

Deep Resilience

Longevity

To not try to live forever. You will not succeed. George Bernard Shaw

“Ad Me’ah ve-essrim shana” (May you live until 120) Hebrew Blessing

The following is from “The Yellow Emperor” 2600 BC

I’ve heard that in the days of old everyone lived one hundred years without showing the usual signs of aging. In our time, however people age prematurely, living only fifty years. Is this due to a change in environment, or is it because people have lost the correct way of life?”

In the past, people practiced the Tao, the Way of Life...They understood the principle of balance, of yin and yang, as represented by the transformation of the energies of the universe. Thus, they formulated practices such as Dao-in, an exercise combining stretching, massaging, and breathing to promote energy flow, and meditation to help maintain and harmonize themselves with the universe. They ate a balanced diet at regular times, arose and retired at regular hours, avoided oversteering their bodies and minds, and refrained from overindulgence of all kinds. They maintained well-being of body and mind: thus it is not surprising that they lived over one hundred years.

Case Study

SP was a woman in her late thirties who came to see me for anxiety and fertility issues. She was an attractive, petite woman who was well, but casually dressed. In the course of running her “doggy day care” in San Francisco, there had been a horrific incident of dog on dog violence involving two very large dogs. This event had been extremely frightening to her and her staff. The danger, the noise and the chaos with the other dogs had been a nightmare and had shaken them deeply. This patient was even more affected than her staff since she was ultimately responsible and had been physically involved in separating the dogs. She went into menopause within 2 days of this dramatic dog fight. In Modern Medicine this would be written off to chance. In Chinese Medicine, however, this sudden menopause could be easily explained as a logical result of a deep fright which can affect the kidneys. Kidneys, as a construct in Chinese Medicine involve more than just filtering and waste removal. They are key to overall constitution along with other functions. The Kidneys are closely linked with Jing

or “essence” and this story helps illustrate its power. My task was to calm her nervous system and nourish the kidney as best as I could since her deepest desire was to have children.

The quest for longevity fascinates us today just as it has over centuries. In Ancient Chinese Medicine as discussed above in the Yellow Emperor, living to 120 years was not unusual. 120 years as a specific measure, as in the Hebrew blessing, seems to repeat and have a resonance across cultures. Science now shows that the neurons in our brains, unlike other cells in our bodies, can live to 120 years. Another instance of modern eyes, ancient teachings.

In this chapter we will first look at how the ancients understood aging and longevity. We will then do a tour into the modern science of aging and how it explains some of these ancient principles of longevity. And then, how we can harness both to optimize our health, develop deep resilience and live long.

Jing or Essence: Key to longevity

In Chinese Medicine, longevity is linked to a concept called *Jing*, one’s primal life force. For those lucky enough to be born with an abundance of *Jing*, they will most likely be healthy, strong, and resilient, and will achieve great longevity. *Jing* is like a fully charged battery you are born with. Though you can limit the leakage and recharge it with healthy, balanced living, nature dictates life will eventually run it down. All disease, minor or major, diminishes *Jing*; and in turn, reduced *Jing* makes us more susceptible to disease, degeneration and aging. This is the vicious cycle that exemplifies classic “spinning out of control”. All death is ultimately associated with the loss of *Jing*. We will be looking at strategies to safely harness the body’s longevity genes or nourish *Jing*. But first let us consider “anterior and posterior heaven”. We know these concepts now as genetics and epigenetics.

Anterior and Posterior Heaven

What you are born with, your potential, according to the Ancient Teachings, is your “Anterior heaven”. “Posterior Heaven” on the other hand, represents your life circumstances and habits. You cannot control your “Anterior Heaven”. This is just the luck of the draw, your genetic inheritance. Health practices can

only affect your “posterior heaven” the only aspect of health under your control. Even with excellent “anterior heaven”, and Jing, if you are born into a situation of severe stress and malnutrition (poor posterior heaven), you will suffer eventually and have health challenges and a shortened life span. Alternatively, even if you were born into royalty, for instance, with hemophilia, there would be limited options for this unlucky “anterior heaven”. No amount of “right living” would change that. But if you are born healthy, live wisely, and guard your Jing, you can theoretically live a very long time, even to 120 years. This requires some deep resilience. **How do we get it?**

Modern Science of Aging

Telomeres: A measure of your battery’s charge or Jing

A famous foray into the science of aging is the Nobel Prize winning work of Dr. Elizabeth Blackburn. She has explored the science of telomeres, the segments of repeating DNA sequences at the end of our chromosomes or inherent DNA genetic material. The telomeres protect the ends of the chromosomes from deterioration or from fusion with neighboring chromosomes. They are like the stiff endings of shoelaces which stop the shoelace from “fraying”. Telomere length is a measure of potential longevity and they do get shorter over time. In a groundbreaking study she and her team found that telomeres shorten with increased stress. Though this had always been intuitively thought, “stress kills” after all, there had been no measure for aging on the cellular level to prove this. The imbalance of the autonomic nervous system with too much flight/fight and not enough rest/digest can shorten your life, it damages your “posterior heaven”. In the case of SP, we see the dramatic consequences of a experiencing a deep fright. We know that a preponderance of fight/flight can lead to increased inflammation and poor immunity as we saw in chapter 4 and 6. These, in turn, can lead to serious illness such as cardiovascular disease and cancer which can lead to death, the ultimate “spinning out of control”. The Yellow Emperor’s admonition to live in moderation and to avoid “over stressing the body” is reinforced by cell biology and telomeres.

The Cellular Science of Aging: Enter Sirtuins and MTOR and AMPK

The current understanding of aging at a cellular level is that there are two modes for cells to be in, the yin and yang of cell states if you will. The yang mode is growth and reproduction mode, the other, is defense and conservation mode or yin mode. Dr. David Sinclair, a foremost longevity researcher, calls this defensive yin mode “hunkering down”. When resources are abundant and there are no threats, cells go into growth and reproduction mode. This is counterproductive to longevity. The key to longevity, is for the cells to go into a defensive or hunkering down state. This is activated when there is threat or hardship, such as inadequate food, or other adverse conditions. For longevity, the optimal trigger is when the threat is mild and triggers a defense mode, but not a mortal challenge. Remember too much of a threat to the system (stress, malnutrition) damages your “posterior heaven”, and can shorten your life. **So how do we get our cells to switch into hunker down mode safely?**

Switch on Longevity Genes

Sirtuins

From the work of David Sinclair and other longevity labs, we know that there are certain mammalian genes that code for this cell switching from growth to defensiveness. These are considered longevity genes. *“Together these genes form a surveillance network within our bodies, communication with one another between cells and between organs by releasing proteins and chemicals into the bloodstream, monitoring responding to what we eat, how much we exercise and what time of day it is. They tell us to hunker down when the going gets tough and they tell us to grow fast and reproduce fast when the going gets easier.”ⁱ* Sinclair’s focus has been ways to exploit these genes. The genes he focuses on make proteins called Sirtuins. Sirtuins are protein enzymes that change the packaging of DNA, which turns genes on and off when needed. (The way I remember this function is that the **Sirtuin** proteins are saying to the DNA **“Sir, do it”** meaning, giving permission to turn on or off a gene.) *“If they get overwhelmed, cells start to misbehave, and we see the symptoms of aging, like organ failure or wrinkles. All of the genetic info in our cells is still there as we get older, but our body loses the ability to interpret it. This is because our body starts to run low on NAD, a molecule that activates the sirtuins: we have half as much NAD in our body when we’re 50 as we do at 20. Without it, the sirtuins can’t do their job, and the cells in our body forget what they’re supposed to be doing.”ⁱⁱ*

This is an example of “epigenesis” the equivalent of a powerful tweak to your “posterior heaven”. Epigenesis changes how genes are expressed without

changing the DNA itself. So Sirtuins do this by controlling which DNA is exposed and expressed. The Sirtuins can control our health, our fitness and even our survival.

TOR and Autophagy

There are other longevity genes, too. One of these is the *target of rapamycin* or TOR or mTOR as it is called in mammals. TOR is a complex of proteins that regulate growth and metabolism. Sensitive to nutrients TOR signal cells in stress to hunker down when inhibited. They can improve survival by boosting such activities as DNA repair, reducing inflammation caused by old and worn cells. Perhaps its most important function is that it digests old proteins which can lead to toxic aging. When TOR is inhibited it forces cells to hunker down, dividing less and reusing old cellular components to maintain energy and extend survival. This is a process called **autophagy** which means self-eating. The way I remember TOR is I think of “Thor” thrashing around eating himself. Self-eating, or autophagy works to conserve and clean up. Think of it as a mechanic scavenging old auto parts to keep an old car running, but also cleaning up the junkyard as a side benefit. If times are tough, you do not buy a new car, you use whatever you can find to keep going. Similarly, when the going gets tough, shutting down TOR permits cellular survival, and survival of the organism.

AMPK the Metabolic Master switch

AMPK (5' adenosine monophosphate-activated protein kinase) is another enzyme which evolved to respond to adverse conditions and has been called “a metabolic master switch” in times of hunkering down.ⁱⁱⁱ It plays a role in cellular energy homeostasis, largely to activate stored glucose and fatty acid uptake when cellular energy is low.

Insulin-like growth factor 1 (IGF-1)

IGF-1 is often found in those centenarians who confound neighbors, family, and researchers by being able to eat anything they want, drink to excess and still live past 100 years. IGF-1 and its gene are linked to longevity. In the general population this gene is triggered by caloric restriction.

All these defense systems are activated in response to biological stress. Obviously, some stresses are simply too great to overcome and cause DNA breaks and mutations and lead to actual illness and death. As we saw in the case of SP, the fear and stress were so overwhelming that it actually caused her to shut down her ovaries (stop reproducing), and immediately go into menopause.

Hormesis: Turning on Longevity Genes

What stressors activate the longevity genes without damaging the cell? These stressors are a type of hormesis. Hormesis is a low exposure to toxins or other stressors which result in a favorable biological response. The term hormesis comes originally from ancient Greek *hormáein* "to set in motion, impel, urge on"^{iv}. I like this definition, since it captures the meaning of "keep going" despite hardship, a type of deep strength. When it can be induced with no damage, this is the beginning of longevity.

Lifestyle Strategies for Longevity: Do not get too comfortable

The lifestyle strategies that help us to switch into "hunker down" mode are time restricted eating, exercise, sauna, and cold shock. All these tactics should be applied in a hormetic dosage, otherwise, they could be damaging.

Calorie restriction

Calorie restriction has been shown to prolong life in yeast, fruit flies and mice and anecdotally in humans. *"If this happened only in yeast, it would be merely interesting. But because rodents also live longer when their food was restricted it was apparent that this genetic program is very old, perhaps nearly as old as life itself."*^v In animal studies the key to engaging the longevity genes is a razor's edge through calorie restriction. Just enough food to function and no more. It is this razor's edge part that is the limiting factor in studying humans, since malnutrition can destroy and lead to shorter life. Enter intermittent fasting.

Intermittent Fasting

A sustainable caloric restriction strategy is called intermittent fasting. Subjects who followed a restricted diet for 5 days a month, lost weight, reduced their body fat and affected their levels IGF-1. IGF 1 and its gene are linked to longevity and centenarians as mentioned above. Some researchers use this gene to predict-with great accuracy- how long someone will live. Those centenarians with this IGF-1 are simply winners in the genetic lottery (lucky anterior

heaven) and can eat fatty food, drink and generally be careless with their habits. The rest of us have some extra work to do.

Short of fasting for days each month, a popular strategy is to spend 16 hours a day without eating. By not having breakfast and just a small lunch and early dinner you can experience some of those benefits of fasting. Almost any periodic fasting diet that does not lead to malnutrition is likely to put your longevity genes to work in ways that will result in deep resilience and that results in a longer and healthier life.

Protein Restriction

Limiting your intake of meat and dairy thereby reducing protein consumption inhibits mTOR. We know when mTOR is inhibited it forces cells to spend less energy dividing and more energy in the process of autophagy, which recycles damaged and misfolded proteins. We cannot live without protein, but we can do a better job of restricting the amount of it we put into our bodies. Restricting Methionine-- which is in beef, lamb, poultry, pork and eggs-- and substituting with plant protein, leads to a good longevity strategy.

Exercise. Scientists found that those adults who exercise more have longer telomeres. Those individuals who exercise the equivalent of at least ½ hour of jogging five days a week had telomeres that appear to be nearly a decade younger than those who live of more sedentary life. Exercise, by definition, is the application of stress to our bodies. The longevity regulators **AMPK, mTOR, and sirtuins** are all modulated in the right direction by exercise irrespective of caloric intake, building new blood vessels, improving heart and lung health, making people stronger, and yes, extending telomeres. Even 15 minutes per day of jogging reduced subjects' chance of death from heart attack by 40% and all-cause mortality by 45%. High intensity exercise, the kind that leaves you breathless and sweating for even 10 minutes a day engages the greatest number of health promoting genes, and more of them in older exercisers.

Cold

Exposing your body to less than comfortable temperatures is another effective way to turn on your longevity genes. Cold activates a gene called UCP2 which activates brown fat in arms back and shoulders. This increased brown fat leads to more mitochondria (the power houses of metabolism), and can significantly

reduce rates of diabetes, obesity, and Alzheimer's disease. Exercising in the cold can turbocharge the creation of brown fat. Even sleeping in the cold can help. Of course, the wellness industry is cashing in on the healthy effects of cold with cryotherapy tanks with sessions at a subzero temperature of -110 to -166 degrees F for a few minutes.

Heat

A study followed a group of approximately 2300 middle aged men from Eastern Finland for more than 20 years. Those who use the sauna with great frequency, up to seven times a week, enjoyed a twofold drop in heart disease fatal heart attacks and all-cause mortality events compared to those who had only one sauna per week. So, a little stress outside of the thermo neutral zone can go a long way to deep strength.

Metformin and Rapamycin

Two medications which have received attention in the longevity industry, are metformin and rapamycin. Medications can easily tip over into the Dr.#3 territory with unexpected side effects. Remember we want to stay in Dr. #1 approach harnessing the body's own systems with lifestyle changes and acupuncture.

Fruits and Vegetables a hormetic challenge?

Another counterintuitive application of the hormetic challenge is that fruits and vegetables may be healthy for you is not necessarily because of the vitamin content, or even the fiber content, but because of the low levels of toxins that vegetables and fruit have in them to ward off predators. During my Chinese Medicine training the teaching was that fruits and vegetables are good for you but the very best fruits and vegetables for you are ones that are grown near your home or best even at your home. Since the toxins that are produced by vegetables or fruit on your own property or near where you live are more likely to be effective against adverse environments that you will encounter.

The Curious Case of Antioxidants

An interesting application of the principle of Dr.#3, is that after much research into antioxidants, it turns out that anti-oxidants may do more harm than good.

Antioxidants, in effect, take away a hormetic challenge. Dr. Nick Lane, a longevity researcher, points out that antioxidants dampen internal stress response in the cells and in so doing weaken the cell. His metaphor is that it is like taking away a smoke detector. The smoke and damage remain, but the cell fails to protect itself.

All these strategies involve some effort but are powerful if adopted as habits. But we will see that we can get many of the same potent anti-aging effects from acupuncture. Acupuncture has the advantage of being relaxing and does not require effort. It calms the body and mind and provides additional benefits as discussed below. As we will see, acupuncture at a cellular level is a type of hormesis since it has a demonstrated effect on longevity genes. It is no wonder that acupuncture was highly valued as a treatment for illness, but also for wellbeing and prevention allowing for long life.

Acupuncture and Longevity

Reducing the Stress Response with Acupuncture

Research has consistently shown that acupuncture leads to improved autonomic balance with increased “rest/digest” and decreased “flight/fight”. As we have seen in previous chapters, this improved balance leads to multiple health benefits. “It all spins together.” But what has also been shown is that patients who show improved autonomic balance with acupuncture, are much more likely to show clinical improvement over time. This measured improvement is a harbinger of better resilience leading to better results.

Adding Complexity

We know that in addition to giving a snapshot of autonomic function, Heart Rate Variability is also a measure of the complexity of heart rate response. We lose complexity across functions as we age from gait to heart rate. Maintaining complexity across different physiological processes can help delay the aging process, so improvement in HRV with acupuncture may improve our resilience and longevity. Other areas of complexity may benefit from acupuncture also. Giving vibrational input to the soles of the feet, analogous to acupuncture treatment, improved balance in elderly patients.

Acupuncture and Jing

Jing and Kidney: We have direct evidence that acupuncture in animals can lead to improved physiological measures that are markers of aging. One study showed that acupuncture on the kidney meridian (closely related to Jing) led to an improvement in renal function and increased sex hormone production to a level of a younger animal^{vi}. More research on this type of direct hormonal response is necessary, but the results are provocative. It is perhaps why acupuncture has been so effective in improving fertility and the success of IVF treatments.^{vii}

But besides harnessing the relaxation response, improving complexity and increasing hormonal levels, aging science shows us another way that acupuncture might be useful in prolonging life. Acupuncture may be a highly effective hormetic challenge.

Acupuncture Provides Cellular Hormesis

AMPK

Some animal studies that show that electro acupuncture activates the AMPK system.^{viiiixx}

Sirtuins

Additional studies showing that Sirtuins are affected by acupuncture^{xixii}

mTOR

Perhaps the most promising studies concerning mTOR signaling was shown in Parkinson mice^{xiii}, mice with premature ovarian failure^{xiv} and upregulating proteins that add to neural plasticity in PTSD mice^{xv}. So, in summary, it is likely that acupuncture acts as a longevity hormetic stimulus by activating the “hunkering down” switch of mTOR.

IGF-1

Acupuncture also triggers this longevity gene^{xvi} And happily, so does moxibustion, a traditional Chinese medicine therapy performed burning *Artemisia argyrii*^{xvii}. Zusanli (, ST36) is an acupoint in the stomach meridian, long associated in ancient Chinese medical practices with the extension of life span when moxibustion is applied to it.^{xviii}

Herbal therapy

Of note is that astragalus, which I recommend to patients and a formula that I have taken daily for over a decade has been shown to lengthen telomeres^{xix}

Modern Medicine and Ancient Strategies

Thankfully, SP ended up getting pregnant after 2 courses of acupuncture and medication for fertility. Her case remains an illustration of the profound effects of “posterior heaven”, and the dangerous wild cards life can deal you. Longevity is starting to be recognized as a valid aim in modern medicine^{xx}, late to the party in comparison to Chinese Medicine. Looking at the science as we currently know it, harnessing stress reduction and hormetic challenges through acupuncture and lifestyle changes, we can claim some of the deep resilience required to reach 100 years and beyond.

ⁱ From Lifespan

ⁱⁱ https://getpocket.com/explore/item/this-scientist-believes-aging-is-optional?utm_source=pocket-newtab

ⁱⁱⁱ Wikipedia In response to binding [AMP](#) and [ADP](#), the net effect of AMPK activation is stimulation of [hepatic](#) fatty acid oxidation, [ketogenesis](#), stimulation of skeletal muscle fatty acid oxidation and glucose uptake, [inhibition](#) of [cholesterol](#) synthesis, [lipogenesis](#), and [triglyceride](#) synthesis, inhibition of adipocyte lipogenesis, inhibition of adipocyte [lipolysis](#), and modulation of insulin secretion by [pancreatic beta-cells](#).^[1]

^{iv} wikipedia

^v Lifespan David Sinclair

^{vi} Find reference

^{vii} Find reference for this

^{viii} Dong J, Zhang Y, Wei Y, et al. *Zhongguo Zhen Jiu*. 2018;38(7):741-746. doi:10.13703/j.0255-2930.2018.07.017 Effects of electroacupuncture at "Zusanli" (ST 36) on expression of mitophagy-related proteins in skeletal muscle in rats with spleen deficiency syndrome

^{ix} Zeng Q, He H, Wang XB, et al. Electroacupuncture Preconditioning Improves Myocardial Infarction Injury via Enhancing AMPK-Dependent Autophagy in Rats. *Biomed Res Int*. 2018;2018:1238175. Published 2018 Aug 6. doi:10.1155/2018/1238175

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- ^x Li ZX, Zhang HH, Lan DC, Zhang HT, Sun J. *Zhen Ci Yan Jiu*. 2019;44(1):8-12. doi:10.13702/j.1000-0607.170633 Electroacupuncture improves lipid metabolic disorder by regulating hepatic AMPK/p38 MAPK/RRAR γ signaling in rats with high-fat diet-induced insulin resistance
- ^{xi} Wang JY, Li H, Ma CM, Wang JL, Lai XS, Zhou SF. Acupuncture may exert its therapeutic effect through microRNA-339/Sirt2/NF κ B/FOXO1 axis. *Biomed Res Int*. 2015;2015:249013. doi:10.1155/2015/249013
- ^{xii} Huang Q, Chen R, Chen L, et al. *Zhen Ci Yan Jiu*. 2019;44(4):270-275. doi:10.13702/j.1000-0607.180190 Electroacupuncture reduces obesity by improving metabolism and up-regulating expression of hypothalamic Sirtuin 1 and proopiomelanocortin in obese rats
- ^{xiii} Tian T, Sun Y, Wu H, et al. Acupuncture promotes mTOR-independent autophagic clearance of aggregation-prone proteins in mouse brain. *Sci Rep*. 2016;6:19714. Published 2016 Jan 21. doi:10.1038/srep19714
- ^{xiv} Zhang H, Qin F, Liu A, et al. Electro-acupuncture attenuates the mice premature ovarian failure via mediating PI3K/AKT/mTOR pathway. *Life Sci*. 2019;217:169-175. doi:10.1016/j.lfs.2018.11.059
- ^{xv} Oh JY, Kim YK, Kim SN, et al. Acupuncture modulates stress response by the mTOR signaling pathway in a rat post-traumatic stress disorder model. *Sci Rep*. 2018;8(1):11864. Published 2018 Aug 8. doi:10.1038/s41598-018-30337-5
- ^{xvi} Hu, T., Lu, M., Chen, B., Tong, J., Mao, R., Li, S. ... Xiyang, Y. (2019). Electro-acupuncture-induced neuroprotection is associated with activation of the IGF-1/PI3K/Akt pathway following adjacent dorsal root ganglionectomies in rats. *International Journal of Molecular Medicine*, 43, 807-820. <https://doi.org/10.3892/ijmm.2018.4035>
- ^{xvii} Article showing moxibustion effect
- ^{xviii} Lin JG, Lin SZ, Lin LH, et al. Effects of Moxibustion on the Levels of Insulin-Like Growth Factor 1: A Pilot Study. *Cell Transplant*. 2018;27(3):551-556. doi:10.1177/0963689717724795
- ^{xix} Guinobert I, Blondeau C, Colicchio B, et al. The Use of Natural Agents to Counteract Telomere Shortening: Effects of a Multi-Component Extract of *Astragalus mongholicus* Bunge and Danazol. *Biomedicines*. 2020;8(2):31. Published 2020 Feb 12. doi:10.3390/biomedicines8020031
- ^{xx} David Sinclair