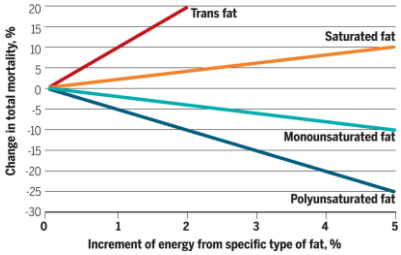
Fasting 101

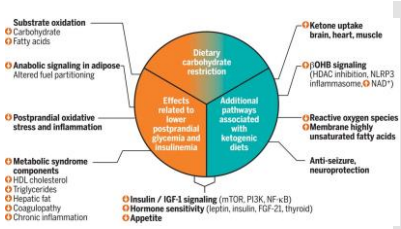
Kristin Kirkpatrick, MS, RDN

Nutrition in the News

Harvard Takes on Fat

David S. Ludwig, Walter C. Willett, Jeff S. Volek, Marian L. Neuhouser. **Dietary fat: From foe to friend?** *Science*, 2018; 362 (6416): 764





Fried foods kill

RESEARCH

OPEN ACCESS

Association of fried food consumption with all cause, cardiovascular, and cancer mortality: prospective cohort study

Yanghe Sun,[1] Baoyu Liu,[1] Linda G Snetselaar,[1] Jennifer G Robinson,[1,2] Robert B Wallace,[1] Lindsay L Peterson,[1] Wei Bao[1,2,3]

ABSTRACT

OBJECTIVE
To examine the prospective association of total and individual fried food consumption with all cause and cause specific mortality in women in the United States.

DESIGN
Prospective cohort study.

SETTING
Women's Health Initiative conducted in 40 clinical centers in the US.

PARTICIPANTS
106 966 postmenopausal women aged 50-79 at study entry who were enrolled between September 1993 and 1998 in the Women's Health Initiative and followed until February 2017.

Introduction

Fried foods are widely consumed in the United States and worldwide. Frying is a complex cooking process that modifies the composition of foods and the frying medium through oxidation, polymerization, and hydrogenation.[1] During frying, foods can lose water and absorb fat, and the frying oils deteriorate, especially when reused.[1] Moreover, frying makes food crispy and more appetizing, which can lead to excess intake.[2]

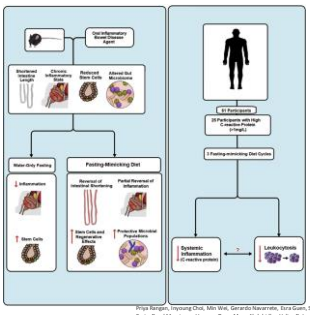
Several cohort studies in US populations showed that higher consumption of fried foods was associated with an increased risk of type 2 diabetes[3] and cardiovascular diseases,[4-6] which are among the leading causes of death. However, a study in a Mediterranean population found no association between fried food consumption

BMJ | first published on 11 January 2019; 1

One or more servings of fried chicken a day was linked to a 13% higher risk of death from any cause and a 12% higher risk of heart-related death compared with no fried food.

Similarly, one or more servings of fried fish/shellfish a day was linked to a 7% higher risk of death from any cause and a 13% higher risk of heart-related death compared with no fried food.

Fasting Mimicking Diet and Inflammation



Priya Bangen, Inyoung Choi, Min Wei, Gerardo Navarrete, Ezra Guen, Sebastian Brandhorst, Nobel Enyati, Gab Pasia, Dand Maesincxx, Vanessa Ocon, Maya Abdulridha, Valter D. Longo. **Fasting-Mimicking Diet Modulates Microbiota and Promotes Intestinal Regeneration to Reduce Inflammatory Bowel Disease Pathology**. *Cell Reports*, 2019; 26 (10): 2704

A clinical trial shows reduction of inflammation in humans and in mice, the diet appears to reverse Crohn's and colitis pathology

- FMD cycles partially reverse IBD-related pathology compared to water-only fasting
- FMD cycles reduce intestinal inflammatory and immune and increase regenerative markers
- FMD cycles promote the expansion of Lactobacillaceae and Bifidobacteriaceae
- FMD cycles can reduce systemic inflammation and consequent leukocytosis in humans

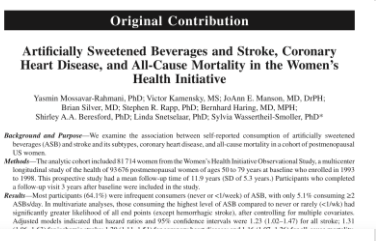
Food and Mood: supplements not the same as food

MooDFOOD prevention trial

(the largest randomized clinical trial to study the effects of nutritional strategies on the prevention of major depressive disorder).

Food behavioral therapy only works if the participants get sufficient exposure and are able to sufficiently improve their diet and dietary behavior.

In a large observational study, women who reported drinking more than one diet soda or other artificially sweetened drink a day had a higher risk of strokes caused by a blood clot



Original Contribution

Artificially Sweetened Beverages and Stroke, Coronary Heart Disease, and All-Cause Mortality in the Women's Health Initiative

Yasmin Mossavar-Rahmani, PhD; Victor Kamensky, MS; JoAnn E. Manson, MD, DrPH; Brian Silver, MD; Stephen R. Rapp, PhD; Bernhard Haring, MD, MPH; Shirley A.A. Beresford, PhD; Linda Snetselaar, PhD; Sylvia Wassertheil-Smoller, PhD*

Background and Purpose—We examine the association between self-reported consumption of artificially sweetened beverages (ASB) and stroke and its subtypes, coronary heart disease, and all-cause mortality in a cohort of postmenopausal US women.

Methods—The analytic cohort included 81 714 women from the Women's Health Initiative Observational Study, a multicenter longitudinal study of the health of 93 676 postmenopausal women of ages 50 to 79 years at baseline who enrolled in 1993 to 1998. This prospective study had a mean follow-up time of 11.9 years (SD of 5.3 years.) Participants who completed a follow-up visit 3 years after baseline were included in the study.

Results—Most participants (64.1%) were infrequent consumers (never or <1/week) of ASB, with only 5.1% consuming ≥2 ASBs/day. In multivariate analyses, those consuming the highest level of ASB compared to never or rarely (<1/wk) had significantly greater likelihood of all end points (except hemorrhagic stroke), after controlling for multiple covariates. Adjusted models indicated that hazard ratios and 95% confidence intervals were 1.23 (1.02–1.47) for all stroke; 1.31

Artificially Sweetened Beverages and Stroke, Coronary Heart Disease, and All-Cause Mortality in the Women's Health Initiative. *Stroke* 2019

Is interval training the magic bullet for fat loss? A systematic review and meta-analysis comparing moderate-intensity continuous training with high-intensity interval training (HIIT)

Ricardo Borges Viana,[1] João Pedro Araújo Naves,[1] Victor Silveira Coswig,[2] Claudio Andre Barbosa de Lira,[1] James Steele,[3] James Peter Fisher,[3] Paulo Gentil[1]

ABSTRACT

Objectives To compare the effects of interval training and moderate-intensity continuous training (MOD) on body adiposity in humans, and to perform subgroup analyses that consider the type and duration of interval training in different groups.

Design Systematic review and meta-analysis.

Data sources English-language, Spanish-language and Portuguese-language searches of the electronic databases PubMed and Scopus were conducted from inception to 11 December 2017.

Eligibility criteria for selecting studies Studies that met the following criteria were included: (1)

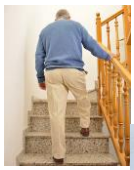
INTRODUCTION

Whether physical activity affects weight control has been an ongoing topic of controversy.[1 2] The majority of physical activity guidelines for the management of obesity recommend high exercise volumes.[3 4] Guidelines generally recommend 150–250 min/week, and up to 60 min/day, of moderate-intensity aerobic exercise to prevent weight gain or to reduce body mass a little bit (2–3 kg).[4 5] More than an hour of exercise daily (>420 min/week) is recommended to lose more weight (5–7.5 kg)[5] and few people meet these guidelines.[6 7]

Interval training may have the potential to

Emmanuel Stamatakis, Nathan J Johnson, Leanne Revol, Mark Hamer, Regan Bergouignan, Andreas Holtermann. **Short and sporadic bouts in the 2018 US physical activity guidelines: is high-intensity incidental physical activity the new HIIT?** *British Journal of Sports Medicine* 2018; bjsports-2018-100197

High Intensity Incidental Physical Activity (HIIPA)



The Current State of the Nation

Prevalence of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2016

Source: Behavioral Risk Factor Surveillance System

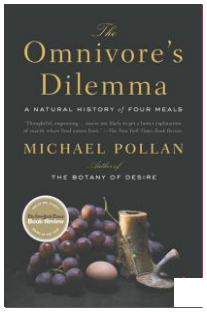
Aging well is dependent on lifestyle choices

1. Something that comes from nature

2. Was fed from nature

3. Will eventually rot

-Michael Pollan



Food

Not Food

Food

Not Food

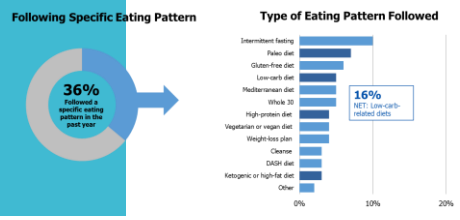
FASTING 101

Calorie restriction lets monkeys live long and prosper

Caloric restriction improves health and survival of rhesus monkeys

One-Third of Consumers Follow a Specific Eating Pattern

A higher number of younger consumers (18 to 34) followed a specific eating pattern/diet



The International Food Information Council (IFIC) Foundation's 2018 Food and Health Survey

All fasting has benefits

"There is considerable similarity between how cells respond to the stress of exercise and how cells respond to intermittent fasting"

– Mark Mattson
(Collier, 2013)

NIH Public Access
Author Manuscript

Published in final edited form as:
Cell Metab. 2014 February 4; 19(2): 181–192. doi:10.1016/j.cmet.2013.12.008.

Fasting: Molecular Mechanisms and Clinical Applications

Valter D. Longo[1] and Mark P. Mattson[2,3]
[1]Longevity Institute, Davis School of Gerontology and Department of Biological Sciences, University of Southern California, Los Angeles, CA 90089-2520, USA
[2]National Institute on Aging Intramural Research Program, National Institutes of Health, Baltimore, Maryland 21224, USA
[3]Department of Neuroscience, Johns Hopkins University School of Medicine, Baltimore, Maryland 21205, USA

Abstract

Fasting has been practiced for millennia, but only recently studies have shed light on its role in adaptive cellular responses that reduce oxidative damage and inflammation, optimize energy metabolism and bolster cellular protection. In lower eukaryotes, chronic fasting extends longevity in part by reprogramming metabolic and stress resistance pathways. In rodents intermittent or periodic fasting protects against diabetes, cancers, heart disease and neurodegeneration, while in humans it helps reduce obesity, hypertension, asthma and rheumatoid arthritis. Thus, fasting has the potential to delay aging and help prevent and treat diseases while minimizing the side effects caused by chronic dietary interventions.

Longo VD, Mattson MP. Fasting: Molecular Mechanisms and Clinical Applications. *Cell metabolism*. 2014;19(2):181-192. doi:10.1016/j.cmet.2013.12.008.

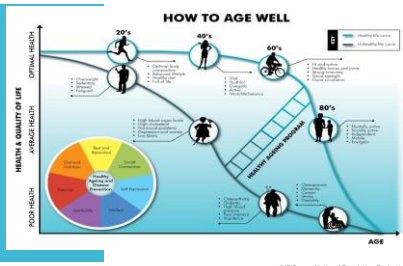
Steady Stream of Sugar and Refined Carbs Also Contribute to Disease

Our culture is one of overeating, obesity, disease and increased mortality

The most recent NHANES statistics show that almost 40% of Americans are obese and over 70% of Americans are overweight

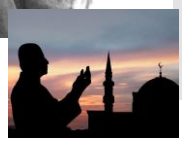
The Western dietary pattern accelerates aging pathways

Eat O'Clock Round (Large) Wall Clo... by PhotoPoint



(US Census National Population Projections 2012
CDC, National Center for Health Statistics, National Health Interview Survey 2010
CDC, National Center for Chronic Disease Prevention & Health Promotion 2012)

A History of Fasting



What is Fasting?

- Absence of food for a specific period of time
- Comparison of Fasting and starvation
- What is a Biologic Fast

Fasting is the Forgotten Balance for Living Healthier, Longer

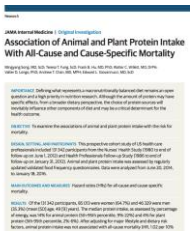
"the body has everything in it to fix itself. Due to the rejuvenation and regeneration aspects of fasting, it is clear that a fasting regimen, and especially a fasting mimicking diet can help to prolong life and "fix" the body."

*-**Valter Longo, PhD**, one of the world's preeminent fasting and longevity experts and TIME Magazines* **50 Most Influential People in Health Care of 2018**

How diet leads to rapid acceleration of aging

Food and Aging

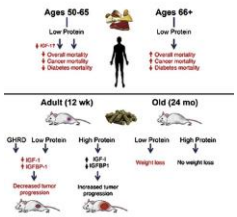
Excess protein, especially animal protein associated with an increase in mortality



JAMA Internal Medicine | Original Investigation

Association of Animal and Plant Protein Intake With All-Cause and Cause-Specific Mortality

Protein and IGF-1



Cell

Article

Low Protein Intake Is Associated with a Major Reduction in IGF-1, Cancer, and Overall Mortality in the 65 and Younger but Not Older Population

Protein intake and mortality

- ✓ High animal protein intake positively associated with mortality
- ✓ High plant protein intake was inversely associated with mortality
- ✓ Substitution of plant protein for animal protein, especially from processed red meat, was associated with lower mortality

JAMA®
The Journal of the American Medical Association

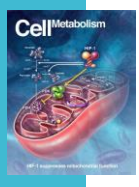
Song M, Fung TT, Hu FB, et al. Association of Animal and Plant Protein Intake With All-Cause and Cause-Specific Mortality. *JAMA Intern Med.* 2016;176(10):1453–1463. doi:10.1001/jamainternmed.2016.4182

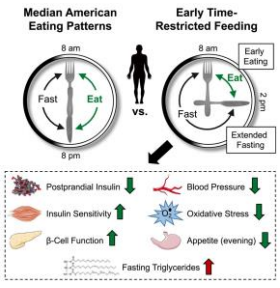
Types of fasting

Types of Fasting

- **Time Restricted Feeding** (**TRF**)
  - A type of intermittent fasting, refers to studies in mice
- **Time Restricted Eating (TRE)**
  - A type of intermittent fasting, refers to studies in humans
- **Intermittent Fasting (IF)**
  - Fasting for 24 hours but less than 2 days
- **Short Term Fast (ST)**
  - 2-3 consecutive days
- **Alternate Day Fasting** (**ADA**):
  - Fasting every other day
- **Prolonged Fasting**
  - Fasting for 4 days or longer
- **Fasting Mimicking Diet (FMD)**
  - Mimics prolonged Fasting, done with food and supplements

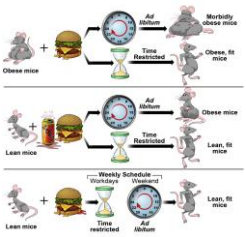
Time restricted eating





Sutton EF, Beyl R, Early KS, Cefalu WT, Ravussin E, Peterson CM. Early Time-Restricted Feeding Improves Insulin Sensitivity, Blood Pressure, and Oxidative Stress Even without Weight Loss in Men with Prediabetes. *Cell Metabolism*. 2018;27(6):1212-1221. doi:10.1016/j.cmet.2018.04.010

Time restricted eating



Chaix A, Zarrinpar A, Miu P, Panda S. Time-restricted feeding is a preventative and therapeutic intervention against diverse nutritional challenges. Cell metabolism. 2014;20(6):991-1005. doi:10.1016/j.cmet.2014.11.001.

Time restricted eating

Special Article

NUTRITION REVIEWS

Time-restricted feeding and risk of metabolic disease: a review of human and animal studies

Jeff Rothschild, Kristin K Hoddy, Pera Jambazian, and Krista A Varady

Time-restricted feeding (TRF), a key component of intermittent fasting regimens, has gained considerable attention in recent years. TRF allows ad libitum energy intake within controlled time frames, generally a 3–12 hour range each day. The impact of various TRF regimens on indicators of metabolic disease risk has yet to be investigated. Accordingly, the objective of this review was to summarize the current literature on the effects of TRF on body weight and markers of metabolic disease risk (i.e., lipid, glucoregulatory, and inflammatory factors) in animals and humans. Results from animal studies show TRF to be associated with reductions in body weight, total cholesterol, and concentrations of triglycerides, glucose, insulin, interleukin 6, and tumor necrosis factor-α as well as with improvements in insulin sensitivity. Human data support the findings of animal studies and demonstrate decreased body weight (though not consistently), lower concentrations of triglycerides, glucose, and low-density lipoprotein cholesterol, and increased concentrations of high-density lipoprotein cholesterol. These preliminary findings show promise for the use of TRF in modulating a variety of metabolic disease risk factors.

Jeff Rothschild, Kristin K Hoddy, Pera Jambazian, Krista A Varady, Time-restricted feeding and risk of metabolic disease: a review of human and animal studies, Nutrition Reviews, Volume 72, Issue 5, 1 May 2014, Pages 308–318, https://doi.org/10.1111/nure.12104

Time restricted eating: impact on skipping breakfast

Skipping breakfast is associated with increasing risk of mortality from circulatory diseases and all causes among men and all causes mortality among women in Japan

Yokoyama Y, Onishi K, Hosoda T, et al. Skipping Breakfast and Risk of Mortality from Cancer, Circulatory Diseases and All Causes: Findings from the Japan Collaborative Cohort Study. *Yonago Acta Medica*. 2016;59(1):55-60.

Delaying breakfast by 90 minutes / eating dinner 30 minutes early led to loss of fat

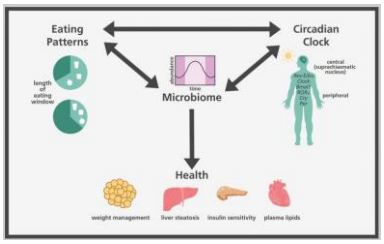

JNS
JOURNAL OF NUTRITIONAL SCIENCE

BRIEF REPORT

A pilot feasibility study exploring the effects of a moderate time-restricted feeding intervention on energy intake, adiposity and metabolic physiology in free-living human subjects

Rona Antoni*, Tracey M. Robertson, M. Denise Robertson and Jonathan D. Johnston

Timed restricted eating: gut microbial diversity



Kaczmarek JL, Thompson SV, Holscher HD. Complex interactions of circadian rhythms, eating behaviors, and the gastrointestinal microbiota and their potential impact on health. *Nutrition Reviews*. 2017;75(3):673-682. doi:10.1093/nutrit/nux036.

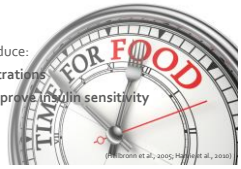
Intermittent Fasting

- Alternate Day Fasting or the "5:2" diet is an example
- Most clinical trials comparing 60-70% of kcal restriction on alternative days or 2 consecutive days
- To be followed continuously week after week

Health effects of IF:

3 weeks of alternate-day fasting has been shown to reduce:

- **body weight, body fat, and plasma insulin concentrations**
- **2 days / week of 500 calories has been shown to improve insulin sensitivity**
- **May lowers abdominal fat and blood pressure**



(Heilbronn et al., 2005; Halberg et al., 2010)

Intermittent fasting: performance


Metabolic and molecular framework for the enhancement of endurance by intermittent food deprivation

Abstract

Mattson M.P., Moehl K., Ghena N., Schmaedick M., Cheng A. Intermittent metabolic switching, neuroplasticity and brain health. Nat. Rev. Neurosci. 2018;19:63–80. doi: 10.1038/nrn.2017.156.

Mattson MP, Moehl K, Ghena N, Schmaedick M, Cheng A. Intermittent metabolic switching, neuroplasticity and brain health. Nat Rev Neurosci. 2018 Feb;19(2):63-80. doi: 10.1038/nrn.2017.156

Marosi K, Moehl K, Navas-Enamorado I, Mitchell SJ, Zhang Y, Lehrmann E, Aon MA, Cortassa S, Becker KG, Mattson MP. Metabolic and molecular framework for the enhancement of endurance by intermittent food deprivation. FASEB J. 2018 Jul;32(7):3844-3858. doi: 10.1096/fj.201701338RR

Intermittent fasting: cardiac benefits

Fasting may be associated with lower prevalence of cardiovascular disease and and diabetes diagnosis

Intermittent fasting may improve health; however, substantial additional clinical research is needed before advocating its use for health purposes.

Benjamin D Horne, Joseph B Muhlestein, Jeffrey L Anderson, Health effects of intermittent fasting: hormesis or harm? A systematic review, *The American Journal of Clinical Nutrition*, Volume 102, Issue 2, 1 August 2015, Pages 464–470, https://doi.org/10.3945/ajcn.115.109553

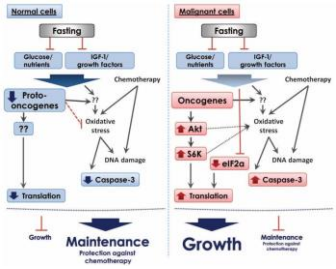
Prolonged fasting: anti-inflammatory benefits

Youm Y-H, Nguyen K.Y, Grant RW, et al. Ketone body β-hydroxybutyrate blocks the NLRP3 inflammasome-mediated inflammatory disease. *Nature medicine*. 2015;21(3):263-269. doi:10.1038/nm.3804.

Prolonged fasting and cancer

Study Suggests that multiple cycles of fasting may promote differential stress sensitization and could potentially replace or augment the efficacy of certain chemotherapy drugs in the treatment of various cancers

Science Translational Medicine
AAAS



Lee C, Raffaghello L, Longo VD. Starvation, detoxification, and multidrug resistance in cancer therapy. *Drug resistance updates : reviews and commentaries in antimicrobial and anticancer chemotherapy*. 2012;15(1-2):114-122. doi:10.1016/j.drup.2012.01.004.

Fasting Mimicking Diets (FMDs)

FMDs are a form of periodic prolonged fasting that combine very specific ratios of Protein Restriction, Mild Calorie Restriction, and Low-Glycemic Index Ingredients

This combination downregulates the body's nutrient-sensing pathways (mTOR/PKA/PKB), while stimulating anti-aging pathways to promote cellular regeneration & rejuvenation

FMDs mimic the beneficial effects of fasting without the challenges

Benefits of fasting mimicking diet (FMD) will be covered in section 2

Induced stress onto the cell → stem cell regeneration/rejuvenation + autophagy

Comparison of Dietary Regimens

Category	Animal Protein	Plant Protein	Saturated Fat	Unsaturated Fat	Sugars	Complex Carbohydrates
Western	High	Low	High	Low	High	Low
Caloric Restriction	Low/Normal	Low/Normal	Low/Normal	Low/Normal	Low/Normal	Low/Normal
Mediterranean	Normal	Low - Moderate	Low	High	Moderate	High
Fasting Mimicking Diet	None	Low	Very Low	High	Very Low	High
Protein Restriction	Low	Low	Normal	Normal	Normal	Normal

Impact on Health Factors

Category	Weight Loss	Lean Body Mass Protection	Cholesterol Impact	Fasting Blood Glucose	Rejuvenation & Regeneration
Calorie Restriction	✓		✓	✓	
Intermittent Fasting	✓✓		✓	✓✓	
Time-Restricted Feeding	✓		✓	✓	
Periodic Fasting	✓✓✓		✓	✓✓✓	✓✓✓
Fasting Mimicking Diet	✓✓✓	✓✓	✓	✓✓✓	✓✓✓

Water Only Fasts

Water only fast limit all food and Drink except water. Usually done over The course of 24 hours or more, this Fast is difficult to sustain and requires Medical supervision

Health benefits:
Triggers autophagy
Reduces risk for certain chronic diseases

Risks of Water Only Fasts

- Loss of Lean Muscle
- Dehydration
- Unsafe drop in blood pressure
- Can make existing conditions worse
- Slows metabolism
- Malnourishment

5 Day Fasting

Benefits

SCIENCE TRANSLATIONAL MEDICINE

SCIENCE TRANSLATIONAL MEDICINE | RESEARCH ARTICLE

METABOLIC DISEASE

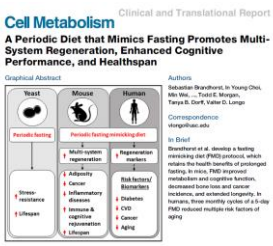
Fasting-mimicking diet and markers/risk factors for aging, diabetes, cancer, and cardiovascular disease

Min Wei,[1*] Sebastian Brandhorst,[1*] Mahshid Shelehchi,[1] Hamed Mirzaei,[1] Chia Wei Cheng,[1] Julia Budniak,[1] Susan Groshen,[2] Wendy J. Mack,[3] Ezra Guen,[1] Stefano Di Biase,[1] Pinchas Cohen,[1] Todd E. Morgan,[1] Tanya Dorff,[3] Kurt Hong,[4] Andreas Michalsen,[5] Alessandro Laviano,[6] Valter D. Longo[1,7]†

Calorie restriction or changes in dietary composition can enhance healthy aging, but the inability of most subjects to adhere to chronic and extreme diets, as well as potentially adverse effects, limits their application. We randomized 100 generally healthy participants from the United States into two study arms and tested the effects of a fasting-mimicking diet (FMD) consumed for five days per month for three months on risk factors/markers/risk factors associated with aging and age-related diseases. We compared subjects who followed 3 months of an unrestricted diet to subjects who consumed the FMD for 5 consecutive days per month for 3 months. Three FMD cycles reduced body weight, trunk, and total body fat; lowered blood pressure; and decreased insulin-like growth factor 1 (IGF-1). No serious adverse effects were reported. After 3 months, control diet subjects were crossed over to the FMD program, resulting in a total of 71 subjects completing three FMD cycles. A post hoc analysis of subjects from both FMD arms showed that body mass index, blood pressure, fasting glucose, IGF-1, triglycerides, total and low-density lipoprotein cholesterol, and C-reactive protein were more beneficially affected in participants at risk for disease than in subjects who were not at risk. Thus, cycles of a 5-day FMD are safe, feasible, and effective in reducing markers/risk factors for aging and age-related diseases. Larger studies in patients with diagnosed diseases or selected on the basis of risk factors are warranted to confirm the effect of the FMD on disease prevention and treatment.

5 Day Fasting

Benefits



Cell Metabolism Clinical and Translational Report

A Periodic Diet that Mimics Fasting Promotes Multi-System Regeneration, Enhanced Cognitive Performance, and Healthspan

Graphical Abstract

Authors

Sebastian Brandhorst, In Young Choi, Min Wei, ..., Todd E. Morgan, Tanya B. Dorff, Valter D. Longo

Correspondence

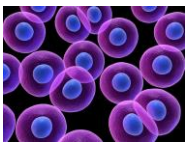
vlongo@usc.edu

In Brief

Brandhorst et al. develop a fasting mimicking diet (FMD) protocol, which retains the health benefits of prolonged fasting. In mice, FMD improved metabolism and cognitive function, decreased bone loss and cancer incidence, and extended longevity. In humans, three monthly cycles of a 5-day FMD reduced multiple risk factors of aging

Cellular Functional Optimization:

Fasting Mimicking Diet may trigger stem cell-based rejuvenation and autophagy, (the clean up of aging & damaged cells) & promote stem cell-based renewal



Consumer Application of Fasting

1. Determine if fasting is a good option for your patient

2. Determine which fasting type would make the most sense given the following factors
   - Overall goals
   - Risk factors
   - Social factors

Contraindications
Symptoms
Labs
Protocols

Certain Populations Should Abstain from Fasting Mimicking Diets

- Pregnant Women
- People who are underweight, have very low body mass <18.5 or suffer from anorexia
- People over the age of 70, WHO LOOK FRAGILE OR HAVE SOME COMORBIDITY (unless in superior health)
- Type 1 Diabetes
- Heart failure
- People with liver or kidney disease
- People affected by pathologies, unless they have prior approval from their specialized Doctor

Certain Populations Should Abstain from Fasting Mimicking Diets

- In the cases of serious or relatively serious illness (cancer, diabetes, autoimmune disease, cardiovascular disease, neurodegenerative disease)
- individuals on medication
- Individuals with certain rare genetic mutations
- Patients with low blood pressure or on medication for hypertension
- Athletes during training or competition

Possible Side Effects of Prolonged Fasting / FMD

Please be aware of and inform the user of all potential side-effects associated with a low calorie, low carbohydrate and low protein meal program, which may include:

- Fatigue
- Weakness
- Headache (including caffeine withdrawal)
- Dry mouth
- Memory impairment
- Muscle pain

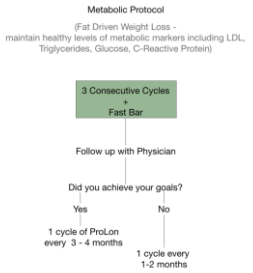
Laboratory Testing Before / After Fasting Regimen
Testing can be done before and after 3 cycles of FMD

Blood Tests
- Cholesterol (total, HDL, LDL)
- Triglycerides
- hs-CRP
- Insulin Like Growth Factor (IGF)
- fasting blood glucose
- Insulin resistance (HOMA test)

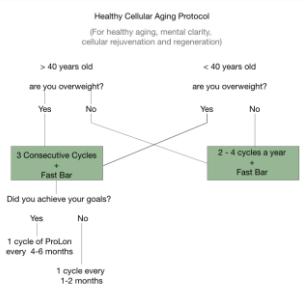
Non Blood Tests
- Weight
- Blood pressure
- Waist circumference
- Body Mass Index (or a proxy for waist circumference)

Other subjective measurements which reflects the stem cell spike are high level of energy which starts by end of day 4 and increase on day 5-10); sharp mental focus, physical performance

Patient Protocols
Metabolic



Patient Protocols
Healthy Aging



kristinkirkpat

krissypicks

kristinkirkpatrickRD

www.kristinkirkpatrick.com