WEIGHT MANAGEMENT:
IS FAT THE SECRET WEAPON?

THE OHIO STATE UNIVERSITY

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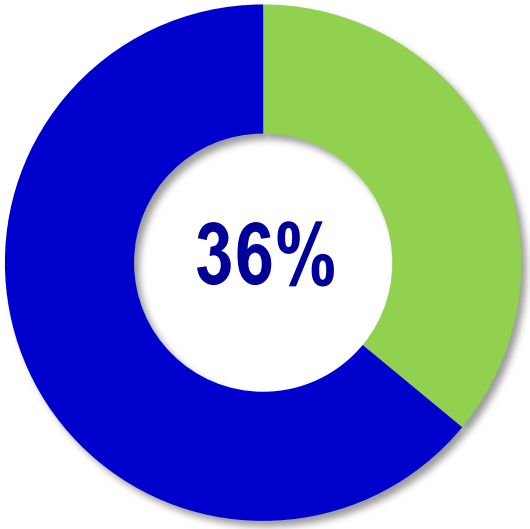
LEARNING OBJECTIVES

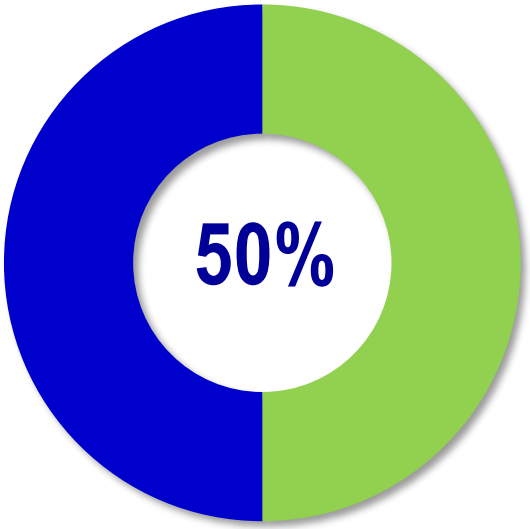
1. **Review the critical significance of obesity and the need for nutritionally based management options**
2. Evaluate the Ketogenic Diet and its safety, efficacy, and outcomes in patients with obesity
3. Learn how to personalize and implement a safe and effective Ketogenic Diet in a real-world clinical practice

The Problem

Obesity in America 2010



Predicted Obesity in America 2030

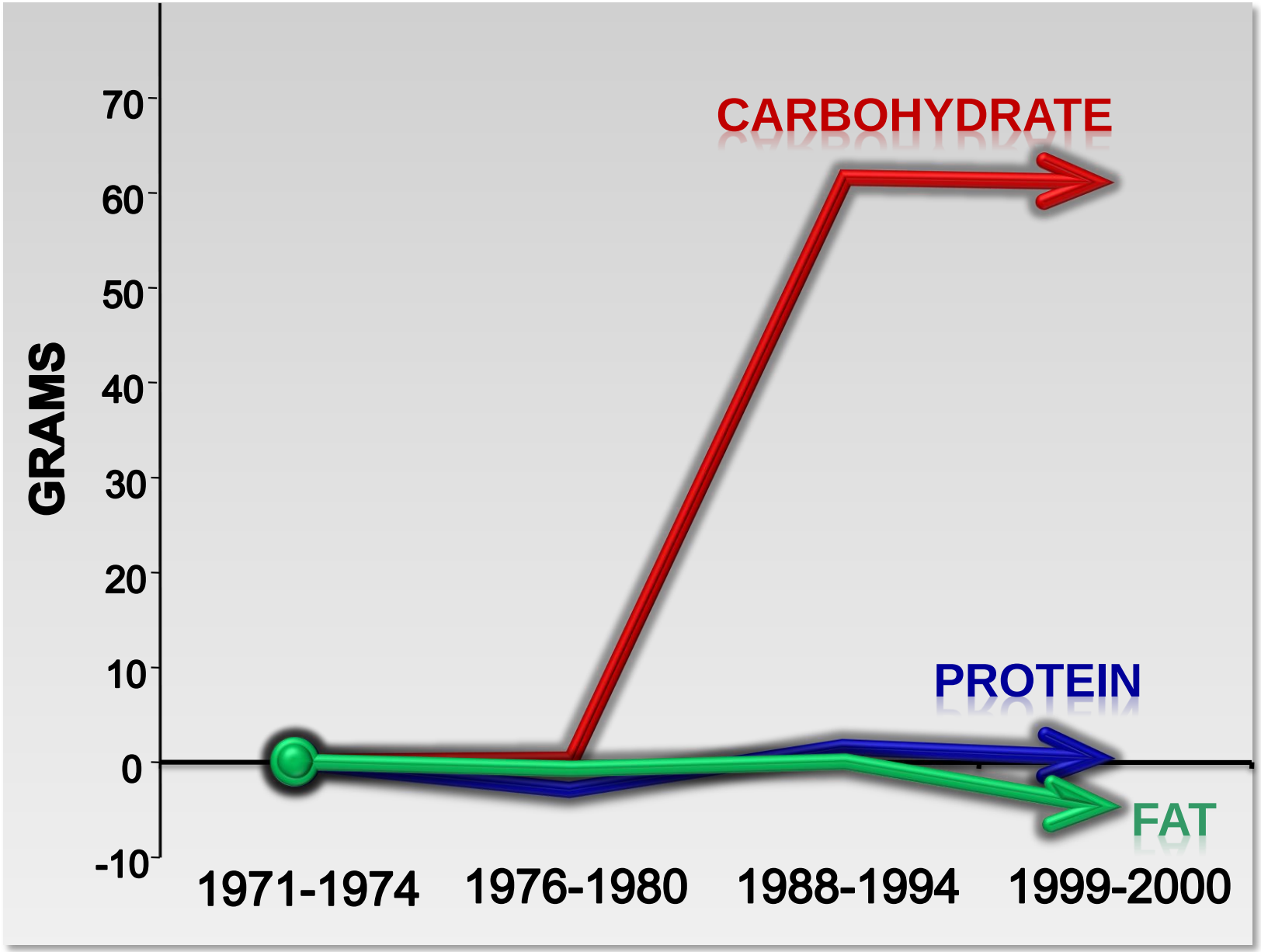


The Solution?

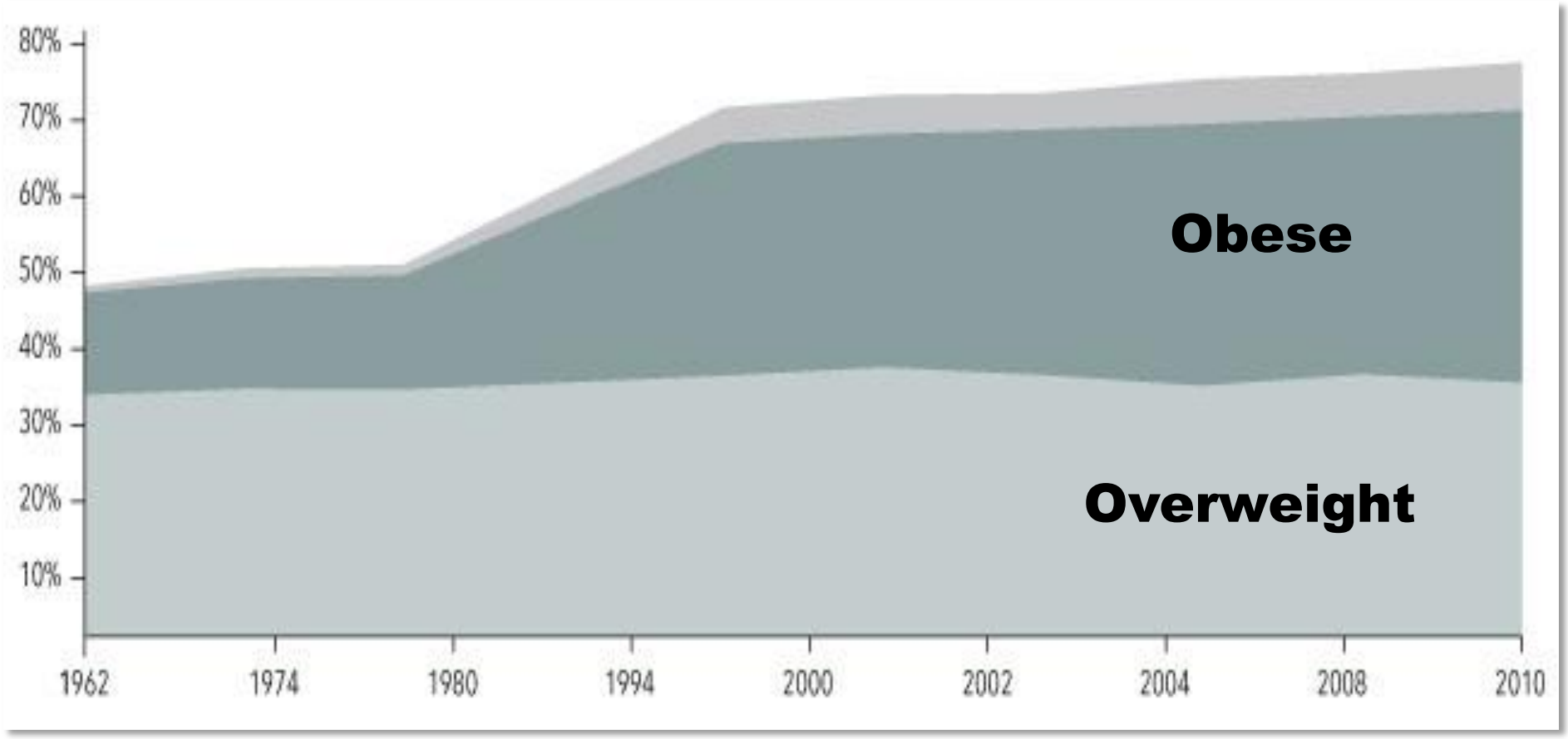
Eat less fat Exercise more

Ogden et al. NCHS Data Brief, No. 131, Oct 2013

Trends in Dietary Intake

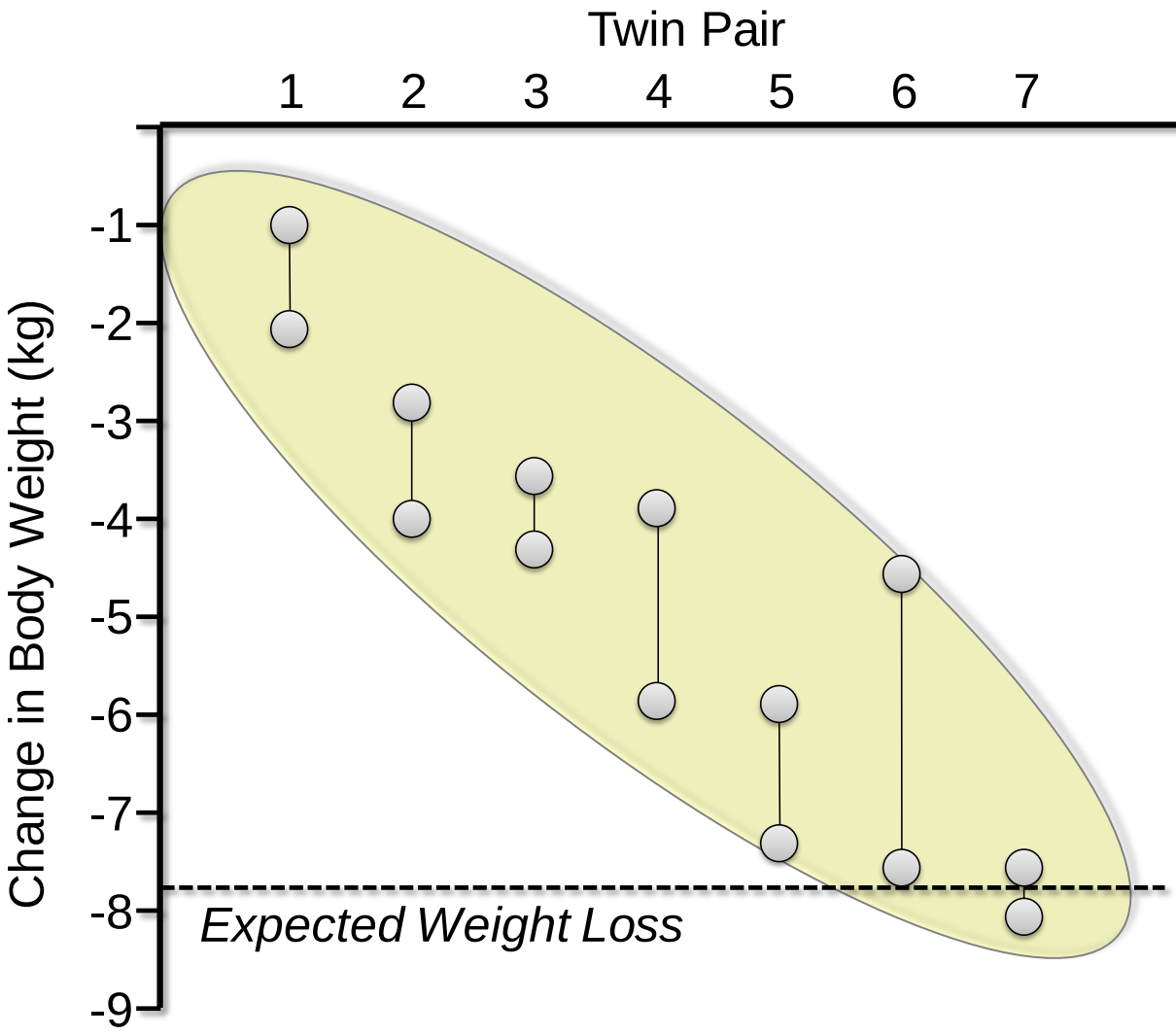


The New Normal



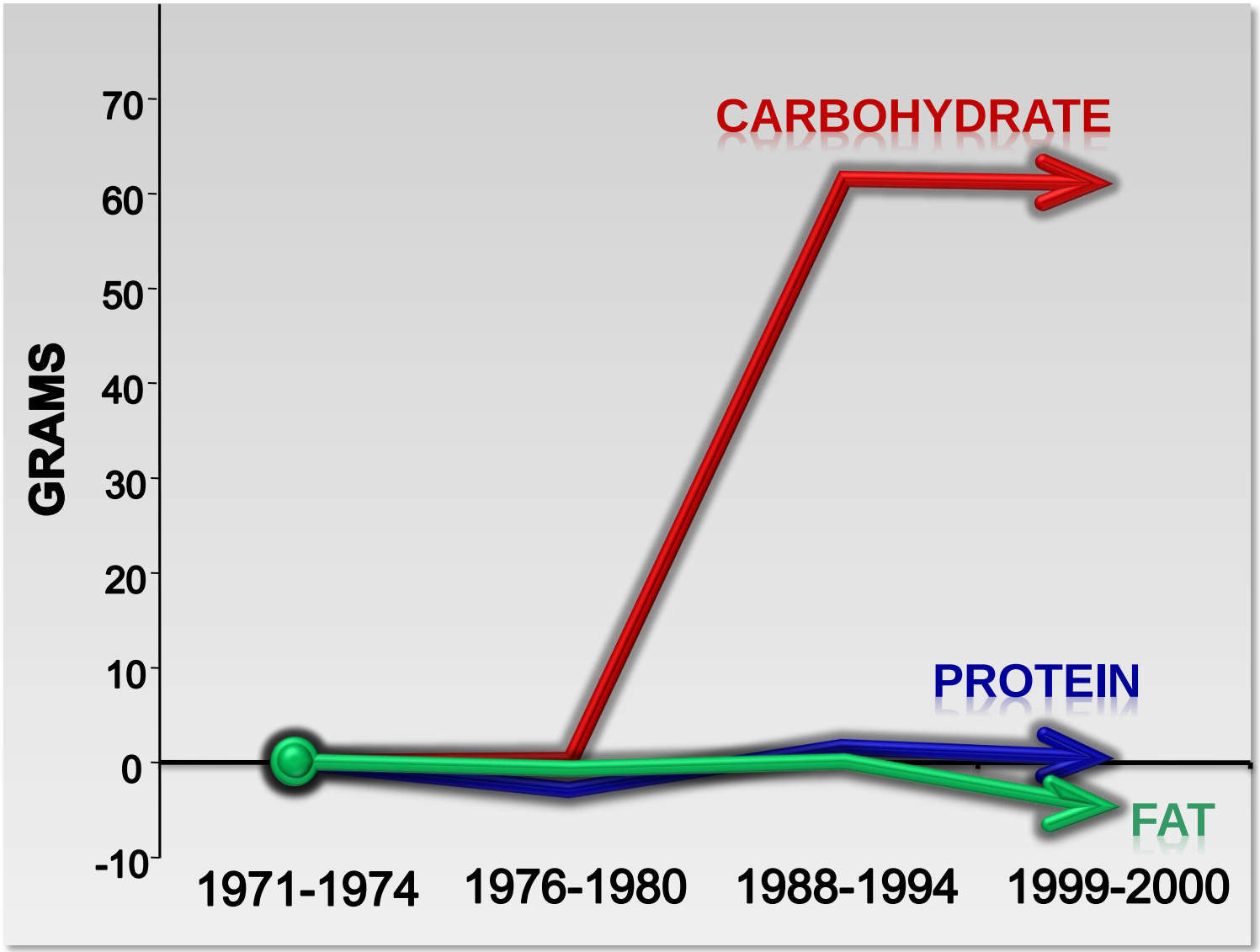
Exercise is a poor weight loss tool for some

- Identical twins exercised twice a day (9 days out of 10) for 93 days (daily deficit of 624 kcal/d)



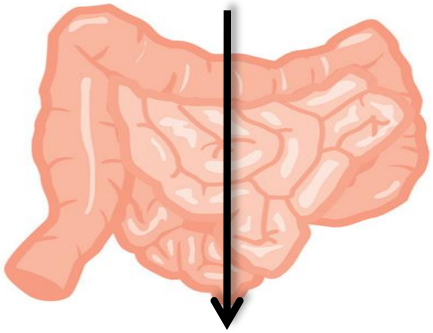
Bouchard and Tremblay. J Nutr. 1997 May;127(5 suppl):943S-947S

The majority of Americans consume too many sugars/starches relative to their tolerance



Carbohydrate *Intolerance*

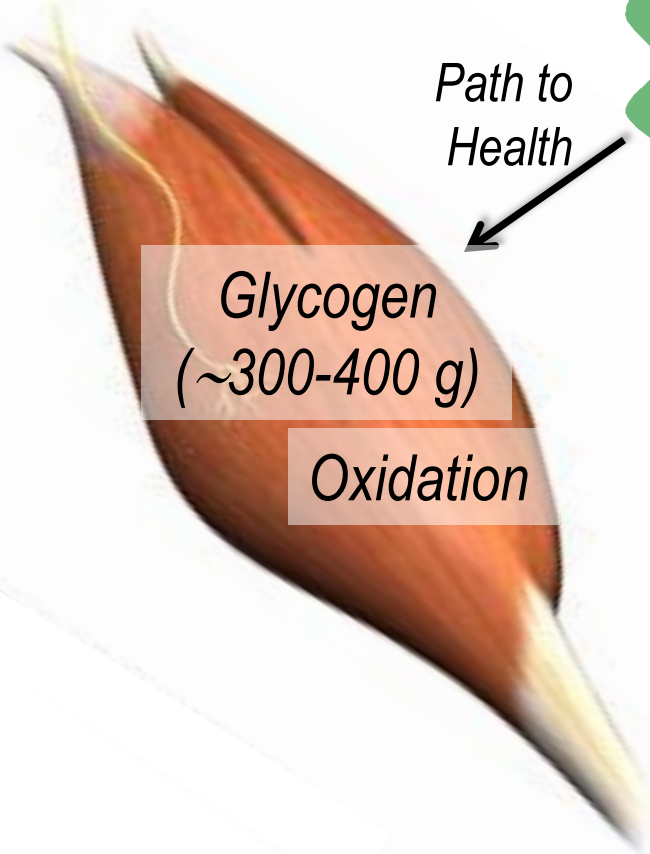
Ingest Carbohydrate



Blood Glucose (~1-2 teaspoons)

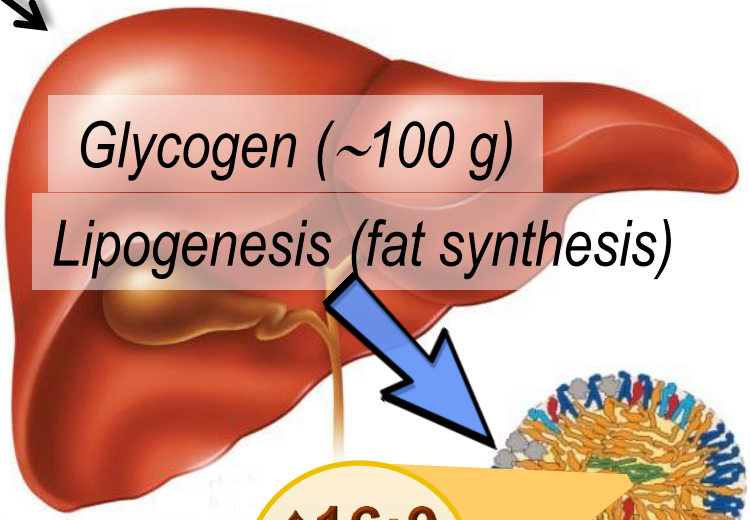
Path to Health

Path to Metabolic Syndrome/T2D



Glycogen (~300-400 g)

Oxidation



Glycogen (~100 g)

Lipogenesis (fat synthesis)

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Meta-analyses consistently show benefits of ketogenic diets on weight loss

British Journal of Nutrition, page 1 of 10

Review – Systematic with Meta-Analysis

Very-low-carbohydrate ketogenic diet *v.* low-fat diet for long-term weight loss: a meta-analysis of randomised controlled trials

obesity reviews

doi: 10.1111/j.1467-789X.2012.01021.x

Systematic review and meta-analysis of clinical trials of the effects of low carbohydrate diets on cardiovascular risk factors

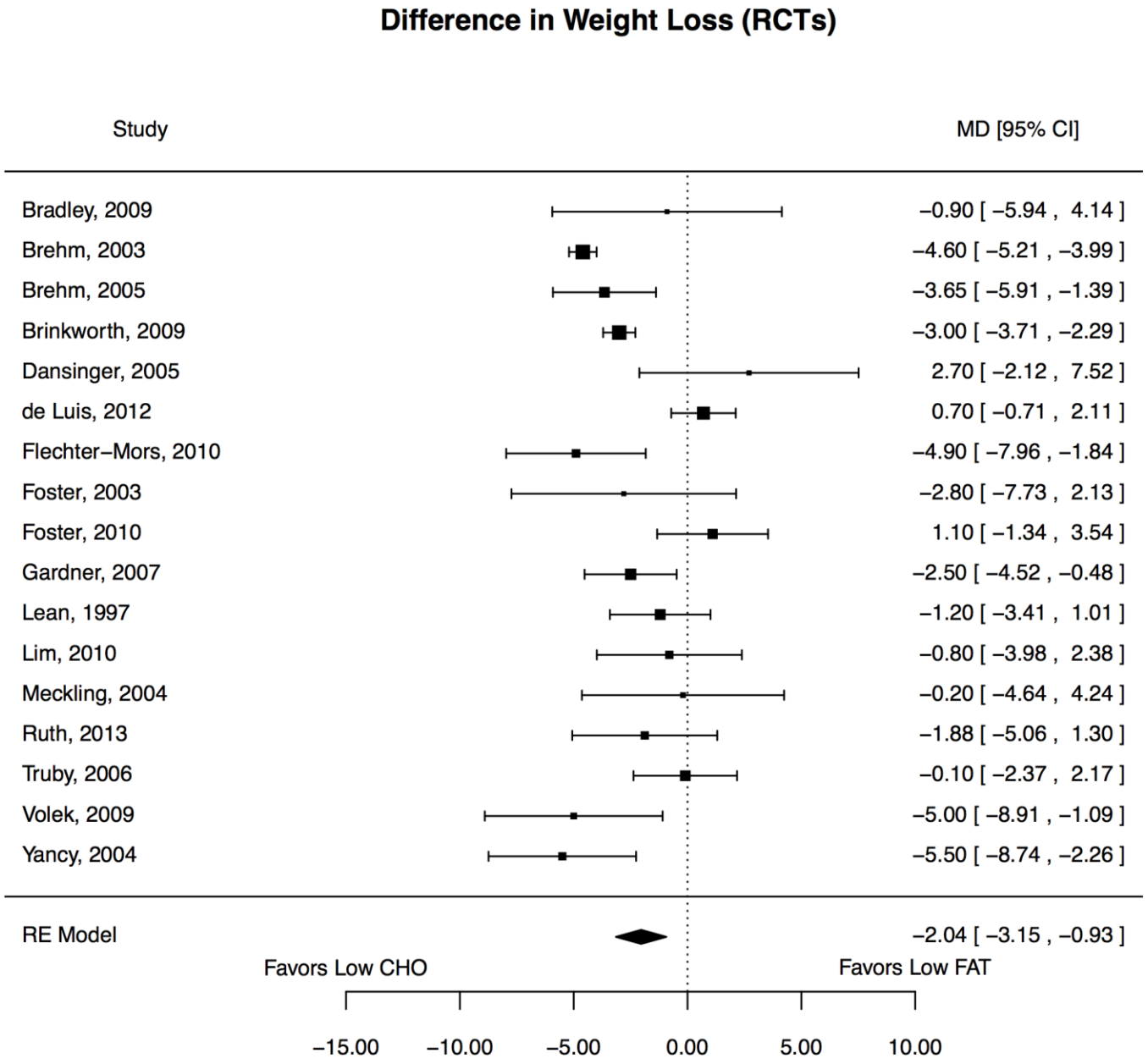
PLOS ONE

Dietary Intervention for Overweight and Obese Adults: Comparison of Low-Carbohydrate and Low-Fat Diets. A Meta-Analysis

Jonathan Sackner-Bernstein[1]*, David Kanter[2], Sanjay Kaul[3]

Conclusions

This trial-level meta-analysis of randomized controlled trials comparing LoCHO diets with LoFAT diets in strictly adherent populations demonstrates that each diet was associated with significant weight loss and reduction in predicted risk of ASCVD events. However, LoCHO diet was associated with modest but significantly greater improvements in weight loss and predicted ASCVD risk in studies from 8 weeks to 24 months in duration. These results suggest that future evaluations of dietary guidelines should consider low carbohydrate diets as effective and safe intervention for weight management in the overweight and obese, although long-term effects require further investigation.


Difference in Weight Loss (RCTs)
Study
MD [95% CI]
Bradley, 2009
−0.90 [−5.94 , 4.14]
Brehm, 2003
−4.60 [−5.21 , −3.99]
Brehm, 2005
−3.65 [−5.91 , −1.39]
Brinkworth, 2009
−3.00 [−3.71 , −2.29]
Dansinger, 2005
2.70 [−2.12 , 7.52]
de Luis, 2012
0.70 [−0.71 , 2.11]
Flechter−Mors, 2010
−4.90 [−7.96 , −1.84]
Foster, 2003
−2.80 [−7.73 , 2.13]
Foster, 2010
1.10 [−1.34 , 3.54]
Gardner, 2007
−2.50 [−4.52 , −0.48]
Lean, 1997
−1.20 [−3.41 , 1.01]
Lim, 2010
−0.80 [−3.98 , 2.38]
Meckling, 2004
−0.20 [−4.64 , 4.24]
Ruth, 2013
−1.88 [−5.06 , 1.30]
Truby, 2006
−0.10 [−2.37 , 2.17]
Volek, 2009
−5.00 [−8.91 , −1.09]
Yancy, 2004
−5.50 [−8.74 , −2.26]
RE Model
−2.04 [−3.15 , −0.93]
Favors Low CHO
Favors Low FAT
−15.00
−10.00
−5.00
0.00
5.00
10.00

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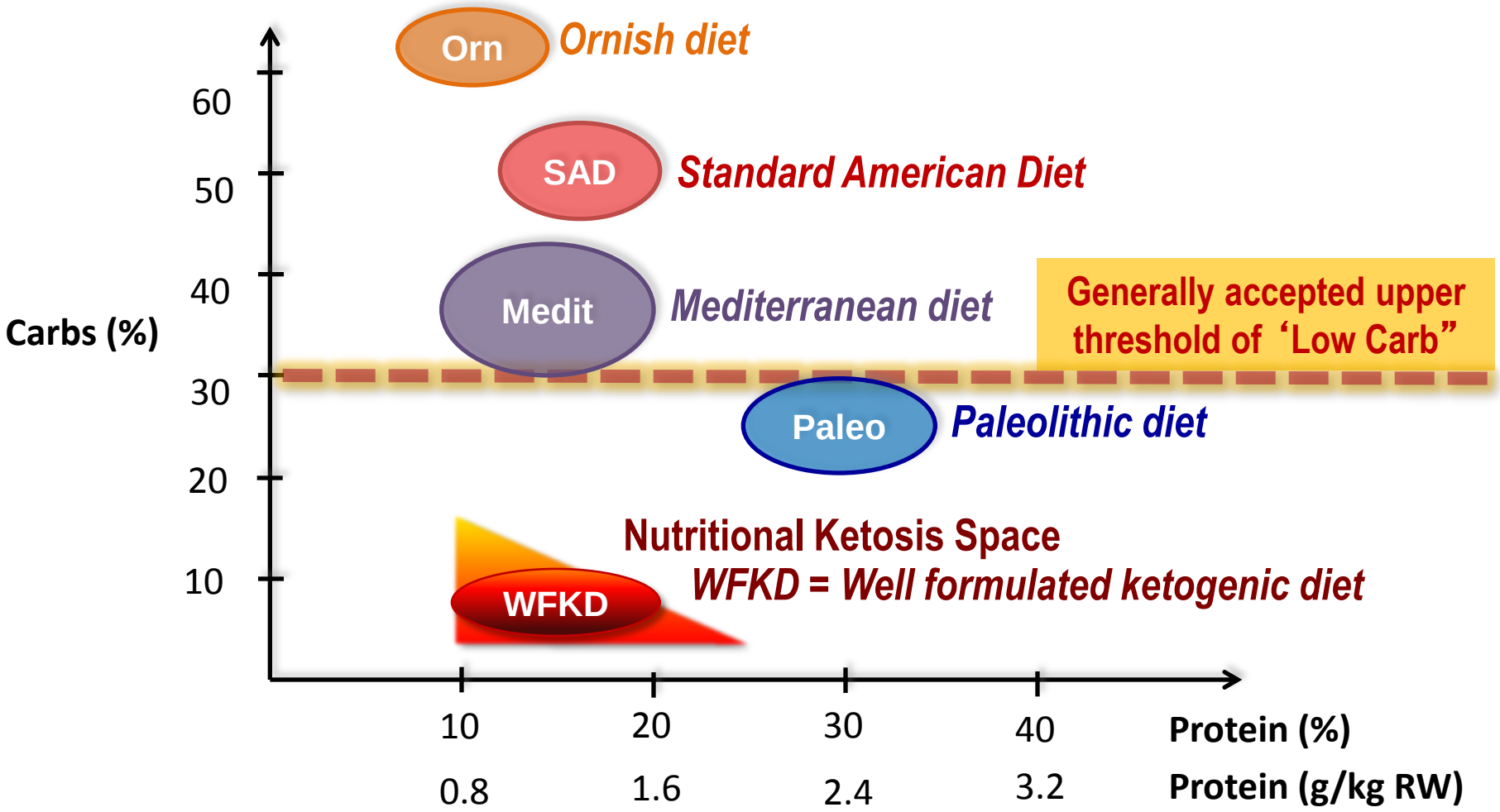
Ketogenic Diets are Distinct from Other Popular Diet Approaches



Note: ***Carbs (%) = Percent of dietary carbs relative to daily energy expenditure***
Protein (%) = Percent of dietary protein relative to daily energy expenditure
Protein (g/kg RW) = Grams of dietary protein relative to reference body weight



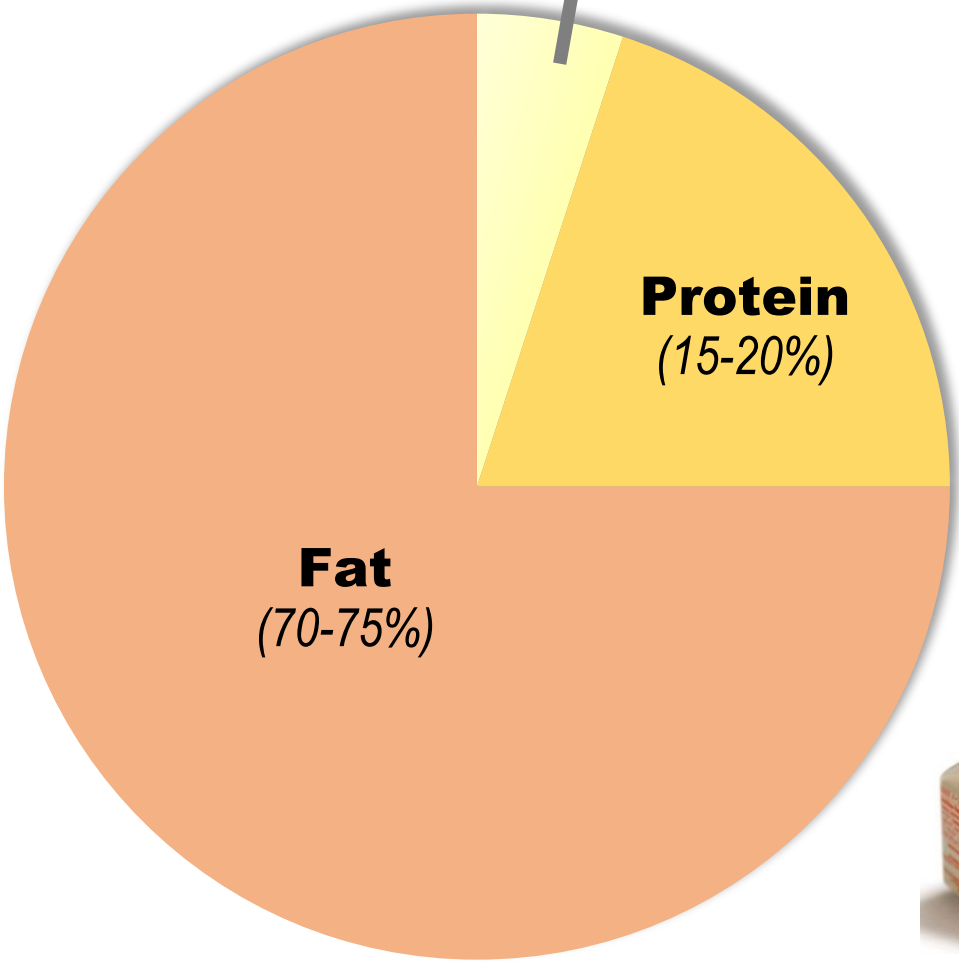





Principles of a Well-Formulated Ketogenic Diet

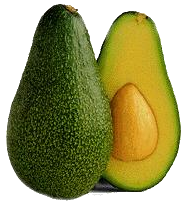
Most either contradict current conventional wisdom or are unknown to mainstream healthcare

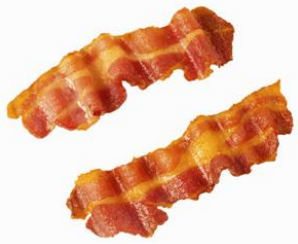
- Carb restriction to ↑ ketones >0.5 mmol/L
- Moderate, not high, protein (15-20% of energy expenditure)
- Sodium, potassium, magnesium, zinc nutriture are critical to well-being and function
- A weight maintenance ketogenic diet is necessarily high fat
- Not all dietary fat are equal (MUFA & SFA are preferred cellular fuels; PUFA are essential but like fat soluble vitamins are poorly tolerated at high intakes)
- Saturated fats should be embraced rather than avoided
- Dietary cholesterol is not a health risk
- Satiety is a robust indicator of appropriate dietary energy intake



Carbs *(5-10%; <50 g)*

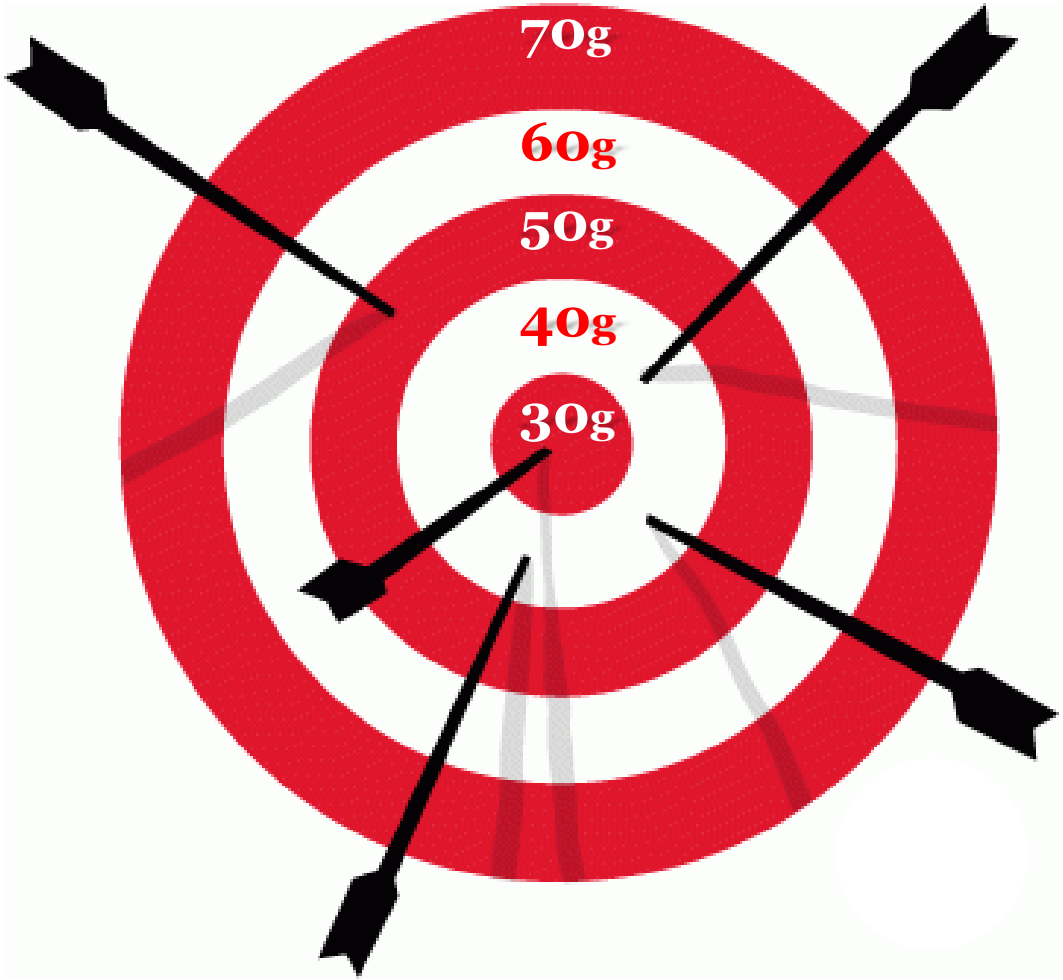
- ❑ 5-10 g protein-based food
- ❑ 10-15 g vegetables
- ❑ 5-10 g nuts/seeds
- ❑ 5-10 g fruits
- ❑ 5-10 g miscellaneous



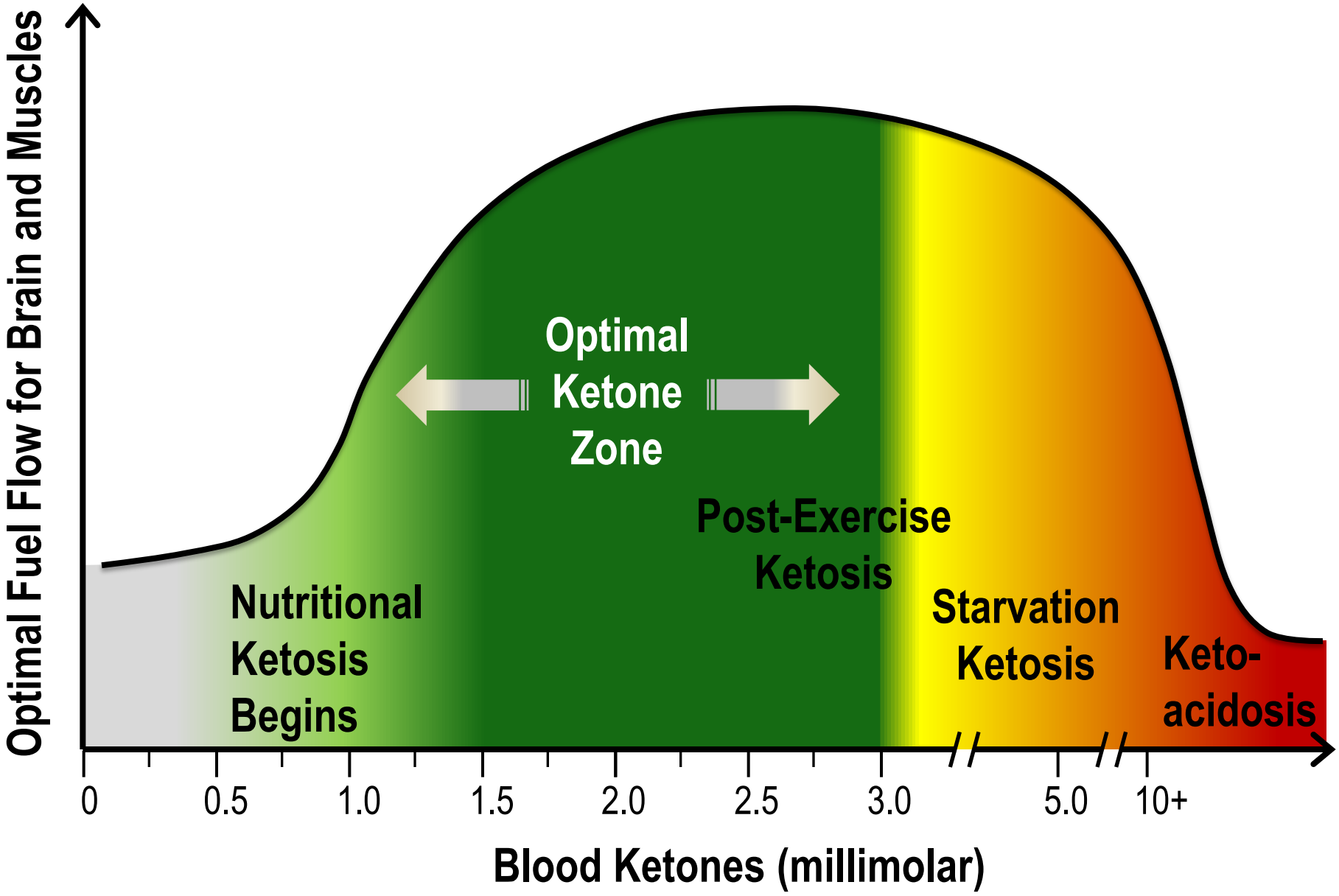


How Much Carbs?

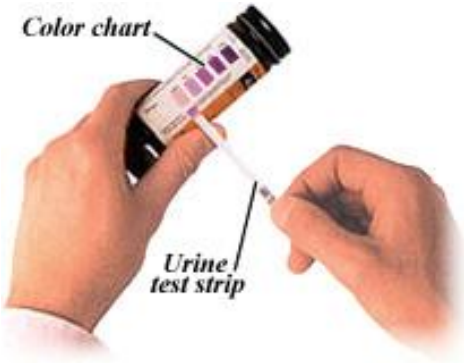
- A dietary carb level that keeps ketones in the desirable range
- A dietary carb level below which you don't convert it into fat



Finding Your Ketone Zone



Monitoring Ketones



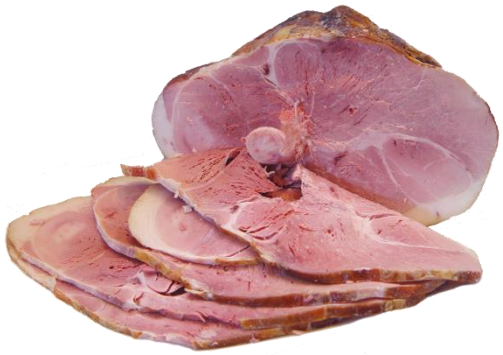
- Urine
- Breath
- Blood
  - BOHB obtained from a finger stick
  - Precision Xtra® (Abbott Diabetes Care, Inc)
  - Nova Max® Plus (Nova Biomedical)

How Much Protein?

- Most proponents of low carb diets describe them as high protein (as do some opponents)
- Most aboriginal hunters and herders treasured fat over protein
- Stefansson recreated the pre-contact Inuit diet in Bellevue in 1928, eating 15 en% protein, >80% fat, and his only carbs from glycogen in the meat (McClellan JBC, 1930)
- Measured from the perspective of daily energy expenditure (not intake 'macros'), one should consume 15-20% of expenditure as protein, which translates to 1.5 – 2.0 g/kg reference body weight.

- Moderate
- 15-20%en
- 1.5 to 2.0 g/kg

Protein



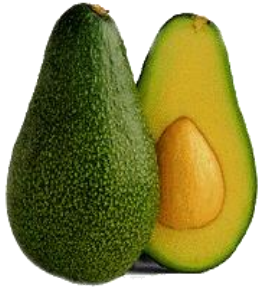
How Much Fat?

- The type of fat chosen is much more important that perseverating over the amount
- In the context of a low carb diet, satiety is an excellent signal that you've eaten enough
    - after all, human metabolism has had > a million years as hunters to get fat intake right, but less than 10,000 (1%) to adapt to agricultural carbohydrates
- In order of effect on satiety:

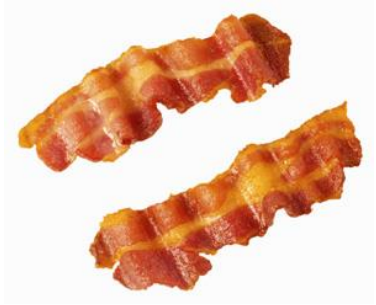
  Fat>>Protein>High Fiber Carb>Refined Carb
- Satisfaction is leaving a meal satiated.

Fat


Hood
All Natural
Sour Cream
No Preservatives
NETWT. 16 OZ. (453g)




SAINT ANDRÉ



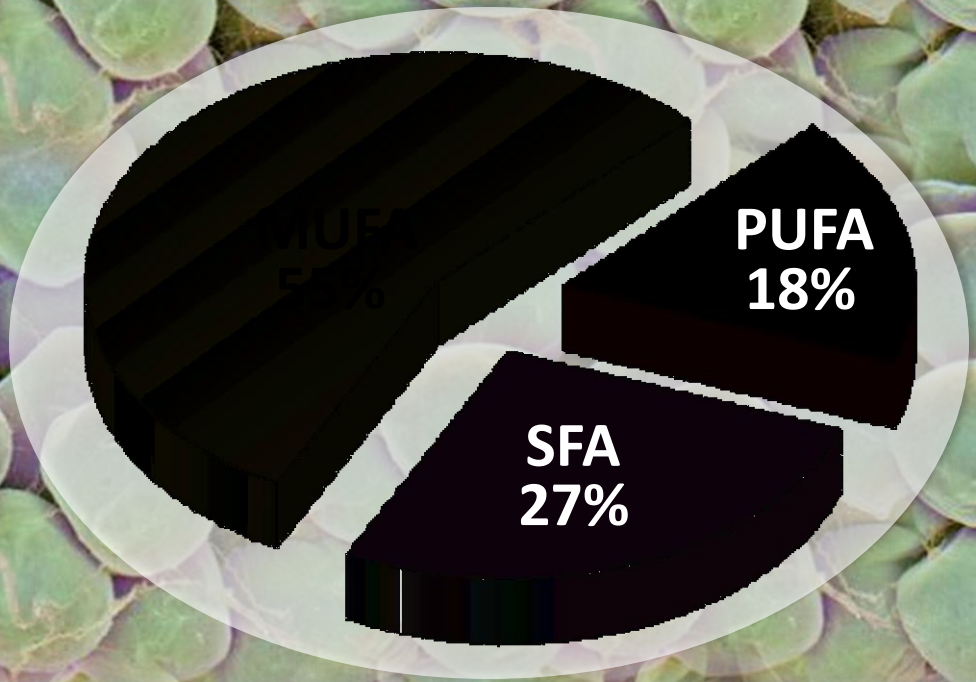

OPEN
Hood
SUPER FRESH
Heavy Cream
ULTRA-PASTEURIZED
NO PRESERVATIVES
8 FL OZ (236mL)

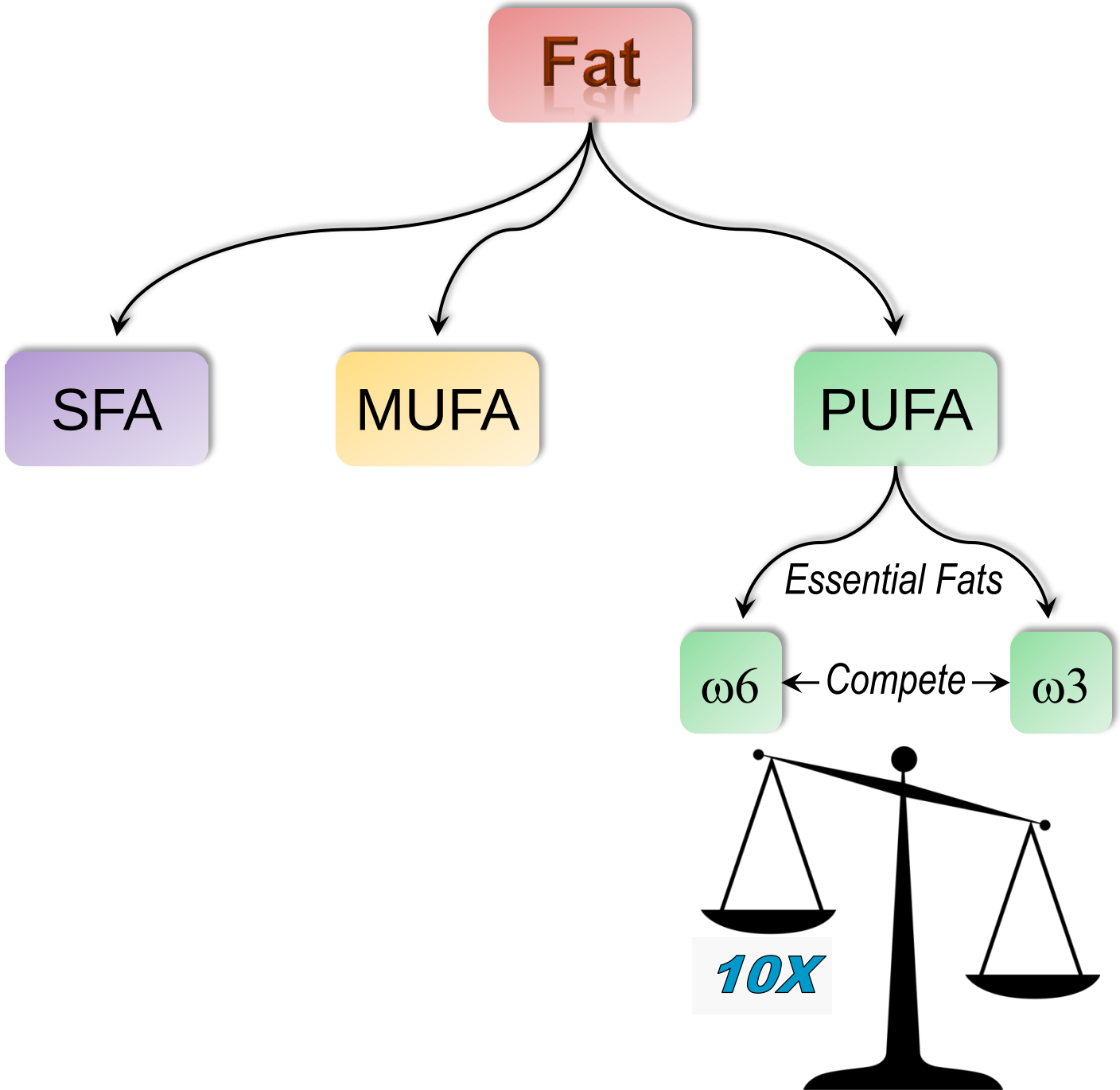

Kerrygold
227g
Best Before: See Base
Kerrygold
PURE IRISH BUTTER


CANOLA OIL

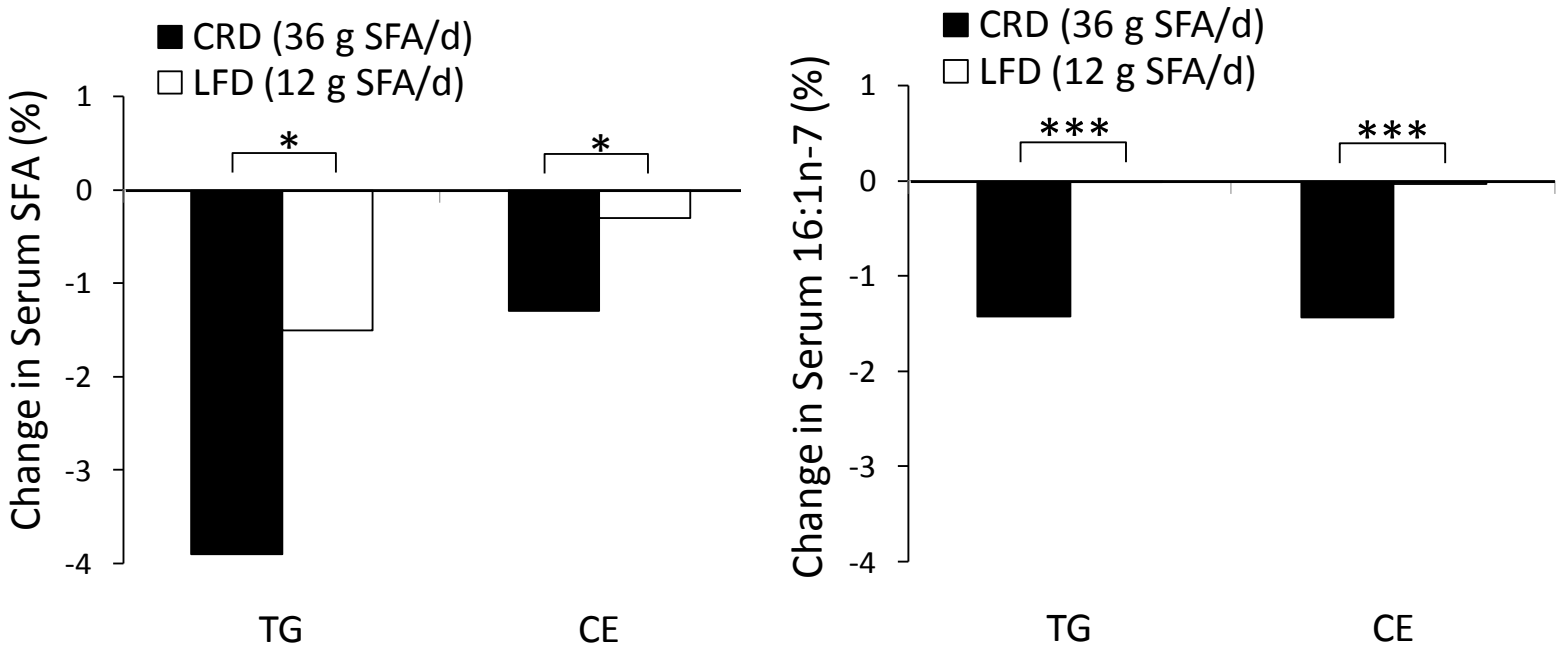

BIONA
ORGANIC
EXTRA VIRGIN
Cold pressed
COCONUT OIL

Approximate fatty acid composition of subcutaneous adipose tissue

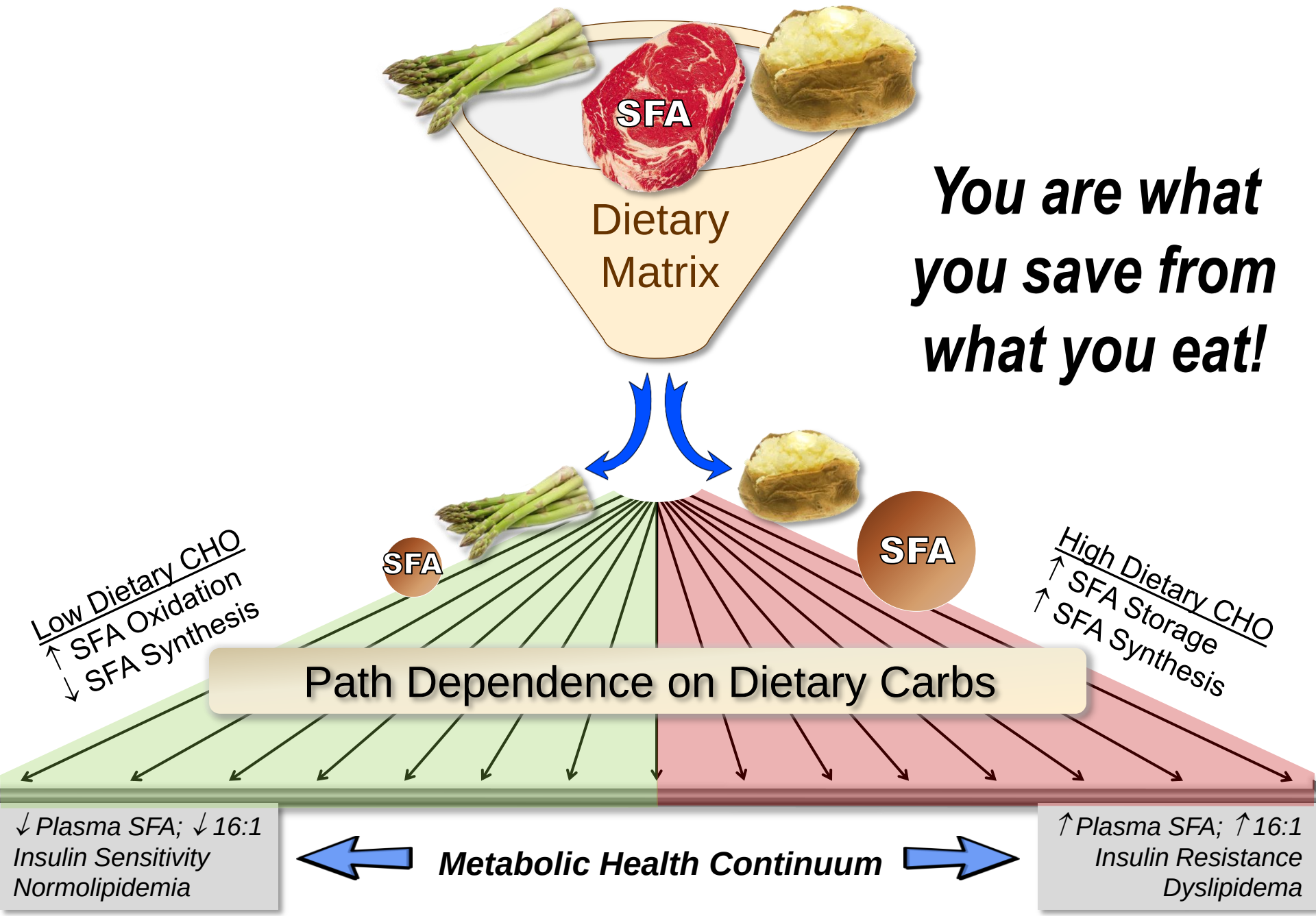


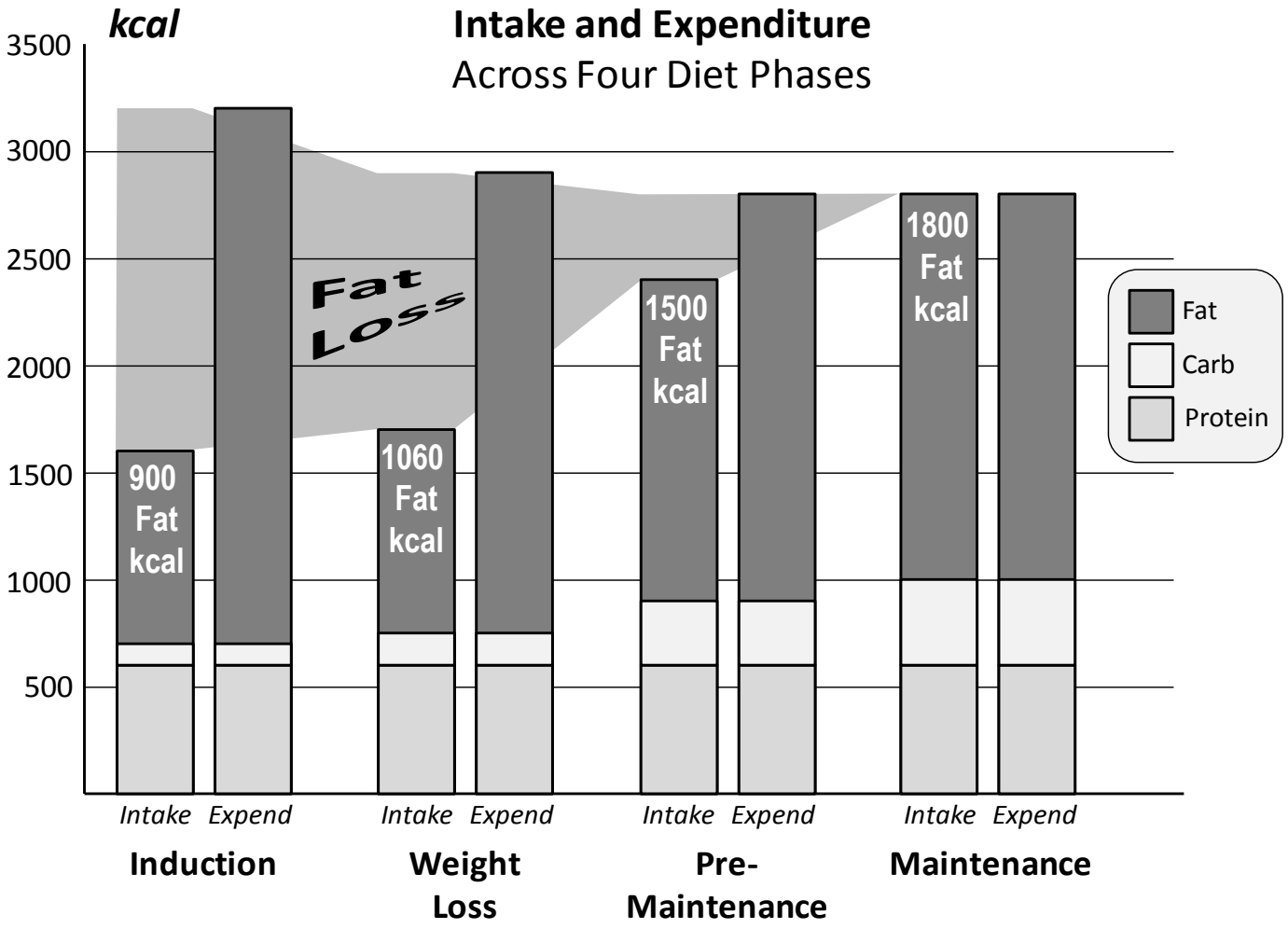

Fat
SFA
MUFA
PUFA
Essential Fats
ω6
Compete
ω3
10X

Despite being higher in saturated fat, a ketogenic diet decreases circulating levels of saturated fat



Forsythe CE, Phinney SD, Fernandez ML, Quann EE, Wood RJ, Bibus DM, Kraemer WJ, Feinman RD, Volek JS. Comparison of low fat and low carbohydrate diets on circulating fatty acid composition and markers of inflammation. Lipids. 2008 Jan;43(1):65-77.

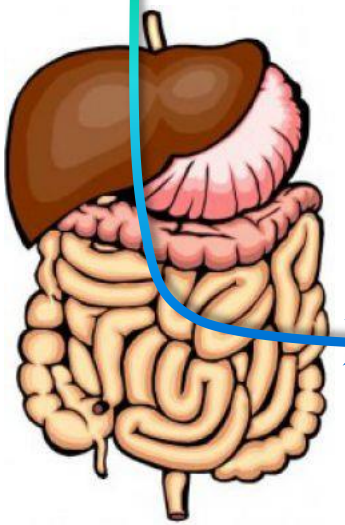

SFA
Dietary Matrix
You are what you save from what you eat!
SFA
SFA
Low Dietary CHO
↑ SFA Oxidation
↓ SFA Synthesis
High Dietary CHO
↑ SFA Storage
↑ SFA Synthesis
Path Dependence on Dietary Carbs
↓ Plasma SFA; ↓ 16:1
Insulin Sensitivity
Normolipidemia
Metabolic Health Continuum
↑ Plasma SFA; ↑ 16:1
Insulin Resistance
Dyslipidema



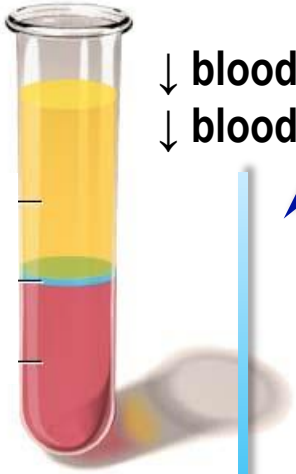
Example: Daily caloric intake and expenditure in a 5'10" man losing from 230 to 180 lbs. Assumes 30 kcal/kg before and 35 kcal/kg after weight loss.

Minerals

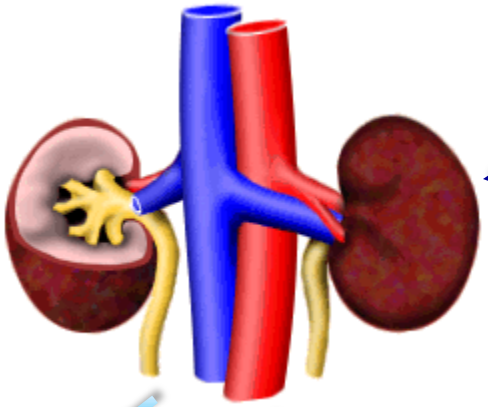
Ketogenic Diet
(minimal carbs)



Low
Insulin



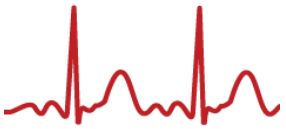
↓ blood sodium
↓ blood circulation



Natriuresis

Potassium

~2 g Sodium



Wide variety of vegetables

2500 kcal, <50 g Carbohydrate

Day 1

***Breakfast* (Scrambled eggs with sides of spinach and sausage)**
Scrambled eggs…2 large + 1 Tbsp palm oil
Mozzarella Cheese…1 oz
Pork Sausage…2 links (48 g)
Chopped frozen Spinach, boiled…3/4 cup (142.5 g) + 1.5 Tbsp Butter

Snack
½ Avocado…67 g
Swiss Cheese…2 oz (56 g)

***Lunch* (Broiled Salmon and a side salad)**
Broiled Atlantic Salmon…4 oz + 1 Tbsp Butter
Side Salad: Mixed Baby greens…2.5 cups
Diced Tomatoes…1/4 cup
Chopped Onion…1/8 cup
Feta Cheese…1 oz
Black and Green Olives…4 each
Blue Cheese Dressing…1.5 Tbsp

Snack
Peanuts, oil-roasted…1 oz
Hood Calorie Countdown Milk…1/2 cup

Dinner (Sirloin with sautéed mushrooms and Cauliflower "mashed potatoes)
Beef Sirloin Tips…3 oz
Olive oil…1.5 Tbsp
Sautéed Mushrooms…1/4 cup
Olive oil cooking spray
Cauliflower "Mashed Potatoes": Boiled Cauliflower…1 cup +
Shredded Cheddar Cheese…1 oz
Butter…1 Tbsp
Sugar Free jello…1/2 cup (121 g)

"I started noticing that I… 1) had no inclination to snack and 2) wake up not hungry. Please note that I feel great, even euphoric."

	Breakfast	Lunch	Dinner	Snack
Day 1	Mini quiches	Cobb salad	Steak, mushrooms, spinach	Mixed nuts
Day 2	Spinach parmesan scrambled eggs	Pork chop over sautéed cabbage	Spicy hamburger over squash and mushrooms	Mixed nuts
Day 3	Low carb pancakes and sausage	Taco-less taco salad	Salmon patties and cauliflower rice	Celery and cream cheese
Day 4	Zucchini patties and sausage	Lettuce-wrapped beef tacos	Italian Chicken	Maple walnut ice cream
Day 5	Breakfast meatballs and cheesy cauliflower hash	Tuna salad lettuce wraps and tomato bisque	Beef with mixed vegetables	Walnuts
Day 6	Steak and eggs	Salmon Caesar salad	Open faced stuffed pepper	Mixed nuts
Day 7	Breakfast Berry Smoothie	Burger and Cucumber Salad	Shrimp Mediterranean Salad	Pecans
Day 8	Mushroom and cheese omelet	Lemon chicken and almond green beans	Prime rib, mushrooms, peppers, and onions	Pepperoni, cheese, cherry tomatoes
Day 9	Egg cups	Ham and Swiss rollups	Cod and sautéed kale; blueberry cheesecake	Provolone, cucumbers, pecans
Day 10	Mocha Breakfast smoothie and walnuts	Deviled eggs and a side salad	Pork tenderloin and French fried green beans	Blueberry Cheesecake
Day 11	French Toast	Grilled balsamic Chicken Breast and caprese salad	Cheesy Sausage and Egg Quiche and buttered asparagus	Jello, whipped cream, and walnuts
Day 12	Leftover quiche	Grilled flank Steak Salad	Chicken legs and blue cheese; broccoli/butter blend	String cheese, pecans
Day 13	Fried eggs, asparagus, pancetta, and hollandaise sauce	Chicken salad lettuce wrap and tomatoes	Pot Roast and French Fried Green Beans	Maple walnut ice cream
Day 14	Ham and Cheese Scramble	Cauliflower mac and cheese with chicken and broccoli	Sesame Beef Stir Fry	Celery and cream cheese

SUMMARY

Fundamentals of a well-formulated ketogenic diet

1. Low-carb, moderate-protein to induce nutritional ketosis
2. Enough energy (too satiety), mostly from fat
3. Right kind of fats is critical, mostly monos & saturates
4. Mineral management: supplement sodium, adequate potassium, magnesium for cramps