Practical Fasting:
The Use of Therapeutic Fasting in a Clinical Setting in the Treatment of Metabolic Syndrome

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Disclosures

President & Co-Founder of the Intensive Dietary Management Program.

No funding. No advertisements.

My Partner in Crime: Dr. Jason Fung

Today…

- Patient demographics

- Selecting the appropriate fasting regimen

- Protocols

- Common concerns

The Numbers...

- Launched in June 2013

- Treated over 5000 patients

    - Time restricted eating windows

    - Intermittent fasting

    - Extended fasting

- Over 70% had some degree of diabetes

- Less than 10% for disease prevention

Typical IDM Patient: Health Profile

- 40 years-old+

- Exercise < 3 times per week

- Metabolic Syndrome

- On medication for hypertension and dyslipidemia

- At least one secondary side effect of diabetes

Typical IDM Patient: Socioeconomic Profile

- Short-term or long-term disability

- Newcomers to Canada

- LCHF not always possible

- Is there hope?

Absolutely

FASTING

What do we treat with therapeutic fasting?

- ▶ Obesity
- ▶ DMII
- ▶ NAFLD
- ▶ PCOS
- ▶ Sleep apnea
- ▶ **INSULIN RESISTANCE**

What are we learning about?

- Cancers
- Tumor growth
- Neurological Conditions
  - Neuropathy
  - MS
  - Parkinson's Disease
- Autoimmune Disorders
- High-Performance Athletes

What is considered therapeutic fasting?

- Time restricted eating
- Skipping one meal per day
  - 16:8 or 18:6
- Intermittent fasting
  - 24, 36 or 42 hours
  - 3 times per week
- Prolonged periods of fasting
  - 2+ days

How to select the right fasting regimen?
Medical Considerations

- Maintain = 1-2 times per week
- Improve = 3 times per week

Duration of Fast	Condition(s)
24 hours	• Disease Prevention • Obesity (Body Fat % < 40%) • PCOS • Borderline DM • DMII, no medications • Very ill
36 & 42 hours Extended Fasts (2-14 days)	• Obesity (Body Fat % > 40%) • DMII, on medications • Not on dialysis, no CHF, relatively healthy

How to select the right fasting regimen?
Mental Considerations

▶ History of negative body image

▶ History of addictive behaviors and substance abuse

▶ Family history

  ▶ Poverty: food stamps, etc.

▶ Emotional eating/coping

# Selecting the Right Fasting Regimen: Lifestyle Considerations

- Career
  - Work environment
  - Meetings
  - Stress
- Family
  - Support
  - Children/age group of children
  - Chef
- Physical Activity

We are <u>not a one size fits all</u> program!

Additional Dietary Recommendations

- Eliminate refined carbohydrates
- LCHF
- Ketogenic Diet
- Active with healthy body composition, more protein
- Inactive with unhealthy body composition, moderate-low protein
- NO SNACKING

What can patients consume during a fast?
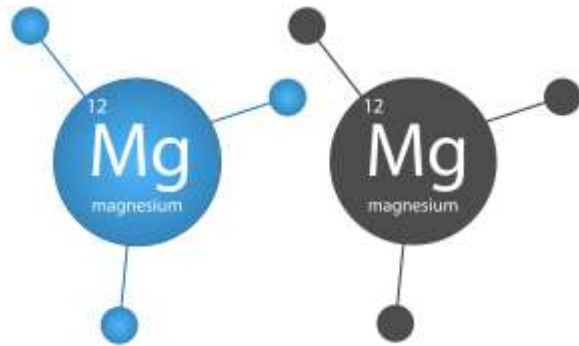
Common Concerns

Electrolytes

Refeeding

Lean Mass

Metabolic Rate

Electrolytes

Certain minerals in the blood: sodium, chloride, potassium, calcium phosphorus and magnesium

Sodium & Chloride (Salt)

- Daily salt requirements are quiet low

- We do recommend people supplement with some good quality salt

Potassium, Calcium, Magnesium & Phosphorus

▶ <u>Potassium</u>: May slightly decrease during a fast but remain in the normal range

▶ <u>Magnesium</u>: Recommend taking magnesium to almost everyone

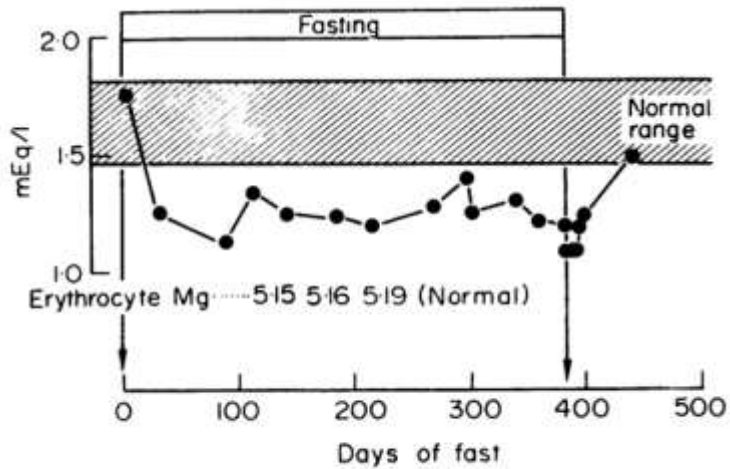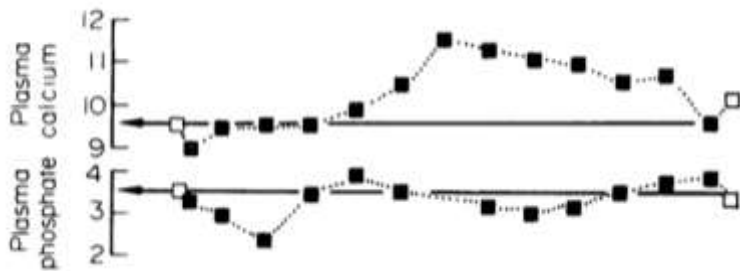▶ <u>Calcium & Phosphorus</u>: Remain stable during the fast

FIG. 2. Plasma magnesium concentrations.

Angus Barbieri

▶ Fasted for 382 days

▶ 456 → 180 lbs

▶ Remained hydrated

▶ Took electrolytes

RULE #1:

NEVER FAST SOMEONE WHO IS MALNOURISHED!

Refeeding Syndrome: Angus Barbieri

456 → 180 lbs

Box 3 Criteria from the guidelines of the National Institute for Health and Clinical Excellence for identifying patients at high risk of refeeding problems (level D recommendations*)[3]

Either the patient has one or more of the following:

- Body mass index (kg/m^2) <16
- Unintentional weight loss >15% in the past three to six months
- Little or no nutritional intake for >10 days
- Low levels of potassium, phosphate, or magnesium before feeding

Or the patient has two or more of the following:

- Body mass index <18.5
- Unintentional weight loss >10% in the past three to six months
- Little or no nutritional intake for >5 days
- History of alcohol misuse or drugs, including insulin, chemotherapy, antacids, or diuretics

*Recommendations derived from low grade evidence—mainly cohort and case series studies—and from consensus expert opinion

BMJ 2008;336:1495-8

Refeeding Syndrome

▶ Occurs within ~2 days after ending an extended fast

▶ Electrolytes (phosphorus) are depleted due malnourishment

▶ Prone to occur if the patient is malnourished and doesn't have sufficient fat stores – not our patients

Refeeding Syndrome Prevention

- Do not recommend prolonged periods of water only fasting

- Remain hydrated

- Take electrolytes

- Keep up your regular activities

Loss of Lean Mass

- Bottom-line: We need more data

- Clinical observation: we see lean mass gain

Lean Mass Loss – Clinical Example

- Female, 53-year-old
- Fasting Regimen (2 years):
  - 4 days (96 hours) once a month
  - 16-24 hour fasts daily
- Exercise:
  - Weight-training, 2x/week
- Diet: Ketogenic
  - Adjusts protein accordingly to support elevated level of lean mass

Loss of Lean Mass

Summary-TotalBodyCompositionAnalysis

ThetotalbodycompositiontablesummarizesthemetricsofyourentirebodyanddisplaysyourTotalBodyFat%,TotalMass(lbs),FatTissue
(lbs),LeanTissue(lbs),BoneMineralContent(BMC),andVisceralFat(lbs).

MeasuredDate	TotalBodyFat%	TotalMass	FatTissue	LeanTissue	BMC	VisceralFat
07/05/2017	45.3%	250.5lbs	113.5lbs	130.4lbs	6.6lbs	3.61lbs
03/15/2017	46.2%	247.3lbs	114.4lbs	126.3lbs	6.6lbs	3.47 lbs

**Gained 4.1 lbs of
lean mass**

A Randomized Pilot Study Comparing Zero-Calorie Alternate-Day Fasting to Daily Caloric Restriction in Adults with Obesity

Victoria A. Catenacci[1,2], Zhaoxing Pan[3], Danielle Ostendorf[2,4], Sarah Brannon[5], Wendolyn S. Gozansky[6], Mark P. Mattson[7,8], Bronwen Martin[9], Paul S. MacLean[1,2], Edward L. Melanson[1,10], and William Troy Donahoo[1,6]

Objective: To evaluate the safety and tolerability of alternate-day fasting (ADF) and to compare changes in weight, body composition, lipids, and insulin sensitivity index (Si) with those produced by a standard weight loss diet, moderate daily caloric restriction (CR).

Methods: Adults with obesity (BMI ≥ 30 kg/m^2, age 18-55) were randomized to either zero-calorie ADF ($n = 14$) or CR (-400 kcal/day, $n = 12$) for 8 weeks. Outcomes were measured at the end of the 8-week intervention and after 24 weeks of unsupervised follow-up.

Results: No adverse effects were attributed to ADF, and 93% completed the 8-week ADF protocol. At 8 weeks, ADF achieved a 376 kcal/day greater energy deficit; however, there were no significant between-group differences in change in weight (mean $\pm$ SE; ADF -8.2 ± 0.9 kg, CR -7.1 ± 1.0 kg), body composition, lipids, or Si. After 24 weeks of unsupervised follow-up, there were no significant differences in weight regain; however, changes from baseline in % fat mass and lean mass were more favorable in ADF.

Conclusions: ADF is a safe and tolerable approach to weight loss. ADF produced similar changes in weight, body composition, lipids, and Si at 8 weeks and did not appear to increase risk for weight regain 24 weeks after completing the intervention.

TABLE 4 Changes in anthropometric measures at the end of the 8-week intervention and after 24 weeks of unsupervised follow-up[a]

Outcome variable and group	Assessment period			Week 8–baseline	P	ES	Week 32–baseline	P	ES	Week 32–week 8	P	ES	P value for overall interaction
	Baseline	Week 8	Week 32										
Weight (kg)													
CR	114.0 (4.6)	106.9 (4.5)	109.0 (4.7)	−7.1 (1.0)	<0.001		−5.0 (1.6)	0.005		2.1 (1.0)	0.047		
ADF	94.8 (4.4)	86.5 (4.4)	89.1 (4.5)	−8.2 (0.9)	<0.001		−5.7 (1.5)	0.001		2.6 (1.0)	0.013		
CR–ADF	19.3 (6.3)	20.4 (6.3)	19.9 (6.5)	1.1 (1.3)	0.409	−0.35	0.7 (2.2)	0.774	−0.12	−0.5 (1.4)	0.739	0.14	0.559
Weight (%)													
CR				−6.2 (0.9)	<0.001		−4.4 (1.6)	0.011		−1.8 (1.0)	0.082		
ADF				−8.8 (0.9)	<0.001		−5.9 (1.5)	<0.001		−2.9 (1.0)	0.006		
CR–ADF				2.6 (1.3)	0.056	−0.84	1.5 (2.2)	0.496	−0.29	1.1 (1.4)	0.456	−0.32	0.456
BMI (kg/m²)													
CR	39.5 (1.4)	37.1 (1.5)	37.8 (1.6)	−2.4 (0.3)	<0.001		−1.7 (0.6)	0.007		0.8 (0.4)	0.045		
ADF	35.8 (1.4)	32.6 (1.4)	33.6 (1.5)	−3.2 (0.3)	<0.001		−2.2 (0.5)	<0.001		1.0 (0.4)	0.008		
CR–ADF	3.7 (2.0)	4.5 (2.1)	4.2 (2.2)	0.7 (0.5)	0.136	−0.64	0.5 (0.8)	0.548	−0.25	−0.2 (0.5)	0.65	0.19	0.207
Total fat mass (kg)													
CR	48.8 (2.7)	45.1 (2.6)	46.3 (2.9)	−3.7 (0.5)	<0.001		−2.5 (1.1)	0.028		1.2 (0.8)	0.162		
ADF	37.7 (2.6)	33.9 (2.5)	33.5 (2.8)	−3.7 (0.5)	<0.001		−4.2 (1.0)	<0.001		−0.4 (0.8)	0.605		
CR–ADF	11.1 (3.7)	11.1 (3.6)	12.8 (4.0)	0.0 (0.8)	0.995	0	1.6 (1.5)	0.291	−0.45	1.6 (1.2)	0.173	−0.59	0.371
Total fat mass (%)													
CR	43.4 (1.7)	42.4 (1.7)	42.7 (1.7)	−1.0 (0.3)	0.007		−0.7 (0.5)	0.222		0.3 (0.5)	0.53		
ADF	40.3 (1.6)	39.2 (1.6)	38.0 (1.7)	−1.1 (0.3)	0.002		−2.4 (0.5)	<0.001		−1.3 (0.5)	0.015		
CR–ADF	3.1 (2.3)	3.2 (2.4)	4.7 (2.4)	0.1 (0.5)	0.826	−0.09	1.7 (0.8)	0.035	−0.93	1.6 (0.7)	0.032	−0.95	0.078
Trunk fat mass (kg)													
CR	26.0 (1.8)	23.9 (1.7)	24.7 (1.8)	−2.1 (0.4)	<0.001		−1.3 (0.7)	0.054		0.8 (0.4)	0.093		
ADF	20.9 (1.7)	18.5 (1.7)	18.2 (1.7)	−2.4 (0.4)	<0.001		−2.7 (0.6)	<0.001		−0.3 (0.4)	0.436		
CR–ADF	5.1 (2.5)	5.4 (2.4)	6.5 (2.5)	0.3 (0.5)	0.637	−0.2	1.4 (0.9)	0.144	−0.63	1.1 (0.6)	0.083	−0.76	0.215
Trunk fat mass (%)													
CR	23.1 (1.1)	22.4 (1.2)	22.7 (1.1)	−0.7 (0.3)	0.017		−0.3 (0.4)	0.34		0.3 (0.3)	0.274		
ADF	22.1 (1.1)	21.2 (1.1)	20.3 (1.1)	−0.9 (0.3)	0.001		−1.8 (0.3)	<0.001		−0.8 (0.3)	0.005		
CR–ADF	1.0 (1.6)	1.3 (1.7)	2.4 (1.5)	0.3 (0.4)	0.484	−0.3	1.4 (0.5)	0.009	−1.19	1.2 (0.4)	0.007	−1.24	0.016
Lean mass (kg)													
CR	60.9 (3.0)	58.2 (2.8)	59.3 (2.8)	−2.6 (0.6)	<0.001		−1.6 (0.6)	0.022		1.1 (0.5)	0.051		
ADF	53.2 (2.8)	50.0 (2.7)	52.1 (2.7)	−3.2 (0.6)	<0.001		−1.2 (0.6)	0.072		2.0 (0.5)	<0.001		
CR–ADF	7.7 (4.1)	8.2 (3.8)	7.2 (3.9)	0.5 (0.9)	0.539	−0.26	−0.4 (0.9)	0.64	0.2	−1.0 (0.7)	0.197	0.55	0.424
Lean mass (%)													
CR	54.2 (1.6)	55.1 (1.6)	54.8 (1.7)	0.9 (0.3)	0.016		0.5 (0.5)	0.309		−0.3 (0.5)	0.509		
ADF	57.1 (1.5)	58.0 (1.6)	59.3 (1.6)	0.9 (0.3)	0.009		2.2 (0.5)	<0.001		1.3 (0.5)	0.012		
CR–ADF	−2.8 (2.2)	−2.9 (2.3)	−4.5 (2.3)	−0.1 (0.5)	0.921	0.04	−1.7 (0.7)	0.026	0.99	−1.6 (0.7)	0.026	0.99	0.061

TABLE 5 Changes in resting metabolic rate at the end of the 8-week intervention and after 24 weeks of unsupervised follow-up[a]

Outcome variable and group	Assessment period			Week 8–baseline	P	ES	Week 32–baseline	P	ES	Week 32–week 8	P	ES	P value for overall interaction
	Baseline	Week 8	Week 32										
Unadjusted RMR (kcal/d)[b]													
CR	1,892.5 (67.7)	1,719.3 (69.3)	1,807.3 (72.2)	−173.2 (35.2)	<0.001		−85.2 (39.0)	0.039		88.0 (22.2)	<0.001		
ADF	1,640.1 (65.1)	1,539.7 (66.8)	1,567.2 (69.2)	−100.4 (34.1)	0.007		−72.9 (37.3)	0.063		27.5 (22.0)	0.223		
CR–ADF	252.4 (93.9)	179.6 (96.2)	240.1 (100.0)	−72.8 (49.0)	0.151	0.62	−12.3 (54.0)	0.822	0.09	60.5 (31.3)	0.065	−0.81	0.096
Adjusted RMR (kcal/d)[b,c]													
CR	1,757.6 (37.0)	1,646.0 (32.8)	1,681.53 (18.6)	−111.6 (36.9)	0.006		−76.1 (35.9)	0.045		35.6 (22.4)	0.126		
ADF	1,689.0 (34.2)	1,672.8 (33.5)	1,659.8 (20.1)	−16.2 (36.6)	0.662		−29.2 (35.2)	0.416		−13.0 (22.5)	0.569		
CR–ADF	68.6 (51.1)	−26.8 (48.1)	21.7 (29.8)	−95.4 (51.4)	0.076	0.77	−46.9 (49.7)	0.356	0.39	48.5 (31.8)	0.14	−0.64	0.14

[a]Linear mixed-effects model analysis with unstructured covariance was used to assess the efficacy of intervention on each outcome variable. Test of time by group interaction was used to test the efficacy of intervention (see P value for overall interaction). Results are mean (SE). Significant P values ($P < 0.05$) are indicated in bold. Effect size (ES) is calculated as $(2 \times t \text{ value})/\sqrt{DF}$, where degrees of freedom (DF). Hand calculations for between- and within-group differences may not be equal to data shown because all data were rounded to 0.1 decimal place. For CR: $n = 12$ for baseline and week 8; $n = 10$ for week 32; for ADF: $n = 13$ for baseline and week 8; $n = 11$ for week 32; non-missing observations: $n = 71$.
[b]RMR results exclude one observation at week 32 for one subject in ADF because the value was physiologically implausible.
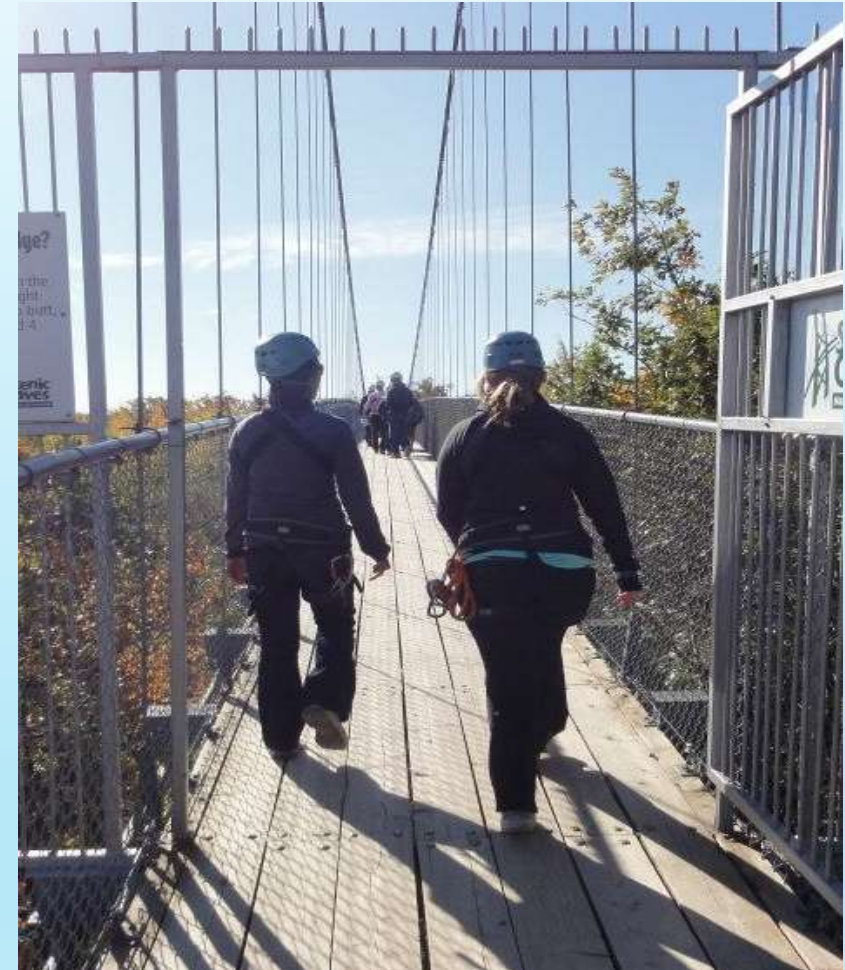[c]RMR results adjusted for fat-free mass (FFM) and fat mass (FM).
RMR, resting metabolic rate.

Case Study: Megan Ramos

The History of Megan J. Ramos

The Background

- Youth:
  - Skinny fat/TOFI
  - Fatty liver, age 12
  - PCOS, age 14

- Adulthood
  - Obesity age 26 (61% body fat)
  - DMII (A1c 6.4%), age 27
  - Osteoporosis, age 27

Fasting and Dietary Regimen

- ▶ Fasting Regimens:
  - ▶ 24-hours on M, W, F
  - ▶ 42-hours on M and W, and 24-hours on F
  - ▶ 72-hours on M, Tu, W, and 24-hours on F

- ▶ Eating Regimen:
  - ▶ Eliminated refined carbs → LCHF → Ketogenic
  - ▶ Two 90-minute eating windows
  - ▶ NO 'BREAKFAST' and NO SNACKING (this nearly killed me)

Results: 6 Months

- At 6-months:

  - 60 lb weight-loss (27.2 kg)

  - A1c reduced to 4.6% (original 6.4%)

  - No fatty liver

  - Regular menstrual cycle

Results: 6 Years

- 80 lb weight-loss (36.3 kg)

- A1c of 4.5%

- No fatty liver or PCOS

- Osteopenia

Learn More

Website	www.IDMprogram.com
Facebook	www.Facebook.com/IDMprogram
	www.Facebook.com/MeganIDM
Twitter & Instagram	@IDMprogram
	@meganjramos
Podcast	The Obesity Code Podcast