

# Breakfast may not be the most important meal of the day: The Benefits of Intermittent Fasting on Health, Exercise, and Muscle Growth



Hannibal Miles ND MS '18  
Faculty Advisor: Jose M. Mahfoud MD ND  
College of Naturopathic Medicine  
University of Bridgeport, Bridgeport CT

## Abstract:

This thesis was devoted to dispelling some of the controversy associated with intermittent fasting and reveal just how beneficial the practice of intermittent fasting can be in terms of improving one's health, and its revolution on the traditional bodybuilding process.

## Introduction:

The societal construct of breakfast, lunch, and dinner not only provides the foundation for overeating, it is utilized by businesses in pushing their food products. (1) The idea that breakfast is the most important meal of the day has largely been pushed by cereal companies to increase their sales. Humans have evolved to eat sparingly during the day and feast at night.

## What is Intermittent Fasting?

After waking, the body is in a metabolic state of low insulin, elevated growth hormone, and elevated cortisol. This is the body's ideal state for fat loss. Eating breakfast places your body in fat-storing mode first thing in the morning. The individual quickly increases their insulin levels during a state of high cortisol leading to a decline in blood glucose levels just as quickly as they were previously spiked, creating a state of "false hunger." The individual then feels "hungry" throughout the day making it more difficult to control cravings throughout the day.

## Types of IF:

1. 16/8
2. 5:2 method
3. Eat-stop-eat 24 hour fast
4. Alternate day fasting
5. Spontaneous meal skipping
6. Warrior diet

## A Challenge to the Conventional Nutritional and Workout Regimen:

When comparing pre-workout, mid-workout, and post-workout protein intake windows, post-workout protein intake proved the most efficient in maximizing Maximal Protein Synthesis (MPS) and minimizing (Maximal Protein Breakdown) (MBS) (2). However, they're have been mixed reviews and evidence supporting the notion that total protein intake throughout the day plays more of a role in muscle hypertrophy and synthesis than the post-workout anabolic window. In a recent study, it was shown that the RDA of 0.8g/kg is likely suboptimal for muscular hypertrophy during weight training and lean mass retention when cutting (3). Current research proposes that a total protein intake of 1.3-1.8 g/kg can promote lean mass retention during hypocaloric diets.

After the traditional bulking routine is deemed sufficient, a period of cutting down begins. Various methods of dieting are followed in attempt to achieve a leaner physique. Most individuals opt for a low carb diet, attempting to optimize this ratio, other macronutrients such as carb and fat content become important, but its efficiency is not necessarily in the reduction of these values. When comparing a ketogenic (low-carb) diet and a non-ketogenic moderate carb diet it was found that there wasn't any inherent metabolic advantage in terms of fat loss when compared with the full-fledged ketogenic diet, given identical protein and calories (4).

## Testosterone and Growth Hormone

Having elevated levels of HGH places your metabolism in a fat burning mode while maintaining muscle mass. In states of starvation, the actions of GH secretion provide two specific actions: an increase in hepatic glucose production and the utilization of an alternative energy source by increasing fat mobilization and oxidation, leaving body protein from skeletal muscles intact (5).

According to a study investigating how short-term fasting affects the pituitary-testicular axis in obese and non-obese men, it was found that testosterone production was far less in the obese group. The study was done under GnRH elicited LH response after an overnight fast, and a second IV after 56 hours of food deprivation. In the obese group, there was a 26% increase in LH, however no corresponding testosterone response. The non-obese group had shown a 67% increase in LH with a corresponding testosterone response of 180% (6).

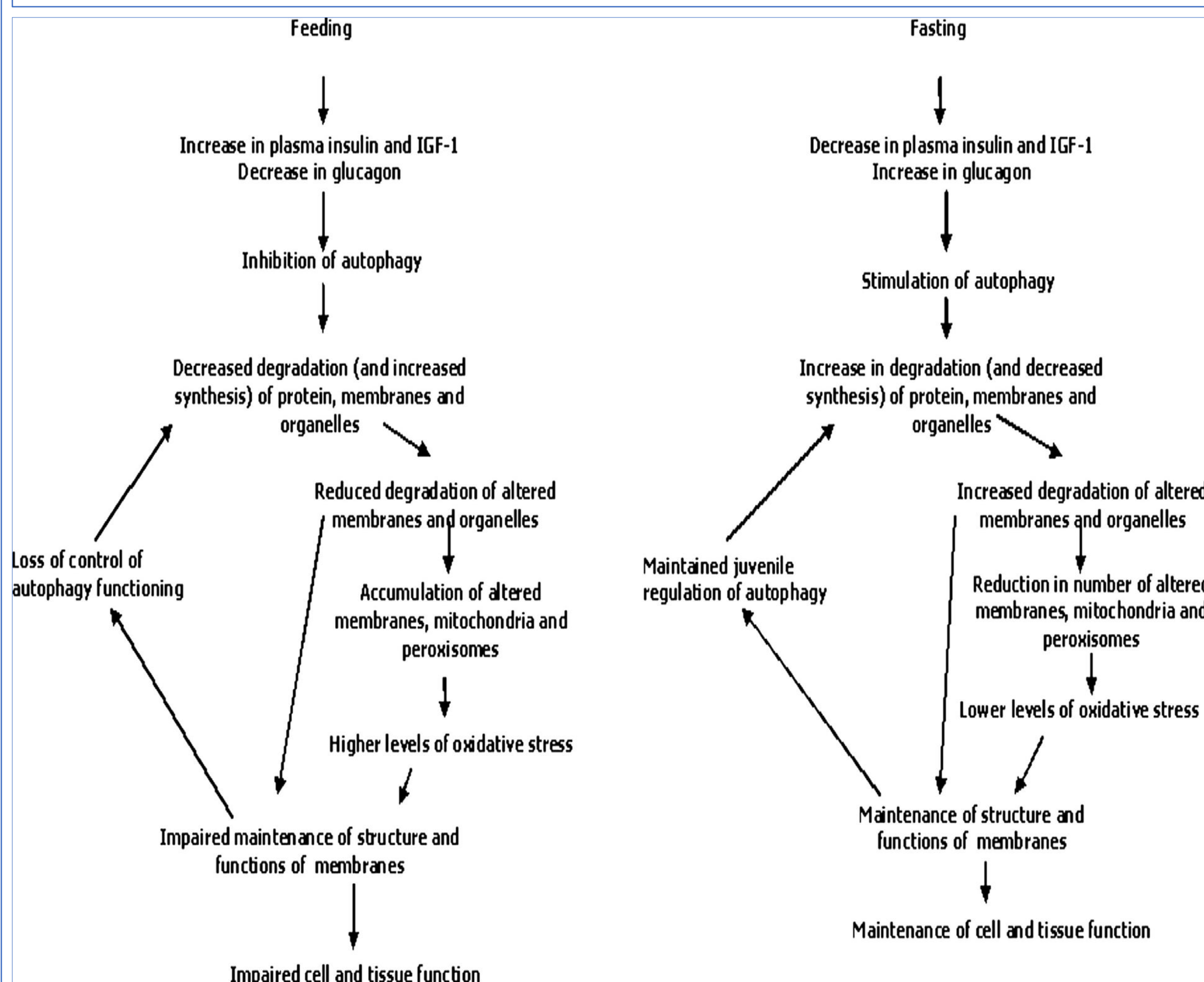
## Autophagy and Neuronal Plasticity

Dietary restriction (either caloric restriction or intermittent fasting, with maintained vitamin and mineral intake) can extend lifespan and can increase disease resistance. Recent studies have shown that DR can have profound effects on brain function and vulnerability to injury and disease. DR can protect neurons against degeneration in animal models of Alzheimer's, Parkinson's and Huntington's diseases and stroke.

Dietary restriction, particularly intermittent fasting, simulates the production of proteins that enhance neuronal plasticity and resistance to oxidative and metabolic insults.

Neurotrophic factors such as BDNF, protein chaperones such as HSPs and mitochondrial uncoupling proteins are elevated.

Analysis of the levels of mRNAs encoding of proteins in the brains of young and old rats, revealed numerous age-related changes in expression that were attenuated by DR (Lee et al. 2000c). The genes in which expression was affected by aging and counteracted by DR included those involved in oxidative stress responses, innate immunity and energy metabolism.



## Glucose, Lipid Metabolism, and Diabetes:

In the Type II diabetic population intermittent energy restriction (IER) has been shown to improve glycemic control and lipid profiles. Fasting insulin and HOMA-IR levels can be largely augmented via IER. It was shown that in a study of a little over a 100 overweight or obese premenopausal women there were comparable reductions in total and LDL cholesterol, triglycerides, blood pressure, fasting insulin, and insulin resistance. Comparing IER to caloric energy restriction (CER) there was a greater decrease in fasting insulin and insulin resistance in the group undertaking IER (7). In addition, alternate-day restriction (ADR) fasting regimen led to a greater reduction in fasting triglycerides compared to CER.

## Discussion:

The body's morning metabolic state of low insulin, high growth hormone, and high cortisol in a fasted state sets the perfect stage for lean muscle gain. In this state, growth hormone and testosterone levels correlate with one another, both acting anabolically due to its inverse relationship with sugar. When the individual does eat, the body concurs by improving glycogen uptake into the muscles, increasing protein synthesis, and increasing training capacity and tolerance. Autophagy also plays an essential role in controlling muscle mass and maintaining appropriate cell function. Intermittent fasting, specifically alternate day fasting, seems to prime the physiological environment for weight loss and reducing cardiovascular risk in obese individuals. The study previously discussed yields evidence that adiposity plays not only a role in lipid and glucose metabolism but also has an effect in hormonal responses throughout the body. Over time fasting can be used as a method to reduce adipose and correct physiologic hormonal imbalances. Autophagic dysfunction produces an accumulation of atypical mitochondria and a dilated sarcoplasmic reticulum due to the cell's inability to initiate the process of organelle recycling and rebuilding. This shows that fasting not only benefits lean muscle gain on a spectrum of physical appearance but its function at the physiological level prime the cells for maximal and efficient growth. Fasting also enhances synaptic plasticity allowing the brain to resist aging and restore function following injury which can be on a physician's radar when treating brain and nerve pathologies.

## Conclusion

Intermittent fasting should be revered for its benefits in the exercise and medical realm. The standard of 3 meals per day including breakfast in the morning, lunch midday, and dinner in the evening with the notion that breakfast is the most important meal of the day becomes debunked. The body's natural metabolic processes are optimized in intermittent fasting allowing a reduction in many disease pictures. Intermittent fasting has a vast array of effects in regard to improving health. It provides benefits in diabetes, cancer, heart disease, brain and neuronal health, hyperlipidemia, hypercholesterolemia, and aging. It revolutionizes the arduous and inefficient body building cycle of bulking/cutting in order to achieve a lean physique.

## References

1. Mattson, M. P., Longo, V. D., & Harvie, M. (2016). Review: Impact of intermittent fasting on health and disease processes. *Aging Research Reviews*, 16, S1568-S1637. doi:10.1016/j.arr.2016.10.005
2. Phillips S, Van Loon L. Dietary restriction for athletes: From requirements to optimum adaptation. *Journal of Sports Sciences*. 2011;29(sup1):S29-S38
3. Morton R, McClory C, Phillips S. Nutritional interventions to augment resistance training-induced skeletal muscle hypertrophy. *Frontiers in Physiology*. 2013;6
4. Johnston C, Tjonn S, Swan P, White A, Hutchins H, Sears B. Ketogenic low-carbohydrate diets have no metabolic advantage over nonketogenic low-carbohydrate diets. *The American Journal of Clinical Nutrition*. 2006;83(6):1055-1061.
5. Ho K, Veidhais J, Johnson M, Furlanetto R, Evans W, Alberti K et al. Fasting enhances growth hormone secretion and amplifies the complex rhythms of growth hormone secretion in man. *Journal of Clinical Investigation*. 1988;81(4):968-972
6. Rojmark S, Asplund A, Rosner S. Pituitary-testicular axis in obese men during short-term fasting. *European Journal of Endocrinology*. 1989;121(5):727-732
7. Harvie M, Pegington M, Mattson M, Frystyk J, Dillon B, Evans G et al. The effects of intermittent or continuous energy restriction on weight loss and metabolic disease risk markers: a randomized trial in young overweight women. *International Journal of Obesity*. 2010;35(5):714-722