Intermittent Fasting, Hormesis, and Delayed Aging
by Mark Force, DC

Long-lived peoples characteristically eat in moderation and fast periodically. These forms of caloric restriction have been studied extensively in lab animals and the results are very convincing: lab animals on caloric-restricted diets or those that intermittently fasted lived longer and exhibited fewer degenerative diseases as they aged.

I began my studies in health and healing with *The Miracle of Fasting* by Paul Bragg, ND. Dr. Bragg overcame tuberculosis as a kid with fasting, whole and natural foods and exercise. He fasted one day every week and up to a couple of weeks four times a year. He was vital and strong until the day he died in a surfing accident at 93. For him, fasting, above all else, restored his health and kept him vigorous.

I recommend Dr. Braggs book for guidance and inspiration when fasting. It has helped me immensely.

At one time, Dr. Bragg had popularized the practice of fasting one day a week among many people. I've had the pleasure of working with some of Dr. Braggs’ disciples over the years and have been impressed with their overall health, vitality, looks, and strength relative to their age. I am convinced, both through my own experience and observing others, that this regular and longterm regimen of fasting works.

Feasting and Fasting - Our Genetic Heritage

Caloric restriction (CR) is well-researched and well-known to extend life-span, retard age-related health decline (senescence), and decrease the development of chronic degenerative diseases in a large number of species.\(^1\) Intermittent fasting (IF) has been shown to have similar effects as CR, even without overall reduction in caloric intake.\(^2\)

It appears that we are adapted genetically to feast/famine and physical activity/rest cycles which modulate metabolic processes and without these cycles we become prone to metabolic derangements such as obesity and Type 2 diabetes.\(^3\)

The benefits of IF are available even when the method is initiated later in life.\(^4\)

What The Heck Is Hormesis?
We are made to adapt to our environment and moderating the stressors that we adapt to seems to improve our health. Hormesis is the concept that small and usually intermittent exposures to stressors (chemical, physical, mental, thermal) will cause a beneficial or stimulatory effect where a much higher exposure of the same stressor will cause an adverse or inhibitory effect on our metabolism. Examples can include exercise, dietary restrictions, and exposure to small amounts of irritant phytochemicals. The benefits seem to be mediated molecular enzyme responses triggered by the stressor.⁵, ⁶

Many phytochemicals, such as capsaicin from cayenne, curcumin from turmeric, allicin from garlic, and resveratrol from wine stimulate the production of cytoprotective proteins such as antioxidant enzymes, growth factors, neurotrophic factors, sirtuins, and mitochondrial proteins through their hormetic stimulation.⁷, ⁸

**Fasting Stimulates Antioxidants**

Free radicals are unstable molecules in the body produced by normal metabolism and antioxidants are the molecules produced by your body to protect you from the damage that free radicals cause (oxidative stress). Aging has been extensively associated chronic damage from oxidative stress.⁹

After eight weeks of intermittent fasting, antioxidant control of oxidative stress was significantly improved. This was measured through increased sirtuin levels, a group of compounds being extensively researched currently and associated with the nutrient resveratrol. What is significant is that sirtuin levels were increased without dietary supplementation.¹⁰ IF increased mitochondrial superoxide dismutase, a primary cellular antioxidant.¹¹

**Fasting Protects You From Toxins**

IF appears to protect against environmental and metabolic toxins.¹², ¹³, ¹⁴

**Fasting, Diabetes, Cholesterol, and Heart Disease**

Intermittent fasting lowers serum glucose, increase insulin sensitivity, increases HDL levels, improves the cholesterol/HDL ratio (a heart disease risk factor), lowers homocysteine levels (a marker for systemic inflammation and stroke or heart attack risk), prevents hypoglycemia, and reduces diabetes.¹⁵, ¹⁶, ¹⁷, ¹⁸, ¹⁹, ²⁰

Adiponectin is a protein hormone that regulates blood sugar and blood fat metabolism and controls body fat that has been found to be increased with intermittent fasting.²¹
Intermittent fasting also improves protein metabolism, controls blood pressure, and protects the heart and cardiovascular system.\textsuperscript{22,23,24,25}

**Fasting Prevents Cancer?**

Intermittent fasting of even 1 day a week suppressed carcinogenesis in mice and this effect was even present when started late in life in mice predisposed genetically.\textsuperscript{26}

**Fasting, Chronic Pain, and Mood**

IF was found to result in control of inflammation and pain through down-regulation of NF-kappaB a primary moderator of these processes.\textsuperscript{27}

Fasting has been associated with increased brain availability of serotonin, endogenous opioids, and endocannabinoids, all of which have been associated with improved control of pain.\textsuperscript{28} Mice subjected to an intermittent fasting display markedly reduced responses to thermal and visceral pain.\textsuperscript{29}

**Fasting and Your Hormones**

Diminished cycling of hormones in relation to the time of day and lower growth hormone (GH) and IGF1 levels with increased age have been associated with degenerative changes of aging.

IF has been shown to increase GH and IGF1 with one study showing a 4-fold increase in GH.\textsuperscript{30,31} Some of the benefits of IF may be had through improved IGF1 signaling/receptor mechanisms.\textsuperscript{32}

IF seems to improve circadian rhythm (day-night cycling) of hormones through improved modulation of the hypothalamus, a part of the brain that controls internal body functions.\textsuperscript{33}

**Fasting and Your Brain**

IF has been postulated by researchers to protect against neurodegenerative disorders such as Alzheimer's and Parkinson's diseases through neurotrophic factors and antioxidant enzymes.\textsuperscript{34,35} IF protects against age related cognitive decline and protects the brain from metabolic stress and injury.\textsuperscript{36,37,38,39,40}

Intermittent fasting even enhances brain function as evidenced by improved memory, learning, and consolidation processes through long-term changes in synaptic efficiency and plasticity.\textsuperscript{41,42}
Is Your Autonomic Nervous System Working For You?

IF has been shown to decrease stress as evidenced by decreased tone of the sympathetic nervous system and improve function of the nervous systems’ regulation of the internal organs as evidenced by increased tone of the parasympathetic nervous system.\(^43\), \(^44\)

How Is Your Brain Derived Neurotrophic Factor?

Intermittent fasting increases production of brain-derived neurotrophic factor (BDNF). This factor increases the resistance of brain neurons to dysfunction and degeneration and may also improve glucose regulation and cardiovascular function.\(^45\), \(^46\)

Fasting and Aging

Methylglyoxal (MG) is a highly toxic glycating agent that is associated with impaired energy production, oxidative stress, and abnormal gene expression and cell signaling. IF has been proposed to suppress MG formation and increase sirtuins.\(^47\) It is proposed that periods of fasting might be a more acceptable approach than permanent undernutrition in our attempts to slow human aging.\(^48\)

How To Fast

One-Day Fast

A weekly fast of 24-36 hours is an ideal health maintenance measure, as are periodic fasts (usually once a season) from three days to a week. This type of regular food restriction has been shown in research to produce very significant health benefits. This is probably due to the cellular and metabolic responses to the hormetic stimulation that fasting provides rather than only the adaptation to decreased caloric intake.

Weekly fasting makes a huge difference in my health when I have the discipline to do it. I have more energy, strength, endurance, and mental clarity. The 24-hour fast is from dinner to the next dinner. If you want to fast for 36 hours, fast from dinner on one day, through the next day, and until breakfast on the third day.

Best results, in the long run, are when you fast on water only or on water with fresh lemon. Please note that fasting is not appropriate while pregnant or nursing.

If you have difficulty fasting on water only, usually due to a drop in your blood sugar, you can add a little honey or maple syrup to the lemon, or you can use fruit and/or vegetable juices or and herb teas. Juices are preferably freshly made, but if this is not possible then glass-bottled, unpasteurized, unfiltered is a good second. Freshly made juices are much different than bottled
and are much more effective. This is not the ideal way to fast as it doesn’t conform to the water fasting from the research. Typically, as you fast regularly, you will find that your tolerance for fasting will improve.

For some, undiluted juices may cause a drop in blood sugar. If you have symptoms, especially problems with energy and/or concentration when using the juices undiluted, mix the juices with an equal amount of water.

When you conclude a one-day fast, it’s okay to make the first meal a regular meal.

**Short Fasts (2-3 days)**
Fasts of two or three days are done the same as the one-day fast, except most people use juices in addition to water.

Blue-green algae, spirulina, or wheat, oat, barley, and rye grass juice powders (or a combination of them) can also be used a few times a day in juice to keep your energy levels up during the fast.

If you fast for two or more days, break the fast with a lighter-than-normal meal. The best first meal after you fast is fruit or a vegetable, such as salad with an oil and vinegar- based dressing. All meals after that, eat as you normally would.

**Long Fasts (4-14 days)**
These fasts are useful for certain conditions, but their utility is probably due to the detoxification effect primarily rather than the hormetic stimulation.

Longer fasts are outside of the scope of this paper and will be covered in another paper on the subject of detoxification.

**Enhancing The Effects of Fasting**

**Exercise**
Exercise along with IF significantly increases the benefits overall through the hormetic stimulation.\(^{49, 50}\)

**Cold**
Cold and IF act synergistically in raising basal metabolic rate and reducing body lipids.\(^{51}\)

**Dietary Irritants**
Dietary polyphenols present in most fruits, vegetables, and spices have strong phytochemical
effects that activate body processes that are metabolically modulating and protective through their hormetic effects. In other words, eat your fruits, veggies, and spices.

**Dietary Fats**
Including dietary fats along with IF results in lower overall caloric intake (less hyperphagia) and less body fat.


6 The concepts of hormesis are presented in Wikipedia.


44 For better understanding of the sympathetic and parasympathetic nervous systems, see my article on the autonomic nervous system from The Elements of Health website articles page.


