Young at Heart by Design

A Program to Live Younger, Feel Younger and Stay Younger for Life

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I have known Dr. Kahn for many years, and he has always been an inspiring and innovative leader in our field, as well as being a knowledgeable and compassionate doctor. His current goal to prevent one million heart attacks by early detection and lifestyle education is just what this country needs as it suffers from so many chronic diseases. By focusing on prevention with lifestyle, our future will be filled with healthier aging, making more productive and enjoyable lives. Congratulations to Dr. Kahn for taking this on!

Kim Allan Williams, Sr., M.D., FACC, FAHA, FASNC

President, American College of Cardiology

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Dr. Kahn is the rare physician who practices both state-of-the-art cardiac care, including interventional therapies, combined with advanced training in nutrition. His lectures and his writings, and his clinical benefits in treating his patients with plant-based, whole-foods diets have inspired many and placed him as a leader in lifestyle medicine. To top it off: his precepts and practices are congruous: he practices what he preaches. All of this makes him a model for the physician of the future.

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Table of Contents:

Dr. Joel Kahn: Professional Biography

Dr. Joel Kahn is a cardiologist on a personal mission to prevent one million heart attacks over the next two years. The U.S. Department Health and Human Services and the Surgeon General embrace this goal of 1Million Heart Attacks prevented.

Dr. Kahn graduated summa cum laude from the University of Michigan, Ann Arbor, and practices a brand of cardiology combining the best of Western and complimentary therapies for total healing.

Known as "America's Holistic Heart Doc," Dr. Kahn has been practicing invasive, interventional and preventive cardiology in Detroit since 1990. He is a Clinical Professor of Medicine (Cardiology) at Wayne State University School of Medicine and Associate Professor of Medicine at Oakland University Beaumont School of Medicine.

In 2013, Dr. Kahn received a certification from the University of South Florida in Metabolic Cardiology and became the first physician to complete the program in the world. The American Academy of Anti-Aging Medicine has also certified Dr. Kahn in Metabolic Cardiology.

Over the past 25 years, Dr. Kahn has improved the lives and vitality of thousands of his patients, taking many of them from chronic health limitations to vibrant living. His devotion to patient care has earned him top honors and he has been nominated as a Top Doctor in Cardiology for many years straight.

Dr. Kahn's patients and peer doctors recognize his passion for education and prevention.

Reader's Digest magazine selected Dr. Kahn for their Holistic Heart Doc column, and their publishing arm published his book, *The Whole Heart Solution,* a #1 Top Selling book. His second book, *Dead Execs Don't Get Bonuses* was published in 2015 and is on the #1 international Bestseller List as well.

The Huffington Post and MindBodyGreen.com publish Dr. Kahn's medical views for a combined circulation 50.1 million unique monthly visitors. He frequently appears as a guest on radio, TV and podcasts. Dr. Kahn also appears regularly on Fox 2 TV in Detroit as a health commentator. He is also a member of the Yahoo Health Advisory Board, and he sits on The Food Babe Advisory Council.

To learn more about Dr. Kahn, visit www.drjoelkahn.com.

Chapter 1. Introduction

I have spent over 30 years training and taking care of tens of thousands of people with heart disease or people worried about growing older and getting heart disease. Increasingly, I have focused on helping people identify if they have silent heart disease that puts them at risk for early death or disability and, if they do, we collaboratively create plans to reach a full life span with a healthy heart, body, mind and spirit. Living to 100 may or may not be a goal of yours - sometimes just living through the day or week gets priority - but it is now realistic to reach advanced ages of 80s, 90s and beyond 100 and the technologies will be getting better and better in the coming years.

The study of persons living beyond 100, or centenarians, has caught the imagination of many authors and scientists. The idea of feeling good, thinking good, loving good and living good for extended lifespans is enticing to many and has driven many infomercials, products and promises. In this course, I'll discuss with you the science and foundation that helps you sort the wheat from the chaff as they say.

Aging is not a single process and there is no consensus amongst scientists as to why bodies falter when it comes to things like your vision, hearing, thought and energy. Just because there is no consensus, however, doesn't mean there isn't enough science to act on. In fact, there is plenty to go off of that will help make some reasonable lifestyle decisions. Some of these might help you feel better today, tomorrow and throughout this century. At least I hope so.

The science of living to 100 and beyond has been a dream of many for centuries, the famed fountain of youth. Serious science on the issue has sprouted up perhaps in the last few decades. One important concept that was offered in 1980 as is worth knowing about is the idea called compression of morbidity. Dr. James Fries, a medical doctor specializing in rheumatology, proposed that 70% of deaths in the elderly were from chronic diseases like heart disease, cancer, diabetes and arthritis that often dominated the last 20 years of life and greatly reduced the quality of life while driving up health care costs. We now know that many of these diseases are largely preventable with relatively simple lifestyle habits, for instance

up to 90% of adult onset diabetes related to obesity has been shown to be avoidable. Dr. Fries proposed the vision of staying healthy, active and vibrant until a brief period before you die, or compressing the sickness or morbidity to the very last days of life. This stands in stark contrast to our current strategy where modern medicine and public health measures have greatly extended our average lifespans into our 80s largely at the cost of those last years from being riddled with disease and pain. Dr. Fries predicted that it might be more reasonable to concentrate on delaying the chronic diseases as long as possible, as opposed to technologies that actually increase our overall lifespan significantly. My grandfather Abraham Kaufman died while swimming on vacation in Florida in his early 90s – he was healthy, happy, vibrant and lucid up until his very last day. I am sure many of you would agree that that is the ultimate compression of morbidity, and while not a centenarian, Zayde as we called him lived out the Dr. James Fries model.

Another piece of the puzzle of living to a healthy 100 and beyond that you may have heard about is the research on areas of the world called Blue Zones. We'll cover this in more detail later on in the course, but I want to bring it up quickly now: journalist Dan Buettner teamed up with National Geographic about a decade ago to identify communities in the world with the highest concentrations of persons over 100 or centenarians. This worldwide hunt lead to a TV special, a magazine article and then a book called the Blue Zones which I highly recommend you read. Why is this important? Because it demonstrates that certain communities, by adopting healthy community-wide diet and habits, have managed to pass down, generation by generation, health and vitality over the long term.

Additional contributions in the field of anti-aging have been offered to the public realm from a community of rock star doctors. Craig Ventner combined science and an entrepreneurial spirit to race with the National Institutes of Health to fully characterize the DNA of the human body, the Human Genome Project. When this massive undertaking was completed in 2003 we were on the verge of leveraging this newly gained knowledge of the human body to identify and correct genetic defects to help us live to our full quota of years in good health. While this may

not happen, Ventner's work helped us uncover and understand an incredible biological phenomenon: that our DNA, our actual genetic material, is actually influenced tremendously by our environment, including the quality of our diet, emotions, air, water, sleep, and stress. In fact, we actually have the ability to rapidly turn on "good" genes promoting health and turning off "bad genes" promoting illness like cancer and heart disease in just a few months by changing how we eat, exercise, breath and enjoy each other. This is called epigenetics, and it is a burgeoning and promising field.

Another superhero of living long and well is Dr. Aubrey De Grey. He clearly wins the award for the best beard in medical science. Dr. De Grey has promoted the idea that aging comes from the accumulation of "junk" or byproducts of metabolism that over decades stuff up our cells like trash in a can. When there is enough trash the cell functions poorly or dies and we do the same.

What I hope has now become clear is that the field of anti-aging, and the possibility of feeling good and healthy well into your elder years, is growing. But for many of us, hitting that century mark is more of a symbolic goal. What we really want is to set ourselves up now for a long and healthy life. The reality is, you have to crawl before you walk – you have to live a year, and then a decade, and then beyond. What I want to focus on are ideas that are practical and can be applied right now to boost your chances of having a good time for longer than most of us are lucky to have. There is a saying that if you fail to plan you plan to fail and health. I hope you agree that your health is too precious to not build a foundation of knowledge and plans to succeed. Finally, maybe you are not sure that all of this interests you and you just want to hike mountains, build a business, raise your family, or take up painting. I leave you with an Indian proverb that says "A person with health has 1000 dreams, while a person without health has only one". I hope we can learn together how to keep all your dreams alive by living a healthy life on purpose.

Chapter 2. Lessons from the Blue Zones and Roseto

It seems so easy. If you want to learn some clues to living an active life free of chronic medical problems just go seek out persons or communities that have done it and copy them! The best and most credible experts on living to a healthy 100 are the ones that made it. This idea led Dan Buettner, a reporter and author, to work with *National Geographic* on a project called the Blue Zones. Buettner researched and then visited communities where people who have lived the longest reside. He reported in print, TV and a book on the habits in areas where people live to be 100 at rates 10 times greater than average in the United States. They areas were: (1) Okinawa, Japan; (2) Loma Linda, California; (3) Sardinia, Italy; (4) Nicoya, Costa Rica; and (5) Ikaria, Greece. These are famously called the Blue Zones of longevity. It is good to know at least one was in the USA!

So the question then becomes, what did these people in these communities actually do (or not do) to promote good health for such a long period of time? Was there anything in common among these communities and cultures scattered across the globe? In fact, there were. And here they are:

An absence of smoking

Daily physical activity centered on walking

A plant-heavy diet with very small amounts of animal protein

Strong family connections, and strong social connections.

Absence of processed foods, fast foods, junk foods high in salt, oils and sugars.

Different areas had unique health habits. In Loma Linda, for example, where the Seventh Day Adventist Church is based, it's common to honor the Sabbath as a day of disconnecting from technology and visiting friends and family. Vegetarianism is a celebrated lifestyle, and eating nuts is common. Drinking alcohol is rare. I will have more to say about the Seventh Day Adventist and a major study of their health in a moment.

In Okinawa, it's taught that you should eat until you are 80% full, something called hari hachi bu, and the average daily food intake there is hundreds of calories less than in other parts of Japan.

Sardinians are known for their cannonau wine reinforced with as much as three times the polyphenols like resveratrol than you'll find in red wine grown in other regions. They also consume a high amount of fava beans.

Costa Ricans consume many oranges and were found to drink very mineral-rich water. Ikarians eat a classic Mediterranean diet rich in home grown vegetables. They enjoy herbal teas daily, and fast frequently. Another reason for their longevity and heart health? Boiled Greek coffee, which is rich in antioxidants and polyphenols.

I've mentioned these unique habits to highlight that these cultures have meaningful differences among them – the Costa Ricans eat oranges and the Sardinians drink wine. But what you'll find among all of these is an important common thread – plant-heavy diets with minimal intake of animal protein, and a marked absence of processed foods.

And now I want to dive a bit deeper into two of the Blue Zones, Okinawa and Loma Linda. These have garnered the most medical attention and research, mostly because they have, as a community, demonstrated really fascinating behaviors and habits that could account for their remarkable life spans. Let's take a look at Okinawa, Japan first. Okinawans have the distinction of perhaps enjoying the longest life span in the world, with more centenarians than any other community. Mainstays of their diet include sweet potatoes, fermented soy, bitter melon, shiitake mushrooms, burdock, jasmine tea, seaweed, and an interesting array of herbs and spices like fennel and turmeric. This is an impressive and diverse diet, and it stands in stark and scary contrast to the Standard American Diet.

The Okinawan Diet is naturally low in added sugar.

In the last few years added processed sugars have received tremendous amount of attention, including in the new USDA good guidelines. We are simply eating too many added sugars, and the science is catching up – our high level of sugar

consumption is associated with cancer, heart disease, diabetes, obesity and dementia. Consider that in contrast to the classic Okinawan diet which has essentially no added processed sugars.

That covers sugar, but what about fat? As you probably guessed, the Okinawan diet is naturally low in fat**.**

The traditional diet in Okinawa, studied and proven to have extended health and longevity, had 6% total fat and 2% saturated fat. This is consistent with the recommendations set forth in the American College of Cardiology guidelines, updated in 2013. So what can you do? Well, if you want clean arteries and a functioning brain later on in life, mimicking this aspect of the Okinawan diet is wise.

The Okinawan Diet is naturally high in potassium**.**

The Western diet, replete with ultra-processed foods, is high in sodium and low in potassium and magnesium. In contrast, a plant-based diet as eaten in Okinawa is rich in potassium and magnesium and naturally low in sodium. By now, I hope you are starting to understand just how different our standard American diet is from the heralded Okinawan diet. I'm not presenting this contrast to scare you. Far from it. I'm presenting you with this information as power, so that you can make changes in your food choices and diet today that will promote long-lasting health well into the future.

A bit more on The Okinawan Diet. It is naturally nutrient dense.

Whole-food, plant-based diets, like the one Okinawans have adopted, are rich in plant omega-3 fatty acids, vitamins like C, E, A and phytochemicals that protect from free radical damage and inflammation. My suggestion would be to seek out and incorporate more of these into you regular diet.

What about carbohydrates? How can our carb intake impact our health over the longer term? This is where the Okinawan Diet gets so interesting! It is naturally very *high* in carbohydrates. But the key and crucial distinction here, and the one that is most important for you to understand, is that these carbs are unprocessed. Believe it or not, but up to 85% of calories of the traditional Okinawan diet are derived from carbohydrates, and we aren't talking bagels, doughnuts and cakes. Overall, studies of the classic Okinawan Diet show that on average, 6% of the

Okinawa diet was from , the same fat content as breast milk, a good source of nutrition for fast growing humans, about 9% of calories were from protein and 85% of calories were from carbohydrates. In fact, grains and legumes were the by far biggest staples of the diet, with a strong preference for sweet potatoes.

In addition, their diet is naturally high in plant-based fiber. In a recent analysis of almost 1 million subjects, increased intake of fiber as cereal vegetable fiber was significantly associated with lower total mortality.

Another aspect on which our American diet differs meaningfully from the Okinawan diet is toxins and pollutants. Our environment is riddled with chemicals that may injure our health. Many studies indicate that persistent organic pollutants or POPs and heavy metals like mercury are concentrated in fats of animals, with fish being a particular reservoir for PCBs and others contaminants such as mercury. The Okinawan Diet, conversely, is naturally low in pollutants. They consume mostly plants, and these are much less likely to be polluted with toxins and chemicals. I risk stating the obvious here, but if you are eating for long-term health, logic tells you avoiding chemicals and toxins that weigh on your health is the smart move.

So what does this all mean? Why should we care about the Okinawan diet? Because it creates positive and long-lasting results when it comes to fostering a healthy and long-living community of human beings. Longevity is associated with the diet, yes, but it isn't just longevity for longevity's sake. It is *healthy and vibrant* longevity. Rates of heart disease were 80% lower compared to those in the US. Rates of breast and prostate cancer were 75% lower. Rates of dementia were 67% lower. The Okinawans live longer, are healthier, and I think it is safe to assume are happier. We should look to their culture, their habits, and their diet, if we want to lay the foundation for a long and healthy life.

Turning from Okinawa to another Blue Zone, let's turn inward, and look for lessons we can gain on living a long and healthy life from right here in the Unites States. Loma Linda, California is just one hour east of Los Angeles. Being so close in proximity, you would think the two cities would have similar average lifespans, right? Wrong. The average lifespan in this city of about 250,000 is over 10 years longer than California as a whole! That is over 3,560 sunrises and sunsets enjoyed

for its citizens. When this was first uncovered in the 1950s, funds flowed freely to study the factors that might account for such an exceptional advantage in this American Blue Zone. This was called the Adventist Health Study and it remains active and ongoing to this very day. Loma Linda is the spiritual center of the Seventh Day Adventist Church, representing about 18 million Christians worldwide. But why does that matter? Well, for starters, one religious principle of the Seventh Day Adventist or SDA church is eating a vegetarian diet. About half of its followers do that to some degree, with about 10% choosing a completely animal free vegan diet.

Several important observations have emerged from high quality scientific publications from a phase of the study beginning in 2002 involving over 96,000 men and women in the Adventist church. These 96,000 individuals were followed for six years, and the findings were pretty remarkable:

1. SDA vegetarians live longer than non-vegetarians.

An earlier phase of the Adventist study found that eating a vegetarian diet with plenty of nuts added five years to one's life. This new phase found that vegetarians lived longer than non-vegetarians in the SDA population. SDA members who consumed fish had the lowest mortality, followed by vegans and lacto-ova-vegetarians (milk and egg-eaters) and finally, the meat-eaters with the shortest life spans.

2. SDA vegetarians have lower cancer rates than non-vegetarians.

In the same SDA study, cancer rates were available for over 69,000 of the study members. Cancer risk was significantly lower among vegetarians, with vegans having by far the lowest risk of cancer.

3. SDA vegetarians were less likely to die of heart disease than non-vegetarians.

In the full group of over 96,000 participants, vegetarians demonstrated an impressiveness elusiveness when it came to death due to cardiovascular disease, with a 50% reduction in vegan men.

4. SDA vegetarians have diabetes far less frequently than non-vegetarians.

Over 41,000 SDA participants had data for diabetes. During follow-up, over 2% of non-vegetarians developed diabetes compared with 0.5% of vegans and approximately 1% of other vegetarian types.

5. The SDA vegetarians had lower blood pressures than non-vegetarians**.**

In a sub-study of white and black SDA populations, average blood pressure was lower for vegetarians, and was the lowest of all for vegans.

Yes, the Adventist Health Study is not randomized, and yes the findings were associations and we know correlation does not prove causation, but it still has profound significance. Why? Because serves as a roadmap for living to a ripe old age, remaining vibrant, energetic and free of chronic diseases.

So how can we incorporate lessons from the Blue Zones into our lives to age more slowly, gracefully, and with more vitality? Dan Buettner and others have summarized the Blue Zones lessons to adopt as a list of 9 activities:

Play daily

Walk often

Move naturally in work (for example doing yard work manually instead of using mechanical devices)

Live with a purpose (for helping others)

Find ways to reduce stress through rest, prayer, and/or humor

Eat less

Eat fewer animal products and use legumes as the core of a fiber rich diet

Drink in moderation if it's acceptable to you

Let faith have a role in your life

Emphasize family and loving relationships

Have social networks

Before we finish this module, let's look a bit more at how social networks – your friends, family and faith – can help sustain healthy living. The Blue Zones we've spoken about are the gold standard – the cream of the crop when it comes to understanding aging. But even if we direct our analytical attention beyond those zones, we still have much to learn It's been over 30 years that I attended medical school, and over that time, the town of Framingham, Massachusetts has taught thousands of physicians about heart disease and how to prevent it. The long term study of over 6,000 residents of Framingham began in the late 1940s and continues to this day. In the 1960s, scientists used their decades of observations to report that smoking, elevated cholesterol, diabetes mellitus, high blood pressure, and family members with early heart disease could predict the development of heart problems. The Framingham Risk Score serves as an icon of preventive cardiology—by inserting just a few numbers into an online calculator, you learn a lot about a person's heart risk. But answers like do you smoke or not do not hold all of the answers to leading a long and healthy life.

Not far from Framingham, Massachusetts is very different community that has taught us some of the "special sauce" that makes Blue Zones and other tight knit communities a healthy support group. Roseto is a town of about 1,600 in Eastern Pennsylvania, settled by immigrants from southern Italy in the 1880s. For decades, the people of Roseto were able to protect their traditions and lifestyles from the old country. In the 1950s, the town began to gain notoriety when it was reported that deaths due to heart disease were dramatically lower than neighboring towns that were more typically "American."

For example, in the nearby town of Bangor (population: 5,000), there were 79 heart attacks from 1935-1944, compared to just 9 in nearby Roseto. Although the two towns are just a mile apart, they continued to show the same dramatic disparity in congestive heart failure and overall death rates for the next few decades.

The disparity remained until about 1965. And over the past 50 years, the so-called "Roseto Effect" has dissipated.

What did researchers observe to explain decades of almost complete freedom from heart events in Roseto? And what changed, starting in 1965, to reverse that dramatic effect?

Scientists looked to nearby Framingham, trying to understand it in the context of data points and risk scores. Roseto residents often smoked cigars, worked in foundries, fried their meatballs, and ate cheese and salami, habits and exposures I would never recommend as a heart specialist. So what was different about Roseto? In a word – family.

In Roseto grandparents lived with grandchildren and many households had 3 or 4 generations under the same roof. Strong ties brought community wide celebrations for life cycle events and religious ceremonies. No one was ever alone, no one was ever lonely, and no one was ever without support and friendships. There was no crime, no locked doors, and no need for social welfare activities by the government as people took care of their own.

Beginning around the mid-1960s, however, traditions began to crumble. Children began to move away, attend university, marry outside the community, bring meals in paper bags, and embrace American suburban life. The introduction of a Western lifestyle with long hours of work and social isolation, increased stress, and a processed food diet produced a quick jump in heart attacks and deaths due to atherosclerosis. Since then, Roseto has joined the melting pot of America and now suffers all of its chronic diseases.

What Roseto taught us is that we humans are social animals who fare best when we're not alone or isolated. The price of modern society on our diet, our stress levels, our exposure to toxins, and also our loneliness has been high. An important part of the Blue Zone “special sauce” as well as Roseto is something we should strive for in our own path to optimal health and longevity: strong family, community connections and support.

I have an admission to make. My favorite part of a yoga practice is when the yogi asks us to join hands with the person on the mat to our right and our left, even if we're strangers. As we sway back and forth, whether chanting in Sanskrit to Girish or singing Let It Be, we build a community and protect our hearts from isolation.

The resident scholar of longevity in the United States, George Burns, was asked about his formula for living over 100. His response? “If you ask what is the single most important key to longevity, I would have to say it is avoiding worry, stress and tension. And if you didn’t ask me, I’d still have to say it”. And now let’s move

on to Module 3 and see if we really can avoid the toll of chronic diseases by applying simple lifestyle habits or, what I call, Vitamin L.

Chapter 3. Can We Prevent Chronic Diseases?

Some of the upcoming modules are going to get into the science and theories of aging and how you can take steps to stay young at heart and soul. Before we go into some advanced steps, I want to convince you that avoiding these chronic diseases and problems is attainable.

How can I say that heart attacks, strokes and diabetes are preventable? Well, in large part because there is an overwhelming body of science which indicates that this is so. That you haven't heard this before is unfortunate, but it is time to change; the message must be spread. Let's take a brief tour of some medical literature which you should know about and take to heart, literally.

In 2001 the Harvard School of Public Health reported on a study of 84,941 female nurses followed between 1980-1996. These women were free of heart disease, cancer and diabetes. They provided information on their lifestyle habits and diet. The researchers defined a low-risk lifestyle for disease as a body mass index (weight divided by height) of under 25, a diet high in fiber and polyunsaturated fat while low in trans-fat and glycemic load, regular moderate to vigorous exercise (at least 30 minutes a day), no smoking and drinking at least half an alcoholic drink daily. When that same study followed up with the patients, 3,300 of the women were diagnosed with diabetes. The single most important predictor of this was being overweight or obese. Sadly, only 3.4% of the almost 85,000 women fit the entire profile of the low risk lifestyle. These women, however, had a 91% lower chance of developing diabetes compared with the other members of the study. So you copy the lifestyle habits of the healthiest these women and you should lower your risk of diabetes by 91% too! Remember, manage your weight,

eat lots of fiber in fruits and vegetables, exercise, don't smoke, and enjoy a drink or less of alcohol daily.

What about heart disease? In 2004 the INTERHEART study group evaluated the factors predicting heart attacks in 52 countries. They reported on 15,000 cases of heart attacks and chose the same number of controls. They accumulated data on a host of factors and analyzed which of those best predicted developing a heart attack. They found nine risk factors that accounted for 90%-95% of the cases of heart attacks... and the good news is that all of these factors can be controlled! What were the big nine? The ones you want to identify and eliminate from your life? They were comprised of smoking, elevated ApoB (think bad cholesterol) to ApoA1 (think good cholesterol) ratio, high blood pressure, diabetes, abdominal obesity (waist over 35 inches for a woman and 40 inches for a man), stress, low intake of fruits and vegetables, lower alcohol intake and lack of physical exercise.

If you're wondering can you really stop heart attacks by planning your lifestyle then you're on the right track. In 2006 Harvard researchers analyzed data from 43,000 men in the Health Professionals Study between the ages of 40-75 who had no heart disease at the outset in 1986. Low-risk men were considered to have a BMI under 25 (normal weight), be non-smokers, be physically active for more than 30 minutes a day, have moderate alcohol intake and have a diet comprised of more than 40% healthy plants. Over the 16 years of follow-up, a heart attack developed in 2,183 men, some of which were fatal heart attacks. Men who had five out of five low risk characteristics had an 87% lower rate of heart attacks! During the study, men who made two or more lifestyle changes to move closer to the ideal low risk group had a lower risk of heart attacks, too. So, again the message is clear. Want to avoid a heart attack 87% time? Just do what these men did, manage your weight, don't smoke, exercise, eat vegetables and fruits a lot, and enjoy small amounts of alcohol.

What about women? Do the same rules apply? In 2007 Swedish investigators began a study of over 24,000 women. They were post- menopausal and free of

heart disease. They followed up after 6 years and found that 308 cases of heart attacks had developed. They also found that A low risk diet (high scores for fruits and vegetable intake, whole grains, legumes, fish, moderate alcohol intake), along with not smoking, walking or biking 40 minutes daily and maintaining a trim waist-to-hip ratio reduced the risk of heart attacks by… 92%!

What about strokes? For these, too, there is data that lifestyle can greatly reduce your risk. In 2008 Harvard scientists reported on over 43,000 men, again from the Health Professionals study, and over 71,000 women from the Nurses' Health Study. This time the risk of stroke was assessed and evaluated in terms of lifestyle habits in persons with no history of stroke. If you want to avoid approximately 50% of strokes, you would need to match the following healthy lifestyle habits: no smoking, a body mass index of under 25, 30 minutes a day of moderate activity, modest alcohol intake and a diet in the top 40% of healthy factors (eat your damn vegetables, again and again and again).

Have we learned any new ways to prevent heart attacks in the last few years? Actually we have. In 2013 the MORGEN study researchers in the Netherlands studied almost 18,000 men and women without heart disease. They followed them for up to 14 years, and in that time more than 600 of the group suffered heart attacks. They found that if people followed four steps they were able to lower their risk of heart attacks by 67%:

1) Averaging 30 minutes a day of physical activity

2) Eating a healthy diet in the Mediterranean style rich in fruits, vegetables and whole grains

3) Not smoking

4) Enjoying more than one alcoholic beverage a month

People who added a fifth health habit — sleeping seven or more hours at night on average — lowered their risk of heart attacks by 83% compared to those not following these steps.

The message is clear. Up to 90% of Type II (formerly called adult onset) diabetes, 85% of heart attacks, and 50-60% of strokes can be avoided by following amazingly consistent lifestyle habits that are affordable and attainable. Here is your roadmap to creating more energy, vitality and health over the long-term:

1) No smoking
2) Exercise, even if walking, 30-40 minutes a day
3) Eat a diet rich in vegetables, fruits and whole grains
4) Maintain a thin body weight and waistline
5) Enjoy alcohol in moderation if appropriate and desired
6) Sleep 7 hours a night.

It's really that simple – follow this roadmap if you want to promote good health throughout your entire life.

Chapter 4. What Causes Aging

Aging, like declining eye sight, hearing, flexibility and muscle mass is a complex process. We age as the result of multiple chemical and biological processes. What I'll do now is explain some of those processes. Why? Well, first because this stuff is fascinating. And second, because knowing how it all works on a high level can help you figure out how to age more gracefully. Halting these processes isn't easy, and in fact, may not provide you with the biggest bang for your buck when it comes to combatting aging. What might make more sense is working on becoming better at cleaning up the cellular garbage that is produced as a result of aging. If you can't stop the cells from making the garbage, you can try to pick it up and haul it away faster.

I was told a long time ago that while there are many ways to injure cells such as infections, toxins, metabolic problems like diabetes, and nutritional deficiencies, there are limited ways that our cells respond to these stresses. One is inflammation and one is oxidation. Let's talk about each briefly.

Inflammation

A process in our bodies called inflammation is involved in many aspects of human health and disease. For example, you may have read that processed foods like Egg McMuffin, advanced snoring from sleep apnea, obesity and even ultra-exercise are inflammatory, while turmeric, meditation, restful sleep and fresh vegetables are anti-inflammatory. When I practice medicine, I tell my patients that creating the right levels of inflammation in the body is a Goldilocks process – you don't want too much or too little, but just the right amount.

So let's start with a basic definition: inflammation is a complex process of cells and chemicals in our bodies standing ready to fight infections and other threats, and is a life saver when it's a controlled reaction to a threat. For example, you may experience inflammation when you're working on your deck and get a wood splinter. Maybe a mosquito lands on your back and enjoys some of your blood. Maybe you sprained your ankle and it was swollen for a few days. Within a few days the injury is resolved. These are examples of acute inflammation. The signs of acute inflammation were described over 2,000 years ago as pain, warmth, redness and swelling. This "first responder" wave of healing occurs because cells in the area are surveying their environment all the time with detectors on their surface that act much like radar watching for invaders. These detectors are called pattern recognition receptors. If the receptors detect something that has a "foreign" structure, a fire alarm internally in the cell will ring and alert surrounding blood vessels.

Chemicals begin to pour out that cause blood vessels to dilate (redness, warmth and swelling); others increase the sensitivity to pain, and the next thing you know, your ankle or finger is a hot, red, sore mess. These chemicals attract white blood cells that begin to clean up the area by engulfing the foreign invader proteins. Enough white blood cells clumped together is called pus. After a period of increased blood flow, helping to dilute the irritant and bringing fighters to the scene, other factors that promote clotting are released and work to balance and decrease the blood flow. This is what happens when you scrape your knee and it weeps for a while but then scabs over.

Some of the star chemicals involved in acute inflammation deserve a shout-out. Histamine is waiting to be released when an injury occurs, and causes arteries to

expand and leak fluid. This is why an antihistamine pill is used for drying up your nose. Interleukins, such as IL-8, come from macrophages or the big eaters in Greek and stand ready to swallow substances sensed as foreign. They bring their best friends the white blood cells. The white cells arrive to fight for your recovery because chemical attractants – sort of a white blood cell perfume – are released. Tumor necrosis factor alpha (TNF-alpha) also is released from macrophage cells, and may produce fever and loss of appetite. Nitric oxide is a gas released by the inner lining of blood cells and can be dumped out to increase blood flow when an injury occurs. If your head is spinning, worry not. That was a lot of chemistry but it's important to understand the miracle of the body responding and healing to injury. So that shows you the good side of inflammation. That is Dr. Jekyll.

Mr. Hyde appears when inflammation becomes chronic. A diverse group of medical illness are believed to be caused in part by chronic activation of the same chemical and cellular processes described above. These include asthma, acne, celiac disease, rheumatoid arthritis, and even atherosclerosis of heart arteries. In fact, in 1856 Rudolf Virchow proposed that arterial disease was an inflammation of blood vessels and now, over 150 years later, people who fear heart disease are routinely checked for this process.

So how does a natural, acute response become a chronic condition? Some of the reasons include injury to the gut (leaky gut syndrome) from processed foods, trans-fats, sugars, alcohol, gluten and dairy allergies, toxins, ultra-exercise, obesity, inadequate sleep, and excessive stress and anger. Functional medicine doctors are trained to hunt down the root causes of inflammation but you can ask yourself important questions. Are your teeth in good health? Are you eating junk food? Are you lacking sleep and gaining weight? Are you having rashes, runny nose or headaches to foods that might indicate a food allergy? Making changes on your own might heal your inflammation.

Oxidation

Oxidation is a chemical reaction we are all familiar with. It is the scientific name for rusting like you see on a car or a pipe. It occurs when oxygen reacts with another substance and that substance is said to be oxidized. In severe instances, the chemical reaction can lead to alteration and malfunction of the substance – think of a hole in your exhaust pipe. Oxidation also occurs inside of our bodies.

Our cells, and in particular our mitochondria, are responsible for producing the energy we need to move our muscle, pump our heart and energize our brains. To do that job, they need oxygen. Our mitochondria can't pump out that energy without it. So if you want to feel good and energetic you need healthy mitochondria. Our precious mitochondria are particularly prone to damage, or "rusting" by oxidation, because of the production of energy within. When they are damage, we don't feel good.

In the process of producing energy in the mitochondria, byproducts are created which include oxygen free radicals. These free radicals are not tossing bombs or marching on Washington, DC. Rather, these unstable molecules can combine with other tissues and cause harm by altering them. It is a strong theory of aging that damage from free oxygen radicals created during normal metabolism but also increased by habits like smoking and conditions like diabetes, accelerate the damage to cells and promote aging. Therefore, keeping oxidation, or cellular rusting, in check is an important goal of healthy aging. Avoiding toxins like cigarettes, heavy metals and plastics that poison our detoxification pathways and mitochondria, staying hydrated, using sauna and yoga to sweat a lot, having a fiber rich diet to eliminate our bowels rapidly, and eating a lot of leafy greens are all ways to minimize oxidation.

A final concept to appreciate in this module is telomeres. Telomeres are a part of the chromosomes in our bodies that are found in every cell. Think of telomeres as the tips that protect the ends of our chromosomes. Every time a cell does what it was born to do, divide, the telomeres divide and replicate as well. But they also shorten. One way to measure the length of our telomeres is through base pairs. It is estimated that at conception, our telomeres have 15,000 base pairs. About nine months later at birth they have only 10,000. This decrease occurs as fetus grows. Our telomeres become shorter and shorter as time goes on, shrinking perhaps by 100-150 base pairs a year. So why is this important? Why should you care about the length of your telomeres? Because when the telomere reaches a critical length, having been slowly whittled down by time, a cell may stop functioning and die. If enough of our cells die, then we do too. So slowing or reversing telomere shortening is a hot topic in healthy aging. And if we can achieve that reversal, perhaps even lengthen our telomeres, we restore resiliency, health and vitality to

our cells. So love your telomeres. We will discuss ways to lengthen our telomeres soon.

How do you know the status of inflammation, oxidation and telomere health in your own body? Next time you're at the doctor, as to receive a high sensitivity C-reactive protein or hs-CRP or CRP for short. This test has been available for decades and is used to diagnose rheumatic fever Other blood tests that can reveal excess or chronic inflammation include the myeloperoxidase or MPO test patented at the Cleveland Clinic or the PLAC test .

While inflammation is measurable, oxidation and the rusting of vessels and other parts of the body is a bit trickier.. A blood test for the amount of oxidative damage the LDL cholesterol molecule is also available from many labs and the oxidized form of LDL cholesterol may be the most dangerous form for artery injury. It is not as easy as seeing a rusted downspout to determine the degree of oxidation in humans.

Measuring telomere length is surprisingly easy, but generally a test not covered by insurance plans and may cost you several hundreds of dollars. The good news is that some lesser expensive alternatives are becoming available. A bit later on in the course, we'll dive into telomeres more deeply and review what we can do to slow that worrisome shortening.

We'll also dive more deeply into how we can leverage, Vitamin L, or the Lifestyle, to stack the odds that we live vitality and longevity by controlling inflammation and oxidation. Before we get there, though, here is a basic roadmap you can follow for keeping inflammation and oxidation in check: 1) incorporate foods that cool down inflammation into your daily meals: these include ginger, turmeric, basil and rosemary, brightly colored vegetables, fruits, nuts, and seeds. 2) Avoiding processed foods, dairy, wheat and sugar are also good strategies. 3) Nutritional supplements, such as vitamin D3, omega-3 fish oil, probiotics, turmeric, and boswellia can be helpful. 4) Avoiding toxins such as pesticides and GMO foods by selecting organic products, taking care to choose skin and personal use products that do not contain irritant chemicals, and drinking purified water are solid recommendations. 5) Get adequate sleep, and try to average 7 hours a

night; 6) Control your weight by getting regular doses of moderate exercise. This will help keep your aging pathways in balance.

Before we close out this module, let's revisit telomeres, or the caps of your chromosomes that may control cell health and your longevity. Can the shortening of telomeres be halted? Or even reversed? In 2009, the Nobel Prize in Medicine was awarded to three scientists who uncovered an enzyme called telomerase that adds length to telomeres and thus holds the potential to slow or reverse aging. So there is hope for the telomere-lengthening advocates!

There are several ways reported to lengthen telomeres in humans, and anti-aging responses like rejuvenated skin and hair have been reported. It's important to note that it's not just older folks who would benefit from slowing telomere shortening. It should be a priority of younger generations as well who want to lay the foundation for a long, healthy life. Here are six lifestyle tips to help you take advantage of this new research:

1. Plant-based lifestyle

Dr. Dean Ornish worked with Dr. Elizabeth Blackburn, one of the 2009 Nobel Prize recipients, to measure telomerase activity in men who ate a low fat (<10% calories) plant based diet, walked daily, practice yoga and stress management, and attended support group meetings. After only three months, the activity of telomerase increased significantly. When a group of the participants was tested at five years, their telomeres had increased in length compared to a control group who had shortened during that time period.

2. Yogic meditation

Dr. Dharma Khalsa of the Alzheimer's Research and Prevention Foundation joined with UCLA School of Medicine teamed with Dr. Blackburn to measure telomerase activity after 8 weeks of practicing a 12 minute Kirtan Kriya meditation daily. Telomerase activity jumped 43% in the meditation group compared to 4% in a group asked just to relax for the same time period.

3. Vitamin D supplementation

Researchers in Augusta, Georgia gave approximately 2,000 IU daily of vitamin D3 to a group of subjects for 16 weeks, raising their blood level to 103 nmol/l. Compared to a control group, telomerase activity increased 19%.

4. Resveratrol

This polyphenol found in grapes, red wine and peanuts has long been considered a potential anti-aging agent, though no definite conclusion is available. There have, however, been some studies with encouraging results; for example, Chinese scientists took human cells exposed to resveratrol, and showed that telomerase activity increased.

5. Qigong exercise

This gentle variation of tai chi has become quite popular in the West, and was studied in Hong Kong for its effects on telomerase activity. Over the course of 4 months, telomerase activity increased 70%.

6. TA-65

This supplement is sold as a nutraceutical and is purified from astragalus, an herb used in Traditional Chinese Medicine. TA-65 increases telomerase activity, and improves immune function and bone strength. Users have reported anti-aging benefits such as skin, hair and memory improvements.

When it comes to understanding and analyzing our telomeres, we're still in early days. However, if you follow those six steps, you can place yourself well ahead of the aging curve.

In this next module, we'll cover other equally-important factors that contribute to aging. The best part? They are under your control!

Chapter 5: Other Causes of Aging You Can Control

We've covered a lot so far. Let's recap quickly before moving forward: 1) first we looked at the Blue Zones and other regions famous for cultivating health and longevity among its respective population, and we pulled out the important

characteristics found among all of those societies that can help you age with grace and good health. 2) Next, we dove into the science head first, examining the role of inflammation and oxidation in health and aging. We also walked through the basics of telomere science. I hope that both of those topics have given you a better sense of how aging works, why it can be so problematic to our health, and most importantly, that we can take concrete and realistic actions today to help pave a healthy, vital and energetic future for ourselves.

Now let's focus on some additional factors you can control to live your best life to a healthy old age.

The first of these is a process known as advanced glycation end product formation or AGE. It is certainly ironic that one of the strongest scientific pathways for cell damage is known as AGE for short. AGEs, particular in higher levels, can contribute to diabetes mellitus and fire up inflammation leading to heart disease, obesity, cancer, dementia and arthritis. AGEs also contribute to aging and are likely to speed up production of wrinkles. Yes, wrinkles so listen up a bit more.

So what are advanced glycation end products and how do they form? AGEs are modified proteins, carbohydrates and fats that are produced in the body under certain conditions. They appear in our body two ways: (1) from the food we eat and (2) from naturally occurring processes in our body

Let's cover the natural forms first. When our blood sugar stays elevated for too long, proteins and lipids are coated by the excess sugars floating around. For example, LDL cholesterol can become coated with sugars and then it becomes capable of producing arterial plaques, something called glycated or sugar coated cholesterol.

Hemoglobin is the important protein inside red blood cells that carries oxygen to all of your tissues. It too can develop a surface coat of sugar. This may affect the function of hemoglobin to deliver oxygen to tissues.

To lower the internal production of AGEs from elevated blood sugars, here are some tips:

- Manage your weight
- Avoid processed foods with added sugars and fats
- Increase your intake of fruits and vegetables
- Avoid toxins like bisphenol A
- Get some regular exercise

The second source of AGEs is "exogenous" or from outside the body and comes from our food. Believe it or not, the way food is prepared has a huge effect on the quantity of AGEs that then get absorbed into our bodies. Yes, cooking matters.

Frying and grilling foods, particularly dry grilling like BBQing, produces among the highest sources of AGEs in our diet. For example, French-fries from fast food chains have nearly 90 times the amount of AGEs of a boiled potato. Grilled or broiled chicken and chicken nuggets have up to 10 times the amount of AGEs of boiled chicken. It is the way the food is cooked that determines the amount of AGEs.

A fried egg has 50 times the AGE level of a boiled egg. Butter and cheeses are naturally high in AGE content and can have three times the amount of a grilled piece of meat. Vegetables are naturally low in AGEs and their high water content protects them from AGE production when heated. So we know AGEs are bad, can be brought into our bodies through the food we eat, and should be avoided. But what can we actually do to keep them out and remain healthy? Here are simple steps:

Limit or avoid charred and blackened meats. This is wise both because of the high AGE content and a reported link to pancreatic cancer.

If you're going to grill, marinate meat before and during cooking. Moistened meats produce half of the AGEs of dry meats. Lemon juice and vinegar combinations are particularly good marinades and a recent report showed that marinating meats in black beer may reduce the formation of AGEs on grilling by up to 65%. Of course, limiting or eliminating meat in your meal is even more effective.

Cook for shorter times at lower heat. Avoid the high flames from extra lighter fluids and dripping fats.

Clean your grill. Keeping the grill clean of old burnt residues or grilling on tin foil may help avoid charring.

Consider steaming, poaching or boiling your foods. Healthy vegetarian and vegan diets are naturally low in AGEs and may be responsible for the longer life span of vegetarians and vegans.

Consider supplements. There are vitamins with long and fancy names that may lessen the damage from AGEs coating important chemicals in your body. Not only do I prescribe these to my patients, I also take them! They are linked to healthy aging, after all, so why not. There are many references online if you wish to learn more but these supplements include: benfotiamine, carnosine, and alpha-lipoic acid which may block some of the ill effects of AGEs.

If you think learning about advanced glycation end products or AGEs is exotic, strap in your seat belt. We're just getting started. Ultimately, you'll make your own decision when it comes to your own Vitamin L. What I plan to do is arm you with the science and knowledge behind healthy aging and living that can help you make the best decision possible.

TMAO. Researchers at the Cleveland Clinic recently reported that the intestinal bacteria in our GI systems can convert carnitine and choline, amino acids in our foods, into a chemical called TMAO. Carnitine and choline are high in red meats and egg yolks respectively. The chemical TMAO can get into our bloodstream and directly adds plaque to arteries which is certainly a damaging phenomenon of aging. In fact, the researchers showed patients with the most advanced heart disease had the highest blood levels of TMAO. What was most surprising about the study was how significant diet and food choice was on producing TMAO.

Study subjects that regularly ate animal products, or omnivores, readily made TMAO while another group of test subjects who followed a plant based vegan diet did not. Not only were their food choices radically different, so too were the bacteria in their respective and collective gut. Those following a diet consisting mostly of plants actually produced much less of the problematic TMAO and saw fewer of the artery aging effects that follow.

Insulin. How the pancreas releases insulin can influence weight gain, diabetes, and even cancer. And insulin release varies according to what foods you're eating. Recently scientists looked at how eating certain foods affects the release of insulin. Surprisingly, some protein-rich and fat-rich foods (eggs, beef, fish, cheese) induced as much insulin secretion as did some carbohydrate-rich, more sugary foods (beef was equal to brown rice and fish was equal to grain bread). The researchers found that fish, beef, cheese and eggs had larger insulin responses per gram than many carbohydrate foods. The scientific fact that meat can lead to the release of insulin is rarely mentioned in modern science. I want to make sure you are aware of it.

Insulin-like Growth Factor 1 (IGF-1). IGF-1 is a hormone responsible for stimulating cell growth. It's also linked to breast and prostate cancers. Meat eaters consistently have higher levels of IGF-1 than plant eaters. What's more interesting is that breast and prostate cancers are rare in traditional Asian communities, like Okinawa, which have a very low intake of animal products.

Methionine. Methionine is an amino acid found largely in animal products. Consuming less methionine is associated with increased lifespan. Getting too much methionine can create oxidative stress and mitochondrial damage. Vegan diets tend to be relatively low in methionine.

Persistent organic pollutants (POPs). POPs are toxic synthetic chemicals that accumulate in fat. The best known are PCBs, dioxins, DDT, and flame retardants used in clothing and furniture. They disrupt endocrine pathways and are linked to cancer, heart disease, hypertension, obesity, and diabetes. Where do POPs come from? Largely the meat that we eat. For example, levels of PCBs in animal fat, cow’s milk, butter, and fish are much, much higher than the levels found in vegetables, fruits and cereals. Ultimately, food is chemistry, leading to reactions that promote health or disease. When studied in scientific experiments, animal

products lead to inflammation and other diseases that may accelerate aging and shorten lifespan. The recent USDA guidelines for nutrition called for reductions in all meats, whether processed, lean or otherwise, for the health of the nation and the planet.

What you're probably realizing now is just how important diet is when it comes to living long, healthy lives. The food you put into your body is perhaps the biggest determinant of your health. And the best part is – it's a conscious decision.

The last topic of this module is getting old due to old mitochondria. You might remember from biology class that the nucleus of our cells contains the DNA that we inherit from our parents but that the energy of the cell is produced in the mitochondria outside the nucleus. According to many experts, the number and health of your mitochondria may determine your quantity and quality of life. To fuel the machines that fuel us, we need oxygen. Nothing can happen in the mitochondria without it. But as we discussed earlier, when that energy is produced, so too are free radicals, and in large quantities. These float around the body and can injure cells and destroy enzymes, leading to chronic diseases and aging. Mitochondria are the easiest target for these free radicals. Why? Because the free radicals are produced *inside* of the mitochondria, so they don't have to travel far to wreak havoc As we get older, more free radicals are produced, less antioxidants to defend us are created, and we accumulate toxins like heavy metal mercury that weigh on mitochondrial health.

Fortunately, it is possible to improve the number and function of our mitochondria, and, in the process, create longer lasting health and vitality.

Coenzyme Q10 is a nutrient used in the mitochondria as an antioxidant to protect tissues from free radicals. With age, our ability to make CoQ10 falls. Those on cholesterol meds are particularly vulnerable to plummeting levels of CoQ10. This leaves cells at risk for mitochondrial damage and aging. The good news is, we can supplement our naturally-produced levels of CoQ10 with, well, *supplements!* Taking CoQ10 as a daily supplement is shown to help control blood pressure and improving heart function. Recently a study in congestive heart failure showed that it could increase heart strength and prolong life. As a cardiologist, I would strongly

recommend taking CoQ10 if you are over 40 years old or on a statin cholesterol lowering medication.

There are other ways to improve the function of the body's mitochondria and make ourselves more resistant to aging. One is to exercise. One of the benefits of exercise that it stimulates more mitochondria to be made in each cell, something called mitochondrial biogenesis. Calorie restriction or intermittent fasting may do the same. The more mitochondria the more energy produced. In addition to exercise, another supplement called pyrroloquinoline quinone or PQQ for short can stimulate the production of more mitochondria. And the more mitochondria we have, the more natural energy and vitality we have too. There is evidence that other supplements including resveratrol and acetyl-L-carnitine also increase mitochondrial number. All these strategies may play a role in delaying aging by reducing heart disease, diabetes and Alzheimer's disease.

Chapter 6. Additional Strategies: Healthy DNA, and Arteries

So what else can we do to achieve optimal and head towards a vibrant 100? In this module, we'll explore some cutting edge concepts and break it all down into simple and actionable steps

Thanks for an earlier module, we now know what telomeres are, and how they relate to aging and health. When the Human Genome Project was completed in 2003, the field of aging and medicine had its collective focus pointed squarely on genetics. We had assumed that the study would allow us understand human health and disease by analyzing the DNA code. This marked the Genetic era of health. Once the study was conducted, people believed that health would ultimately be achieved through efforts to directly repair DNA might be needed to improve health. Over ten years later and this type of repair is still not around. And while that school of thought still claims many medical professionals, the Genetic era has been overtaken by a newer, incredibly exciting paradigm for understanding human physiology. This is called epigenetics, and it is the process by which our environment influences our genes, actually switching certain ones and certain ones off changing their structure. Often times, food is the most powerful environmental factor that can influence our genes. This process is called

nutrigenomics. While we were waiting for gene splicing techniques and other space age approaches we learned that our fork, our feet, our sleep and many other approachable activities had powerful control over our DNA. It may be that our genes load the gun, but our lifestyle pulls the trigger. Put a different way: Our fork is so powerful it can not only transport food to our mouth, it can be used as a genetic on and off switch to alter our weight, blood pressure, blood cholesterol, cancer growth, and even our chances of healthy aging.

To date, most of the elegant studies on nutrigenomics have been performed with a plant based, low fat menu, the so-called Ornish Diet. Let's look at some of these ground breaking experiments and consider what they mean to our attempts to live long and vibrant lives.

1. A plant-based diet can turn off prostate cancer genes.

Dr. Dean Ornish, a cardiologist in California, fed 31 men with low-grade prostate cancer a plant-based diet with fewer than 10% of calories from fat. The men were encouraged to walk, meditate and meet in group sessions. At the end of only three months, 48 genes crucial to cancer growth were found to be more active but 453 genes, ones that controlled for tumor growth and protein production, were less active in producing proteins. Overall, blood tests for prostate cancer activity improved and tumors shrunk. These epigenetic changes from the lifestyle plan were doing great things for these men.

2. A plant-based diet slows aging.

From the same group studied above, Dr. Ornish measured the activity of an enzyme produced by genes, telomerase, believed to be involved in slowing the aging process. At five years, the age-related decrease in telomerase activity was much less in the plant-based low fat group than a control group and their telomeres were longer, suggesting a slowing of the aging process.

3. A plant-based diet improves inflammation, weight, and vascular health.

A recent research group in Pennsylvania studied 63 individuals with heart disease who followed the Ornish program and compared them to a group of 63 people who did not follow any particular program. While the control group experienced no improvement in health, the Ornish group lost weight and blood pressure fell by about 10%.

At 12 weeks, researchers found that 26 genes were exhibiting different activity in the Ornish group. After a year, that number swelled to 143 genes. The genes that promoted inflammation and blood vessel injury were significantly reduced in activity. The control group showed no improvements as they maintained their standard diet during the year.

Food is no longer just a source of calories containing protein, carbs and fats. Food is information and can be viewed as a remote control to our genes, turning them on and off by a variety of modifications. Our fork is the most powerful surgical instrument there is. When you load it up with a rainbow colored, organic, plant strong diet you can plan on enjoying more time to pursue your passions and dreams, free of illness and medications.

Knowing just how powerful food can be, let's take that finding and apply it to the arteries in our bodies. A few words are in order on healthy arteries as a strategy to reach 100 years old. A physician 400 years ago, Thomas Sydenham, was quoted saying "a man is as old as his arteries." I've adopted that phrase in my practice, but of course made it more inclusive to read 'men and women are as old as their arteries.' I've studied and treated arteries for over 30 years in my practice. I know what an unhealthy heart, and unhealthy arteries look like. And my experiences over the last three decades have led me to agree with Sydenham: young arteries equal long life. After all, most heart attacks and many strokes come from diseased arteries.

So what does an artery actually look like? Taking it one step back, what does an artery actually do? An important concept to appreciate about our arteries is their wonderful "wallpaper" lining. The scientific term for this wallpaper is the endothelium - it's a one-cell thick layer and it works magic for our arteries. At first the endothelium was viewed as just a barrier to keep the blood inside the vessel. What we know now, however, is that it is much more than a simple barrier. In fact, the artery lining serves as a factory making products geared to protect the vessel. For example, the endothelium can produce a gas called nitric oxide or NO. When NO is produced in adequate amounts arteries relax lowering blood pressure, blood products are less likely to clot, and the artery wall is more resistant to forming a plaque which can progress on to a total blockage or a heart attack or stroke. The understanding of how important the endothelium

and NO was in our health led to the awarding of the Nobel Peace Prize to 3 researchers in the late 1980s. So a goal for a healthy long life is a healthy endothelium.

How do you know if your endothelium is healthy and making lots of NO? There is no easy blood test. Not to offend, but one question I ask every man is if they have easy and satisfying erections. When the flagpole goes up easily and on demand it is a sure sign that at least that artery has healthy lining and NO production. There are more sophisticated ways to measure the endothelium and look for endothelial dysfunction or ED. One system I use in my clinic is called the EndoPat. It is a FDA approved device that includes a blood pressure cuff on one arm and a patented sensor on one finger on each hand. The sensor can accurately measure blood flowing down to the finger. The blood pressure cuff is inflated to a very high level for 5 minutes leaving one of the hands tingling and cold and the sensor on that hand shows no flow while the other hand sensor is fine. Suddenly the blood pressure is totally released and the blood flow to the tingling hand is measured. If there is normal endothelium, the amount of blood rushing down the hand with the recently released cuff will be torrential as the endothelium makes lots of NO and the arteries expand. The sensor measured a doubling, tripling or even more of an increase in blood flow in the one hand. If there is ED, the amount of blood may increase some but not to an amount determined to be normal.

Far and away, the best, cheapest and most enjoyable way to boost endothelium health is through upping your dose of Vitamin L, the lifestyle measures that create a happy and healthy life. It is important to not smoke, eat lots of brightly colored vegetables and fruits, reduce fats in the diet, exercise, meditate, and maintain a healthy blood sugar, blood pressure and cholesterol. Meditation and yoga can also prevent endothelial dysfunction. So what foods are the best for promoting and enhancing endothelial function? The big ones are the brightest of colors like yellow and red watermelons, tomatoes, blueberries, leafy greens, pomegranates, grapes, and green teas. Why do these foods work so well? Why can these foods lower blood pressure, slow artery aging, and even enhance sexual responsiveness? They have polyphenols. Let’s spend a few minutes exploring the topic of polyphenols.

Polyphenols are a group of plant-based chemicals that have at least one phenol group. WHAT IS A PHENOL GROUP One broad type of polyphenols are phenolic acids including red fruits, black radishes, onions, coffees, cereals and spices. The second broad group are the flavonoids, including isoflavones found in soy, anthocyanidins found in berries and wine, flavones found in herbs, flavonols found in broccoli, tomato and tea, flavanones found in citrus fruits and juices, and flavan-3-ols found in cocoa, tea and wine. Finally, some famous ones don't fit into any class, including resveratrol and stilbenes from wine and nuts, curcumin in spices, and lignans in flaxseeds.

Polyphenols improve your health in six ways:

1. Lower cholesterol
2. Lower blood pressure
3. Improve artery (endothelial) function
4. Prevent platelet clumping
5. Improve arterial flexibility and reduced ED
6. Improved life span

The evidence for the heart benefits for foods rich in polyphenols comes from hundreds of studies. One example published recently was a large study in Europe reporting that a higher intake of polyphenols, particularly stilbenes from grapes and nuts and lignans from flax, was associated with a longer life span.

In another study of more than 500 European subjects, those who ate raw veggies and avoided high-fat dairy products were found to have meaningfully healthier arteries than their polyphenol-poor counterparts. Consumption of fresh fruit, wine and avoidance of high-fat dairy products was also associated with less inflammation in the same subjects.

In over 34,000 post-menopausal women, intake of flavonoid-rich foods such as bran, apples, pears, grapefruit, strawberries, red wine and chocolate was associated with a lower risk of heart disease and all-cause deaths.

So if you’re looking to up your intake of polyphenols, which I hope you are, start with these 10 foods.

1. Cloves
2. Star anise
3. Cocoa powder
4. Mexican oregano, dried
5. Celery seed
6. Black chokeberry
7. Dark chocolate
8. Flaxseed meal
9. Black elderberry
10. Chestnut

Honorable mention goes to sage, rosemary, spearmint, thyme, capers, basil, curry, strawberries and coffee.

Polyphenol-rich foods found in fruits, vegetables, nuts and seeds are a pharmacy to enhance your bodies "chemistry set", moving the needle away from inflammation and disease and toward healing and vitality. They are an important part of youthful arteries for life, leading to a path of health, energy and a long life free of illness.

So the food you eat, a conscious choice you make, can determine how healthy your arteries, and consequently you, are: isn't that such an exciting and hopeful notion! Another piece of good news: we can supplement our diet with vitamins to promote even better artery and overall health. There is evidence that garlic, sources of omega-3 fatty acids, and a less commonly known vitamin K2 can all improve arterial health. Vitamin K2 is difficult to find in healthy whole foods and I often prescribe it to patients who have dysfunctional endothelium. It is reasonable to also supplement with vitamin K2 if you want to prevent artery damage and at least one major study found that the higher the blood level of vitamin K2, the lower the rates of heart disease and death.

There is one last topic about arteries to discuss before we move on to the final module. Have you ever heard of chelation therapy? Odds are, you haven't. What

we'll discuss now is most readily applicable to people currently suffering from heart disease, but it is useful info for everyone to know as well.

Chelation therapy was designed decades ago to trap and remove from our bodies serious environmental toxins like arsenic. While using it, some practitioners noted improvements in symptoms of heart disease, and thus chelation became a mainstay at many clinics

Physicians in traditional practices, however, wrote off chelation therapy as quackery, citing the lack of scientific evidence as an indication that it simply wasn't 'right. As a physician, I too advised my patients to avoid it, since I couldn't find much research to support its use.

Fast forward to the past few years: in November of 2012, the results of a $31mm trial for chelation therapy, called the Trial to Assess Chelation Therapy, or TACT, are revealed. The trial lasted 10 years, giving more than 1,700 people who had suffered a heart attack real chelation therapy, or sham IV therapies, once a week. So what did those results tell us? Unfortunately, very little. They showed that chelation therapy modestly reduced the risk of bad cardiovascular outcomes, but not to the point of achieving any sort of conclusiveness, certainly not enough to support routine use of the therapy after heart attack. So on that front, the trial failed. Since then, however, many more trials have been conducted, with more academic research published on the topic. That info, together with the TACT results, have identified that:

1. Overall, chelation therapy modestly reduced bad outcomes (hospitalization for chest pain, stroke, heart attack, and need for a stent) compared to the placebo group.

2. In patients with a prior heart attack and diabetes, chelation therapy reduced bad outcomes in the 5 years of follow-up by nearly 40%. Powerful therapy.

3. In patients with a large heart attack before chelation therapy, the treatment also reduced bad outcomes in follow-up by nearly 40%.

4. When chelation therapy was combined with high dose oral multivitamins, even more benefit was obtained with chelation therapy.

5. Adverse effects from chelation therapy were infrequent.

Those results are staggering! Imagine a new pill that reduced the risk of heart problems by 40% for thousands of patients. Do you think it would generate billions of dollars in sales? So what has happened in the last few years since these findings have been made public? Just about nothing. Chelation has made no impact on the routine care of patients. Why? For starters, there are some real challenges to the therapy: IV chelation therapy is far more involved than taking a pill and there are oral agents that can be used. It's also not covered by insurance programs. So if you can't expect to get it from your doctor, what can you do? Start by taking oral agents like n-acetyl cysteine (NAC). Eat plenty of organic cruciferous and leafy green vegetables as well. And read up on infrared saunas. These effectively bolster your body's natural detoxification of harmful chemicals. Avoid exposures to heavy metals by not smoking and limiting fish consumption, and finally, consider the removal of dental fillings made with mercury.

And lastly, spread the word! Raising awareness that another therapy, in addition to lifestyle changes, pills, bypass surgery and stents, exists to help benefit the well-being of heart patients is important.

Chapter 7: Biohacking your Life for Health

As we begin this module I have to admit something. The term biohacking meant absolutely nothing to me until recently. And maybe it means nothing to you which is fine. Join the club. It is an increasingly popular term in the health space and a concept worth exploring. I heard Rich Roll use the term hacking but it flew over my head. I then heard Dave Asprey of Bulletproof Exec use it at a meeting we were at together. He explained it as the discipline of using the mentality of hacking into a computer network to analyze and improve the functionality of the system applied to the human body. If you can use some form of analysis, technology or other tools to improve your performance and health

then you are biohacking. In some sense, the science of epigenetics, leveraging our environment to influence our health, is biohacking. But I plan to take you beyond that example and talk about some technologies that can improve your overall wellbeing.

You might think it is odd to start with a discussion of sauna therapy for as a way to hack your health but the data is amazing and you should know it. Although there are dozens of scientific studies attesting to the benefit of sauna for health, traction for the idea was limited until recently, when a landmark study was published in premier medical journal. Over 2,000 men in Finland were followed for almost 21 years, testing for the impact that sauna use might have on overall health. The findings were absolutely incredible: the frequency of use of sauna bathing was correlated with risk of heart events or death. Men who averaged 4-7 sauna sessions a week had a 63% lower risk of sudden death, a 50% lower risk of dying of any heart issue, and a 40% lower risk of dying from any cause compared with those only averaging one sauna session a week. The longer period the men spent in the sauna the greater the benefit.

This seems so odd, right? How can sauna use be so strongly linked to good health, energy and longevity? Well, you sweat in a sauna, so let's take a step back and get even more basic: what does the science say about sweating and your health?

1. Sweating can help eliminate phthalates.

Phthalates are used in plastic toys, cooking utensils, fragrances, nail polish, cosmetics and paints. Researchers in Canada examined blood, urine and sweat concentrations of various phthalates in 20 people. They found that the concentration of these chemicals was twice as high in sweat as in urine and suggested that perspiration may help eliminate of some toxic compounds.

2. Sweating can help eliminate BPA.

Bisphenol a (BPA) is widely used to make clear plastics but is also used in cash register receipts, water pipes, electronics, and eyeglass lenses. This compound has been known for years to have estrogenic properties and exposure to it has been linked to obesity, early puberty, sexual dysfunction, miscarriage. The same group of Canadian researchers found BPA in the sweat of 80% of subjects tested.

Some of these people had no detectable levels in their blood or urine, which suggests that sweat was the best way to excrete stored bisphenol A.

3. Sweating can help eliminate heavy metals.

The heavy metals arsenic, cadmium, lead and mercury are confirmed or suspected carcinogens and are toxic in all sorts of ways to your body. They are known to harm the heart, brain, kidney, and immunological systems. Heavy metals are present in water, food, dental amalgams, cigarettes, and industrial emissions.

Studies show sweat can concentrate arsenic up to 10 times more than blood, cadmium up to 25 times more than blood, lead up to 300 times more than blood, and mercury somewhat more than blood, leading to effective elimination.

4. Sweating can improve the health of arteries

Studies in Japan using infrared sauna in animals and humans have shown that sick arteries become healthy when treated regularly with sauna sessions.

Over 20 research studies from Japan describe their unique approach to sauna therapy. The findings are too amazing to not take a closer look.. The technique used in Japan is called *waon therapy*, from the Japanese words *wa* for soothing and *on* for warmth, or so called soothing warmth therapy. Patients are asked to sit in an infrared sauna set at 60° C (140° F) for 15 minutes, followed by resting outside the sauna for 30 minutes, wrapped in towels. People are encouraged to drink water to compensate for the perspiration.

The benefits of waon therapy published in research studies include:

1) Improved endothelial function in arteries. Remember, the healthier your arteries are, the longer you are likely to live.
2) Lower inflammation. When measured after a few weeks of waon therapy, the levels of inflammatory markers in the blood decreased in patients with heart disease.
3) Better exercise ability. A hallmark of heart disease is the reduced ability to exercise. Perhaps due to a healthier endothelium and less inflammation,

after treatments with waon therapy people demonstrate a greater ability to walk.

4) Improved lifespan. Just like the Finnish sauna study, there is one from Japan that also indicates you may live longer if you take regular saunas. 129 patients with bad heart problems treated with waon therapy at least two times a week were compared to similar patients who did not get the soothing warmth therapy. Over five years of follow-up, the rate of re-hospitalization and death was half in the waon treated patients compared to the others. This is similar to the striking results in Finland.

What this data shows you is that for unwell individuals, saunas can literally be a life-saver. But what impact does regular sauna use have on healthy individuals? My diagnosis: it can't hurt. Overall, I recommend sauna therapy as a way to biohack your health.

Let's turn to stress, sleep, meditation and ways to hack it in our favor for your health. Can you prolong your life by sleeping better? I previously discussed data that adding 7 hours of sleep at night to other heart friendly habits boosts the rate of heart attack free survival from the mid-60%s to 85%! Not a bad benefit for pillow time. There is also data that sleep effects the length of telomeres, those tips of your DNA that are involved in the health and aging of cells. In a study of women, sleeping 6 hours or less shortened telomeres and was predicted to cut 9 years out of lifespan. In men a study showed those sleeping 5 hours or less had shorter telomeres than those sleeping more than 7 hours at night. Perhaps an alarm clock should be called an aging clock!

There is ample evidence to suggest that meditation also has the ability to add health and vitality to our lives. Many of the medical benefits of meditation have come from Dr. Robert Schneider and his team at the Institute for Natural Medicine and Prevention. The researchers completed a study on 201 people with heart disease. The group was taught either to practice Transcendental Meditation 20 minutes twice a day or received instructions to spend at least 20 minutes learning about health. During a follow up just over five years, the group that meditated saw a 48% reduction in the combined occurrence of death, heart attack and stroke!

A second style of meditation is the *kirtan kriya*, which comes from the Kundalini tradition and is taught by Dr. Dharma Singh Khalsa in Tucson. Dr. Khalsa and a group out of UCLA have shown this meditative practice resulted in different patterns of brain metabolism compared to other general relaxation methods. Using PET scanning, they saw that meditation resulted in 19 genes being up-regulated and 49 genes being down-regulated, resulting in the production of fewer inflammatory mediators. Furthermore, measurements of telomerase activity increased by almost 50% leading to longer telomeres. The research group also showed meditation led to higher scores of mental health and lower depression.

So, is there a way to hack your stress, your sleep, and your actual meditative practice? The answer to that lies in what science has coined as the various heart-brain connections

The heart is a "little brain."

There are 40,000 neurons relaying information to the brain from the heart. What sits in our chest and keeps us going each and every day is a "little brain" in and of itself!

The heart communicates with the brain and the body.

The heart speaks to the body in four ways, via:

- Nervous system connections
- Hormones produced in the heart itself
- Biomechanical information via blood pressure waves
- Energy information from the strong electrical and electromagnetic fields.

Through these four channels, the heart sends more info to the brain on a daily basis than the brain sends to the heart.

Indeed, the neurons within the heart enable it to learn, remember, and make decisions independent of the brain's cerebral cortex. Here are some interesting facts about the heart:

The heart emits more electrical activity than the brain.

The heart emits an electrical field 60 times greater in amplitude than the activity in the brain and an electromagnetic field 5,000 times stronger that of the brain. Ever have an EKG during a doctor's visit? How can they put the electrode by your ankle that records heart signals way up in the chest? Actually our heart field radiates at least 5 feet away from our bodies.

Activity in one person's heart can be measured in the brain waves of another person.

The electromagnetic field of two individuals (human or pet and human), touching or within a few feet of each other, can interact so that energy activity in the heart of one individual is measured in the brain waves of the other. This serves as the foundation for healing therapies that rely on the act of touch for results.

The electrical activity of the heart and the brain can be guided into a synchronous electrical rhythm called coherence that is easily measured and displayed by simply focusing on positive and loving emotions.

The technique is to imagine breathing through your heart with slow and deep breaths that last about 5 seconds each and make your heart area on your left chest rise and fall. Second, add a feeling of positive emotions by thinking about a loving experience, appreciation, or calm. By maintaining the heart centered breathing and the positive emotions with your eyes closed and a smile on your face you can create a pattern of coherence showing internal harmony.

What is the hack to capture coherence? And why does it matter? There is a software program that can be downloaded to a laptop or smart phone and coupled with a cable that attaches to the earlobe. The free application for your phone or computer is available from Heartmath.org for free. Colorful graphics track the degree of coherence achieved during your heart based breathing session. So why am I bringing up coherence, and how we can achieve it more naturally? I'll let the results do the talking:

HeartMath has shown that just 5 to 10 minutes a day of coherence is associated with the following benefits:

1. Enhanced immune function and Lower cortisol levels with improved levels of DHEA (anti-aging hormone)
3. Lower blood pressure
4. Improved memory on testing in seniors
5. Improved school performance during exams in high school students
6. Improved walking times in heart failure patient

Simply put, stress is a killer. HeartMath is a way to hack some stress out of your body and out of your life. Frankly, it is easier than a standard meditation practice and supported by dozens of published scientific studies. Speaking as a trained and practicing cardiologist, I sincerely hope you will explore HeartMath in your life.

There are other stress/meditation hacks, both old and new, that I want to mention. In 1989 Bill Harris and Wes Wait, both with a long-term interest in meditation and personal growth, established Centerpointe Research and Holosync. Drawing from an early 1970s study that leveraged precise sound to alter a listener's state of mind, these two pioneers sought to re-create that experience, leveraging sound to reproduce calm states of mind within study subjects that are usually achieved only through hours of daily meditation. What were the results? Users reported profound positive changes in physical and mental health, mental clarity, happiness, and inner peace. Isn't that fascinating? Just by listening to ambient and precise sounds, we can introduce more calm, clarity and peace into our lives. I'm not sure there is an easier way to help pave the path to a graceful and healthy 100.

Another frontier in meditation and biohacking is brain sensing and scanning. A company called Muse, which produces a brain-sensing headband, has emerged as a force for innovation. Muse is a brain fitness tool that helps you do more with your mind. It detects your brain signals, like a heart monitor senses your heart, and gives you valuable real-time feedback. Train your brain to improve your focus, composure and response to stress - in as little as 3 minutes a day. During fun and relaxing focused-attention training sessions, you receive real-time feedback from the app as to when your mind has wandered and when it is in focus. By seeing the brain's performance in real time as well as over time, you can enhance the mental skills you already have and do more with your mind than you ever thought possible. Muse was named Innovations 2014 Design and

Engineering Awards honoree in the category 'Tech for a Better World' and is a promising way to enhance concentration, cognition and performance.

When it comes to sleep, there are hacks aplenty. One of the most interesting and practical is understanding the connection between sleep and light. About 12 years ago, researchers discovered that in the retinas of our eyes, we have not only rod and cone cells to permit vision, but we also have cells that are directly linked to centers in the brain for circadian biorhythms, such as sleep and hormone cycles. So when it's time so sleep, our eyes speak to our brain. These photosensitive cells respond differently to different wavelengths of light. When light in the blue wavelength (around 480 mm) strikes the retina, which regulates sleep cycles, it produces less melatonin. As a result, we feel more energetic and less prone to be sleepy. When light low or free of blue wavelengths strikes the retina we produce melatonin and are more likely to sleep.

Why should you care about this breakthrough? Maybe you're among the 50% of people who don't sleep well at night. Maybe, like so many others, the last thing you do is check your phone or read your email, both of which emit blue light wavelengths. Or maybe your old-school like me, and you prefer to read in bed before you try to fall asleep. Even that can be problematic, since the light bulb in your lamp emits blue light wavelengths that your brain reads as a prompt to *wake up*, not sleep. Are the concrete changes we can make around light exposure to sleep better or feel more energetic?

Yes there are. For one, try to use your phone less as you approach bedtime. Powering down can be a good way to naturally power up. And if you are a nighttime reader, there are now LED light bulbs commercially available that filter out almost all of the blue light wavelengths. This bulb is ideal for bedtime, as it supports melatonin production and thus better sleep. I have these special light bulbs made by Definity Digital in my lamps on my nightstand in my bedroom.

Light can be manipulated to facilitate attentiveness and focus, as well as sleepiness and relaxation. Look for bulbs that emit blue light waves if you're hoping for sharpened focus and awareness. As you probably guessed, soon we'll see 'smart' bulbs on the shelves of our local hardware store or Home Depot. These will (1) white light, (2) sleep enhancing light, and (3) energizing light, all controlled by a three way switch which you can adjust depending upon the time

of day and your desired energy level. Rest assured that these will be available for purchase sooner rather than later – some of the finest research minds at NASA and the International Space Station are using this technology to optimize the performance and health of astronauts in space for many months.

Good sleep promotes good health. Are there other ways we can take advantage of the explosion of innovation around us to hack our sleep, and consequently our health? Why yes there are! Some of these include

1. The 90-minute rule.

When you sleep, your brain cycles through different stages, each lasting 90 minutes. You will feel most refreshed when you awake at the end of a 90-minute sleep cycle. There are apps like sleepyti.me and sleep cycle that track the depth and timing of your sleep and wake you up with a simple alarm when you are in your lightest phase of sleep to feel more refreshed.

2. Use neutral relaxing background noises to relax deeply.

Even when you're asleep your brain is listening out for sounds that might mean danger. Research has shown that white noise or nature sounds like waves crashing or rain falling can drown out annoying noises. If you go to You Tube and search 528 Hz you will find noise tracks specially designed for sleep that are 6-8 hours of constant background sounds.

3. Have an Epsom salt bath just before bed.

A bath around bedtime has been shown to increase sleep quality. Scientists don't quite know why, but it might be because it mimics how your body temperature tends to fall slightly just before you fall asleep. Another possible reason these baths help you sleep like a baby? They are rich in magnesium which gets absorbed through your skin. Magnesium is associated with calm and better sleep.

4. Introduce some scented essential oils to your bedroom.

There is research that indicates that an essential oil diffuser may help you sleep and enjoy the anti-aging benefits of sound rest. A small study sprinkled lavender on to bedclothes and found that those sleeping in those clothes actually slept better than the control group. In my experience, a diffuser is easier to use than sprinkling oils on bed sheets.

5. Rest on an acupressure pad.

Several brands of pads are available with plastic disks applied that have relatively sharp edges to simulate acupuncture. Lying on one of these pads in bed for 20 minutes before falling asleep has been reported to be a sleep aid.

6. Grounding pads.

In the past 20 years a theory of health and disease has surfaced, postulating that current society has separated us from direct contact with the earth and its electrical field. What is the cause of that separation? Rubber soled shoes, wood floors and anything else that sits between your feet and the earth. The theory continues that the loss of contact with the earth has made us unhealthy. Though it may sound kooky, some studies do indicate that grounding with to the earth, or earthing, by being barefoot on grass and connecting electrically to its energy has health benefits. It's tough to just walk around barefoot all day, so how else can we connect with our earth? Through things called grounding sheets: These are mats with a fine thread running through them. One end of the thread is connected to a cable that is plugged into a wall socket, and the other simply leads out to nature, thereby connecting the sheet electrically to our earth. By sleeping on such a sheet, or sitting at work on one, you may be able to promote better health, lower inflammation, and hack sleep.

7. Meditation as a sleep aid.

I'm happy to report that science finally seems to be catching up when it comes to meditation. Multiple landmark studies have produced results that scientifically prove the mental and physical health benefits that regular meditation confers. For a minute let's focus specifically on how meditation can help you hack sleep. A recent study evaluated whether mindfulness meditation could in fact enhance sleep in older adults. The study was randomized and controlled. One cohort received mindfulness training while another received standard sleep hygiene education like 'be sure to sleep in a dark, cool room. The results? The group taught mindfulness practices had significant improvement in sleep compared to the hygiene group.

The Final Hack: Calorie Restriction and Fasting

Michael Pollan wrote in his book In Defense of Food “Eat food, not too much, mostly plants”. This credo has gained considerable traction, and now serves as a mantra that many people live by. But how much is “not too much”? It turns out the idea of restricting calories for health can be tracked back to the Book of Daniel in the Bible. If you recall, when Prophet Daniel was captive in the King’s prison he rejected the kings food and lived on “pulses” and water. When he and his associates were presented to the King’s guard’s days later they looked to be in glowing health. The Daniel Fast was thus born. This 21 day fast of just plants and water has been formally studied in the last few years, and the results have been overwhelmingly positive: in thousands of individuals, it corrected many abnormalities of blood sugar, blood cholesterol, weight, blood pressure and inflammation.

In many animal models there are life-extending benefits of caloric restriction. Lab results show that drastically cutting food intake can nearly double longevity in rodents, worms, and flies, and a massive 20-year study on rhesus monkeys, a species closely related to humans, found that the benefits of the diet seem to be universal: a resistance to cancer, heart disease, and age-related cognitive decline.

There is a Calorie Restriction Society International with thousands of members. Members try to live on 30 percent fewer calories than the number recommended by conventional medicine hoping to gain the benefits seen in animal models. Another idea is to fast intermittently rather than daily. Intermittent fasting is quite popular and can be practiced a day a week or every other day for example. Another approach I favor is to try to avoid eating 12 hours a day, such as from 7 PM to 7 AM. This allows the GI track to rest.

Cancer prevention

Extensive research conducted by institutions like the University of California at Berkeley, the University of Southern California, and Chicago's Mount Sinai now shows that intermittent fasting may help prevent and treat cancer. During a fast, the cells in our bodies go into a protective mode, while cancerous cells continue their metastatic, robotic growth. But the fasted state is hostile to cancer cells in part because their fuel, glucose, disappears from the bloodstream. This hostile

environment has seen success in battling the proliferation and growth of cancer cells.

Longevity and neuroprotection

Fasting challenges the brain in a way that's similar to exercising muscle. It increases a peptide called brain derived neurotropic factor or BDNF, crucial for learning and protection against age-related cognitive decline.

Conclusion

Now, we reach the end. We've covered a ton of ground and examined many concepts and principles. My hope is that you've identified the right lifestyle for you to facilitate good health and graceful aging. If you've made it this far, then you've probably picked up on the fact the most powerful tool we have in promoting longevity and health is our fork. The food we eat is far and away the most important lifestyle choice we can make. Use your fork to collect brightly colored fruits and veggies. Abstain from smoking, move around with regularity, and go ahead and indulge every so often with alcoholic beverages.

Remember that stress is literally a killer, and that the sleep we get can bust that stress. The techniques we've covered for getting restful and uninterrupted sleep should help you live each day with more natural and vibrant energy. Finally, though it may sound extreme, experiment with intermittent fasting. The results are there.

I have a confession to make. You do not need to worry so much about living to a healthy 100 unless you are 90 years old. The pace of advancements in aging research are so rapid that you should shoot for surviving 10 years with a healthy body and mind.. There will be so many new strategies available by then that you can reset your goal for another 10 years incorporating the new information and strategies. In that manner decade by decade you can progress to a healthy old age and I plan to see you at your 100^{th} birthday party and beyond.