels are sustained, there is no blood glucose crash, and you are less likely to fall prey to fattening foods. But you do need to plan your meals more carefully so as to avoid junk food, and sometimes eat on the go depending on your job and daily activities. Nutritious and healthy snacks can easily be prepared at home and be stored in the refrigerator or freezer for gradually consuming during the week.

According to the Medical Research Council's Human Nutrition unit, measurements of fatty acids in the blood also remain stable when you eat little and often. This prevents peaks and troughs in blood lipids which in turn reduces the risk of heart disease and stroke.

Finally, done properly, the little-and-often approach makes it easier to get all the nutrients you need, giving you better overall nutrition; and a bonus is that by avoiding a large meal before bedtime you will sleep much better.

"When we studied eating patterns, we found that regular grazers actually had healthier diets than those eating the traditional three square meals a day approach. They ate less fat, more carbohydrates and more fruit and vegetables. Other studies have found grazers to have higher levels of vitamin C and other nutrients - they also tend to have lower levels of body fat". Source: Dr. Sandra Drummond, Senior Lecturer in Nutrition, Queen Margaret University, Edinburgh, UK.

Unfortunately, once you lose muscle it is not easily re-gained (if at all). It is easy to lose muscle but not so easy to add muscle. You would need to follow rigorous muscle workout routines that are strenuous and long-term if you want to strengthen your muscles more than they already are. Those bulging muscles that you see in body builders are not gained just from work-out routines, they are mostly gained with steroids, and you are urged to not follow suit!

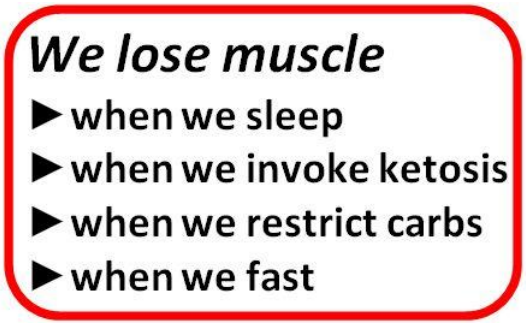
The best advice is to minimize muscle loss by minimizing gluconeogenesis. This is much more practical and effective than trying to increase muscle mass through exercise. However, that is not say you shouldn't do muscle-strengthening workouts. Ideally you should do both: minimize gluconeogenesis and be physically active in every way you can without resorting to harmful sweaty/breathless exercise.

As mentioned and to summarize, the body must always maintain a minimum level of glucose circulating in the blood, so gluconeogenesis is an emergency measure to keep glucose available to the brain and the body. It's an emergency because the body cannot immediately start to use fat for fuelling our muscles and physical movement.

Fat burning that ***replaces glucose burning*** in the muscles takes a long time to slowly ramp up (several days), but the body and brain cannot wait so in the absence of sufficient glucose from food the body is forced to use gluconeogenesis to make new glucose from compounds found inside the body. In effect, the body is forced to cannibalize itself by stripping (consuming) protein from muscles, including heart and organ muscles. Over time this can seriously weaken and damage your muscles and organs. You always want to minimize gluconeogenesis in your life.

Incidentally, you should never contemplate any kind of low-carb or ketogenic diet (or fasting regime) as this greatly increases gluconeogenesis and muscle loss.

"A ketogenic diet reduces muscle gain or promotes muscle loss. Studies in children on ketogenic diets have shown that they experience growth impairments in height and mass. Ketogenic dieting is counterproductive. Muscle loss is too high a price to pay for reduced fat". Source: Abridged extract, Team MD, Ketogenic Diets Cause Muscle Loss, www.musculardevelopment.com.



How can we minimize the incidence of gluconeogenesis in our lives? We can do it by following a high carbohydrate diet that excludes sugary foods and processed carbs. Put another way, we should eat plenty of high-carb foods that do not cause glucose spikes, and we should avoid those foods that do cause glucose spikes.

Non-processed carb foods such as lentils, yams, sweet potatoes, beans and many other legumes and starchy vegetables offer super-healthy nutrition that provide sustained energy without making you fat. Best of all, these foods trickle-feed glucose into the blood without making glucose or insulin shoot up. These super-foods should form the bulk of your diet. They minimize gluconeogenesis and protect your muscles, and in so doing they protect all your organs.

A diet high in non-processed carbs truly is a principal way to optimize health and extend lifespan. Your last meal at night should include a non-processed carb food so as to minimize gluconeogenesis while you sleep. And your breakfast should include at least one whole fruit (chewed well) as this stops gluconeogenesis from the night's sleep.

Do not delay breakfast thinking that this is healthy or that it will help you lose weight. When you get up you're in a state of gluconeogenesis, so the sooner you have breakfast the better. Those who promote intermittent fasting by abstaining from breakfast are risking regular and significant muscle loss.

To summarize, you should in general minimize gluconeogenesis in your life so as to minimize muscle loss and protect your organs. This is a principle way of optimizing your health and extending lifespan. You do this as follows:

1. Make non-processed carb foods the bulk of your diet. Include plenty of legumes and starchy vegetables in your meals. They are non-fattening, they provide sustained energy and they minimize gluconeogenesis.
2. In particular, make sure that your last meal of the day is high in non-processed carbs.
3. Your first meal of the day (breakfast) should include fresh whole fruit, eaten in moderation and chewed very well. This provides the body with glucose to halt gluconeogenesis without making your glucose level shoot up. Combine this with a little protein such as an egg, a lump of cheese or some lentils or beans. Protein helps fill you up and stave off hunger.
4. Avoid sugary foods and processed carbs as they make blood glucose shoot up and this triggers an insulin response. This is very unhealthy and increases the risk of diabetes.

5. Avoid low-carb and ketogenic diets (and fasting regimes of any kind) as they are unhealthy for many reasons, and in particular they greatly increase gluconeogenesis and muscle loss.

6. Several small meals/snacks during the day are better than fewer large meals. For example, six small meals will be healthier than three large meals. This is much better for health generally and greatly minimizes gluconeogenesis.

*****

The takeaway message: minimize gluconeogenesis in your life by following a high-carb diet that avoids sugary foods and processed carbs. This greatly protects your muscles and organs.

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Putting it all together

Each chapter in this book finishes with a takeaway message. Here they are listed together:

1. It is never too late to improve your health and extend your lifespan. The sooner you start the better. The key to longevity is to avoid chronic inflammation.

2. Much longevity advice is useless or false.

3. Avoid low-calorie diets, they are counter-productive, they make you ill and they don't help you lose weight or live longer.

4. Avoid meat, poultry, fish, and seafood because animal protein promotes bad health and shortens life. For optimum health follow a high-carb, high-fat, high-calorie diet as explained in this book.

5. Follow a high-fat diet for optimum health and longevity, but avoid unhealthy fats (know the difference).

6. Preserving the finite telomere capacity of the body is the key to staying healthy and living longer. This is not beyond our control. We do it by minimizing oxidative stress and glycation.

7. Avoid oxidative stress in your body so as to be healthy and live longer. Limit nutritional supplements to vitamins D, K2 and B12 unless other supplements medically prescribed.

8. Avoid glycation by minimizing or avoiding fructose consumption and by avoiding harmful lifestyle factors such as smoking and alcohol that also promote glycation.

9. Avoid all kinds of added sugars and sweeteners for optimum health and longevity. If you absolutely must use an added sweetener, use just a little pure glucose, but not enough to make your blood glucose shoot up. Remain as insulin sensitive as possible throughout life.

10. To avoid ill-health, obesity and a shortened life-span switch from exercise to physical activity.

11. Do not deceive yourself about hormesis. There is no hormetic law of nature at play. Instead, focus your understanding on the particular cause-and-effect of the phenomena or issue of interest. Avoid heat-shock and cold-shock treatments.

12. Minimize gluconeogenesis in your life by following a high-carb diet that avoids sugary foods and processed carbs. This greatly protects your muscles and organs.

*

Here are the top ten tips for optimal health and longevity (not in any particular order of importance). Note that the advice overlaps in some cases.

1. Healthy diet: Follow a diet that gives you optimum health and longevity, and keeps you slim. See our sister book The Lipo Diet for more information.

2. Avoid animal protein: meat, fish and seafood should be avoided as they promote bad health and obesity. See our sister book The Fish Oil Myth for more information.

3. Avoid nutritional supplements: sometimes a doctor may prescribe nutritional supplements to meet a specific medical need, and this is fine. But in general avoid all vitamin and mineral pills, particularly antioxidants A, C, and E. Also avoid Omega-3 and fish oil supplements. The exceptions are vitamin supplements B12, D3 and K2 which should be taken daily as advised on the label.

4. Avoid pollutants: avoid polluting your body with cigarette smoke, alcohol, drug abuse, air pollutants, pesticides, environmental toxins, and junk food.

5. Avoid oxidative stress: follow a healthy diet, avoid exercise in favour of physical activity, avoid harmful stress, and avoid pollutants (smoking, alcohol, environmental pollution, etc).

6. Avoid glycation: avoid unbound fructose in foods and drinks, and minimize foods that make your blood glucose shoot up such as sugary foods and processed carbs.

7. Avoid exercise: avoid all kinds of exercise that make you sweat or pant for air, and switch instead to physical activity for optimum health and longevity. See our sister book Why You Should Avoid Exercise.

8. Avoid obesity: follow a healthy diet, avoid junk food, and avoid all forms of exercise as they are fattening.

9. Sleep well: get enough daily sleep as this is vital for good health and longevity.

10. Make a plan: be proactive about improving your health, make a plan (a daily routine) tailored to your circumstances, then revise and tweak your plan on a regular basis. For example, plan how to minimize gluconeogenesis by eating more small meals instead of fewer large meals.

(Please see '***The Next Step'*** that follows)

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The Next Step

Join our mailing list

By simply reading this book you've taken a giant step towards improving your health, staying fit and living a longer & happier life. But don't stop there. You now need to take the next step. Join our mailing list and we'll keep you up-to-date and motivated on improving your health, staying slim, avoiding disease and living longer. We'll give you tips and advice that will greatly help you stay the course and change your life for the better. And we promise to respect your privacy and never spam you. You can unsubscribe anytime.

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A free gift

When you join our unique mailing list we have a surprise gift waiting for you: a very special ebook that explains why certain vegetables that are commonly consumed should be avoided in the human diet as they can devastate your good health. This truly is a must read book.

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Thank you for taking the time to read this book. I look forward to you joining our special newsletter group and staying in touch.

Any reviews that you can post about this book will be much appreciated and my sincere personal thanks.

Keep well

Russell Eaton

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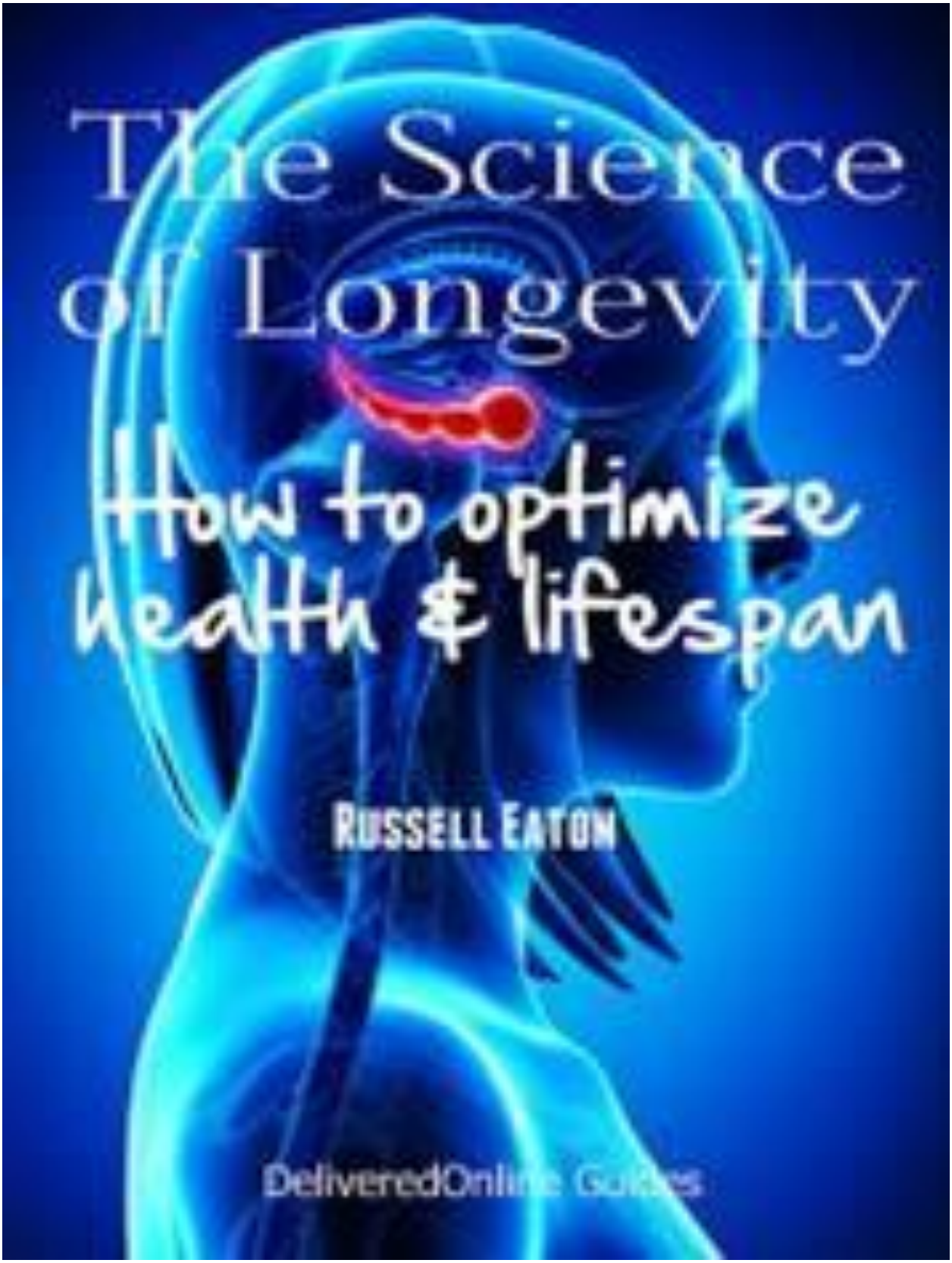
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