



ANTI-AGING SCIENCE

## Cellular Rejuvenation: The Science Linking Intermittent Fasting and Longevity

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Fasting dates back to the earliest humans. At a time when food sources were scarce and irregular, eating cycled between periods of hunger and feasting. This cycle encouraged – and ultimately, evolved – the body's ability to survive during periods of food scarcity.

Today, food abundance, not scarcity, is the nutritional problem. We now use fasting selectively as a means to manage body weight, remove harmful toxins in the body, and challenge the body's stress-response pathways.

Let's take a closer look at how fasting works, its benefits and challenges, and how a diet that mimics fasting might be the ideal solution for your patients.

### How Does Fasting Work?

**Fasting works** on both sides of the calorie equation.<sup>1</sup> Fasting by not eating increases the number of calories burned by boosting the metabolic rate and reduces the number of calories consumed. True fasting with no food intake is difficult to maintain, however; it causes powerful hunger sensations and isn't compatible with daily life and work schedules. When fasting continues for more than 24 hours, the body can start to consume lean muscle mass along with stored fat.

A long-term alternative to fasting without eating is *intermittent fasting*, or eating only within a limited daily time frame. The eating window during intermittent fasting typically spans between four and seven hours during the day. It can be reduced or expanded, depending on dietary needs, but the fasting period should be at least 12 hours from the last meal of the evening to the first meal the following day.

During intermittent fasting, calories are *not* restricted; only the time frame for consuming them. The diet (preferably healthy with no processed foods or sugar) remains as usual, with no caloric

limits. Even without cutting calories, intermittent fasting can lead to [weight loss](#) of 3-8 percent if done consistently over three to 24 weeks.<sup>2</sup> Intermittent fasting with at least 12 hours overnight without eating puts the body into mild ketosis, which can lead to weight loss, greater insulin sensitivity, and improved body composition.

The stress of fasting, without food or intermittently, on the body activates *autophagy* – the body's natural cellular regeneration process. Autophagy literally means self-eating. During autophagy, damaged cells break down; the body recycles their components for energy and as the building blocks of new cells.<sup>3</sup>

Autophagy helps the body remove the harmful and toxic compounds released when cells break down, recycles damaged proteins, and increases the production of ketones. It also removes damaged immune system cells and activates stem cells.

### The Fasting Mimicking Diet (FMD)

Despite its health benefits, fasting can be difficult for even the most determined and health-conscious among us. Serious calorie restriction from fasting isn't recommended for extended periods. As the body uses up the last of its glucose during fasting, it searches for energy in the form of glycogen, amino acids and glycerin to help maintain blood glucose levels. Fasting can lead to a significant loss of muscle mass over just a few days when the glycogen and amino acids stored in the muscles are depleted for energy.

Meanwhile, essential micronutrients and amino acids aren't being synthesized by the body – a combination that isn't sustainable for optimum health over an extended period of time. The side effects of fasting, including hunger, dehydration, headache, fatigue and others, make extended fasting unpleasant and impractical.

The solution? A fasting mimicking diet, or FMD. This diet avoids hunger by allowing calories from selected foods while tricking the body into a fasting metabolic state. When followed over a five-day period, the fasting mimicking diet can promote the body's natural ability to protect, regenerate and rejuvenate its cells to help reduce risk factors for aging and age-related diseases.

With the aid of a meal program that consists of macronutrients (fats, carbohydrates, proteins) and micronutrients (vitamins and minerals), the FMD shuttles nutrients from food into the body without releasing the signaling factors for cellular growth and aging. The body receives essential nourishment and can maintain muscle mass without interfering with the beneficial effects of fasting. The FMD doesn't cause hunger or disrupt normal daily activities, making compliance easy.

During a fasting mimicking diet, the body conserves energy by decreasing cellular growth pathways such as insulin-like growth factor-1 (IGF-1), target of rapamycin (TOR), and protein kinase A (PKA). Reductions in these pathways cause cells to enter into a protected state and activate the body's clean-up mechanisms.

By reducing these pathways, fasting also promotes resilience and protection from aging and disease. For instance, reduced IGF-1 levels have been shown to lower the risk of cancer, improve stress resistance, reduce TOR signaling, and reduce insulin levels while increasing insulin sensitivity. Low levels of IGF-1 are also associated with the longest-living human populations.

### What Does the Research Say?

In a [2017 clinical trial](#), 100 volunteers were given fasting mimicking diet (FMD) foods for five

consecutive days per month for three months, with unrestricted diet and exercise in between, to evaluate the impact of FMD on markers and/or risk factors associated with aging and age-related diseases after FMD cycles.<sup>4</sup>

The study found that three FMD cycles reduced body weight, trunk and total body fat; lowered blood pressure; and decreased IGF-1 in all subjects. BMI, blood pressure, fasting glucose, IGF-1, triglycerides, total and LDL cholesterol, and CRP were more beneficially affected in those at risk for disease than those not at risk. The study also concluded that cycles of a five-day FMD are effective in reducing markers and/or risk factors for aging and age-related diseases.

However, larger studies in patients with diagnosed diseases or selected on the basis of risk factors are needed to confirm the effect of fasting mimicking diets on disease prevention.<sup>4</sup>

### Health Benefits You Can't Ignore

The health benefits of the fasting mimicking diet are numerous:

- The FMD can help patients manage body weight, remove harmful toxins and challenge the body's stress-response pathways.
- Using a specific combination of low protein, carbohydrates and sugars, and high fat, the FMD can downregulate the body's key nutrient-sensing pathways, while still providing essential nourishment.
- The FMD protocol can help with weight management and body composition, as well as improving insulin sensitivity and lowering A1C levels.
- People with elevated cholesterol, triglycerides and blood pressure will probably see decreases.
- In addition, the fasting mimicking diet may also help reduce risk factors for aging and age-related diseases.

The fasting mimicking diet is versatile and collaborative. A suggested protocol is FMD for five days once a month for three months, then five days once every three months going forward. During the non-fasting times, patients follow whatever healthy diet plan works best for them.

### References

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