THE THERAPEUTIC BENEFITS OF A LOW CARB / KETO LIFESTYLE

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Keto Salt Lake

April 15, 2022

Disclosures

Duke University

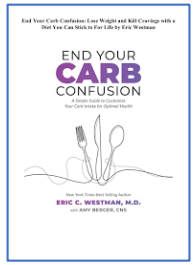
Associate Professor of Medicine
Director, Keto Medicine Clinic, Established 2006
Published over 50 peer-reviewed papers on keto

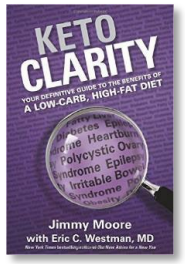
Obesity Medicine Association

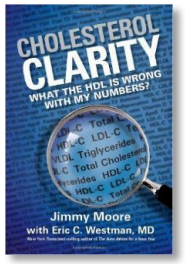
Past Chairman of the Board

ADAPT

Co-founder, Keto products and education: equity







Author: book royalties

Taboo on studying low carb/keto diets

1980

J Am Diet Assoc. 1980 Sep;77(3):264-70.

Effects of high-protein, low-carbohydrate dieting on plasma lipoproteins and body weight.

Larosa JC, Fry AG, Muesing R, Rosing DR.

Twenty-four obese but otherwise normal men and women were followed for: Two weeks on their usual food intake; eight weeks on a high-protein, low-carbohydrate diet; and then again for two weeks on their usual diet. During this time, several metabolic parameters were measured bimonthly. The high-protein, low-carbohydrate dieting resulted in substantial weight loss, probably due to a combination of salt and water loss, as well as caloric restriction. Plasma triglycerides fell as well. Significant increases occurred in LDL-cholesterol, uric acid, and free fatty acid levels. HDL-cholesterol levels failed to rise despite significant weight loss, indicating that the previously reported relationship between HDL-cholesterol and weight may be dependent, in part, on the composition of the diet.

2002

Effect of 6-Month Adherence to a Very Low Carbohydrate Diet Program

Eric C. Westman, MD, MHS, William S. Yancy, MD, Joel S. Edman, DSc, Keith F. Tomlin, Christine E. Perkins, MSW

PURPOSE: To determine the effect of a 6-month very low carbohydrate diet program on body weight and other metabolic parameters.

SUBJECTS AND METHODS: Fifty-one overweight or obese healthy volunteers who wanted to lose weight were placed on a very low carbohydrate diet (<25 g/d), with no limit on caloric intake. They also received nutritional supplementation and recommendations about exercise, and attended group meetings at a research clinic. The outcomes were body weight, body mass index, percentage of body fat (estimated by skinfold thickness), serum chemistry and lipid values, 24-hour urine measurements, and subjective adverse effects.

RESULTS: Forty-one (80%) of the 51 subjects attended visits through 6 months. In these subjects, the mean (± SD) body weight decreased 10.3% ± 5.9% (P <0.001) from baseline to 6 months (body weight reduction of 9.0 ± 5.3 kg and body mass index reduction of 3.2 ± 1.9 kg/m^2). The mean percentage of body weight that was fat decreased 2.9% ± 3.2% from baseline to 6 months (P <0.001). The mean serum bicarbonate level decreased 2 ± 2.4 mmol/L (P <0.001) and blood urea nitrogen level increased 2 ± 4 mg/dL (P <0.001). Serum total cholesterol level decreased 11 ± 26 mg/dL (P = 0.006), low-density lipoprotein cholesterol level decreased 10 ± 25 mg/dL (P = 0.01), triglyceride level decreased 56 ± 45 mg/dL (P <0.001), high-density lipoprotein (HDL) cholesterol level increased 10 ± 8 mg/dL (P <0.001), and the cholesterol/HDL cholesterol ratio decreased 0.9 ± 0.6 units (P <0.001). There were no serious adverse effects, but the possibility of adverse effects in the 10 subjects who did not adhere to the program cannot be eliminated.

CONCLUSION: A very low carbohydrate diet program led to sustained weight loss during a 6-month period. Further controlled research is warranted. **Am J Med. 2002;113:30–36.**
©2002 by Excerpta Medica, Inc.

Body Composition and Hormonal Responses to a Carbohydrate-Restricted Diet

Jeff S. Volek, Matthew J. Sharman, Dawn M. Love, Neva G. Avery, Ana L. Gómez, Timothy P. Scheett, and William J. Kraemer

The few studies that have examined body composition after a carbohydrate-restricted diet have reported enhanced fat loss and preservation of lean body mass in obese individuals. The role of hormones in mediating this response is unclear. We examined the effects of a 6-week carbohydrate-restricted diet on total and regional body composition and the relationships with fasting hormone concentrations. Twelve healthy normal-weight men switched from their habitual diet (48% carbohydrate) to a carbohydrate-restricted diet (8% carbohydrate) for 6 weeks and 8 men served as controls, consuming their normal diet. Subjects were encouraged to consume adequate dietary energy to maintain body mass during the intervention. Total and regional body composition and fasting blood samples were assessed at weeks 0, 3, and 6 of the experimental period. Fat mass was significantly ($P \leq .05$) decreased (-3.4 kg) and lean body mass significantly increased (+1.1 kg) at week 6. There was a significant decrease in serum insulin (-34%), and an increase in total thyroxine (T_4) (+11%) and the free T_4 index (+13%). Approximately 70% of the variability in fat loss on the carbohydrate-restricted diet was accounted for by the decrease in serum insulin concentrations. There were no significant changes in glucagon, total or free testosterone, sex hormone–binding globulin (SHBG), insulin-like growth factor-I (IGF-I), cortisol, or triiodothyronine (T_3) uptake, nor were there significant changes in body composition or hormones in the control group. Thus, we conclude that a carbohydrate-restricted diet resulted in a significant reduction in fat mass and a concomitant increase in lean body mass in normal-weight men, which may be partially mediated by the reduction in circulating insulin concentrations.
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Volek et al. Metabolism 2002;51:864-70.
Westman et al. Am J Med 2002;113:30-36..

Outpatient Randomized Controlled Trials for Obesity

Reference	N	Duration (mo)	Low-fat (kg)	Low-carb (kg)
Brehm 2003†	42	6	-3.9	-8.5*
Yancy 2004‡	119	6	-6.5	-12.0*
Samaha 2003†	132	6	-1.9	-5.8*
Foster 2003†	63	6	-5.3	-9.7*
Foster 2003†	63	12	-4.5	-7.3
Stern 2004‡	132	12	-3.1	-5.1
Dansinger 2005§	160	12	-3.0	-2.1
Gardner 2007§	311	12	-1.6	-4.7*

* $p < 0.05$ for between-groups comparison.

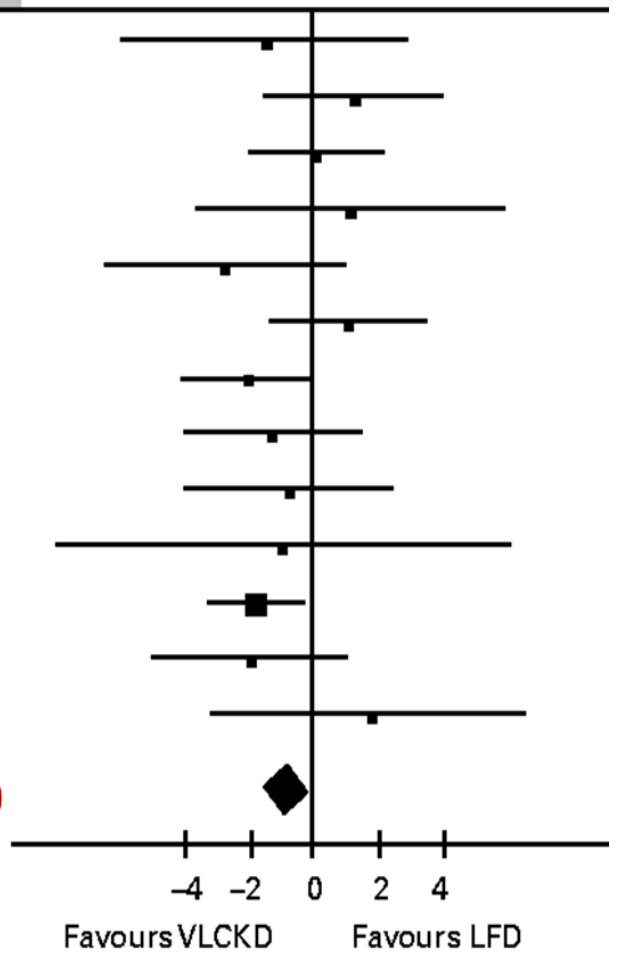
For Gardner, comparison was the Zone diet.

Obesity RCTs ≥12 months: Low Carb vs Low Fat

Body weight (kg) Study	VLCKD Mean, SD and total			LFD Mean, SD and total			Mean difference (95 %CI)
Brinkworth *et al.* [28]	−13·1	11·86	55	−11·6	11·53	52	−1·50 (−5·93, 2·93)
Dansinger *et al.* [50]	−2·1	4·8	40	−3·3	7·3	40	1·20 (−1·51, 3·91)
Davis *et al.* [51]	−3·1	4·8	55	−3·1	5·8	50	0·00 (−2·05, 2·05)
Dyson *et al.* [52]	0·3	6·96	11	−0·8	3·97	11	1·10 (−3·64, 5·84)
Foster *et al.* [53]	−7·2	7	33	−4·4	8	30	−2·80 (−6·53, 0·93)
Foster *et al.* [27]	−6·34	10·82	153	−7·37	10·98	154	−1·03 (−1·41 3·47)
Lim *et al.* [30]	−4·7	7·16	77	−2·6	5·55	76	−2·10 (−4·13, 0·07)
Iqbal *et al.* [29]	−1·5	8·36	67	−0·2	7·74	71	−1·30 (−3·99, 1·39)
Lim *et al.* [54]	−2·9	4·9	17	−2·1	4·7	18	−0·80 (−3·98, 2·38)
McAuley *et al.* [55]	−5·4	12·6	24	−4·4	12·2	24	−1·00 (−8·02, 8·02)
Shai *et al.* [49]	−4·7	6·5	109	−2·9	4·2	104	−1·80 (−3·26, −0·34)
Stern *et al.* [26]	−5·1	8·7	62	−3·1	8·4	64	−2·00 (−4·99, 0·99)
Truby *et al.* [56]	−9	4·1	9	−10·7	6·2	9	1·70 (−3·16, 6·56)
Total (95 % CI)			712			703	−0·91(−1·65, −0·17)

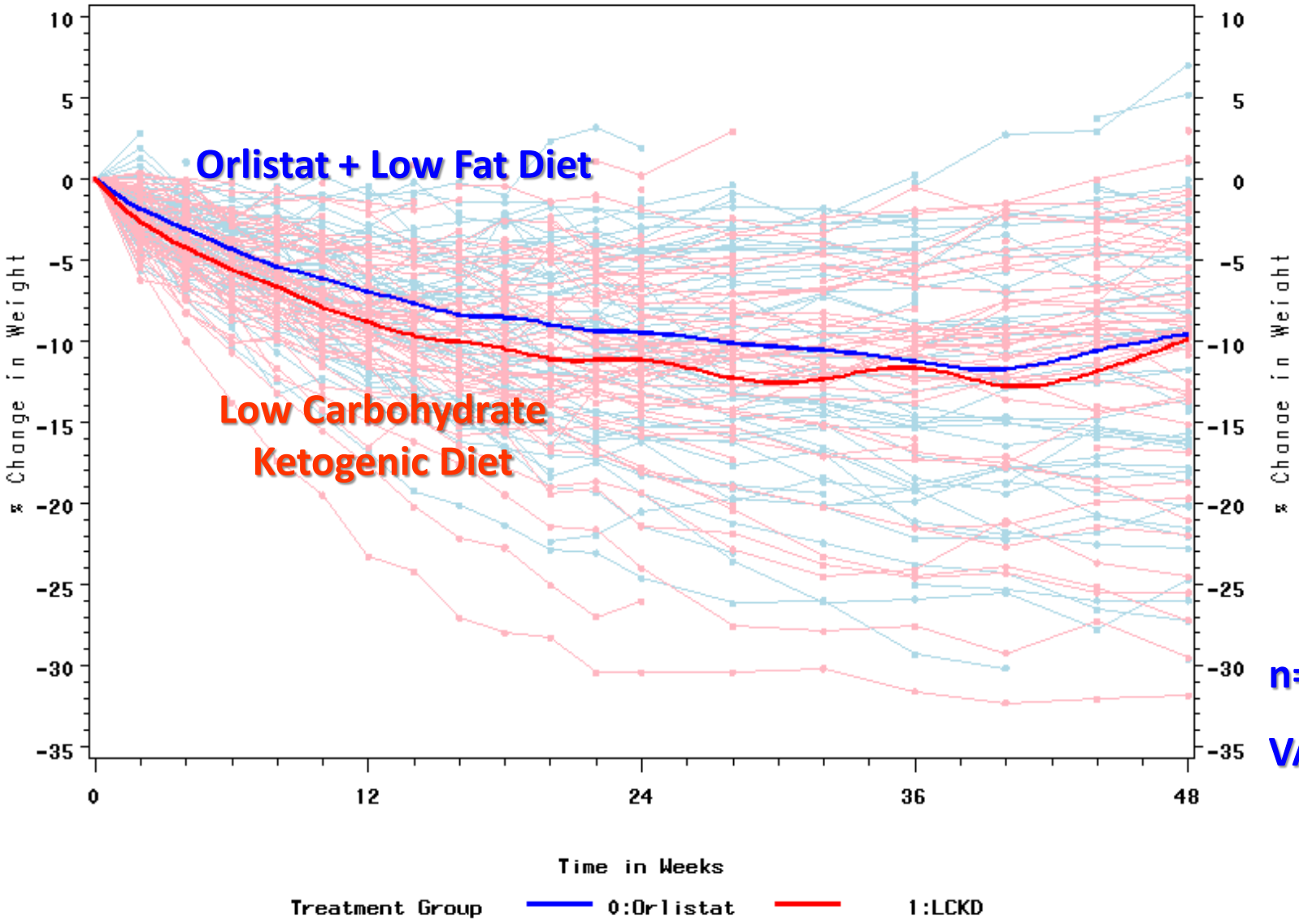
Heterogeneity: τ^2= 0·0(df= 12 (P = 0·47); I^2=0 %

Test for overall effect: Z)·02)



Bueno NB, Br J Nutr, 2013.

LCKD vs. Diet and a Drug

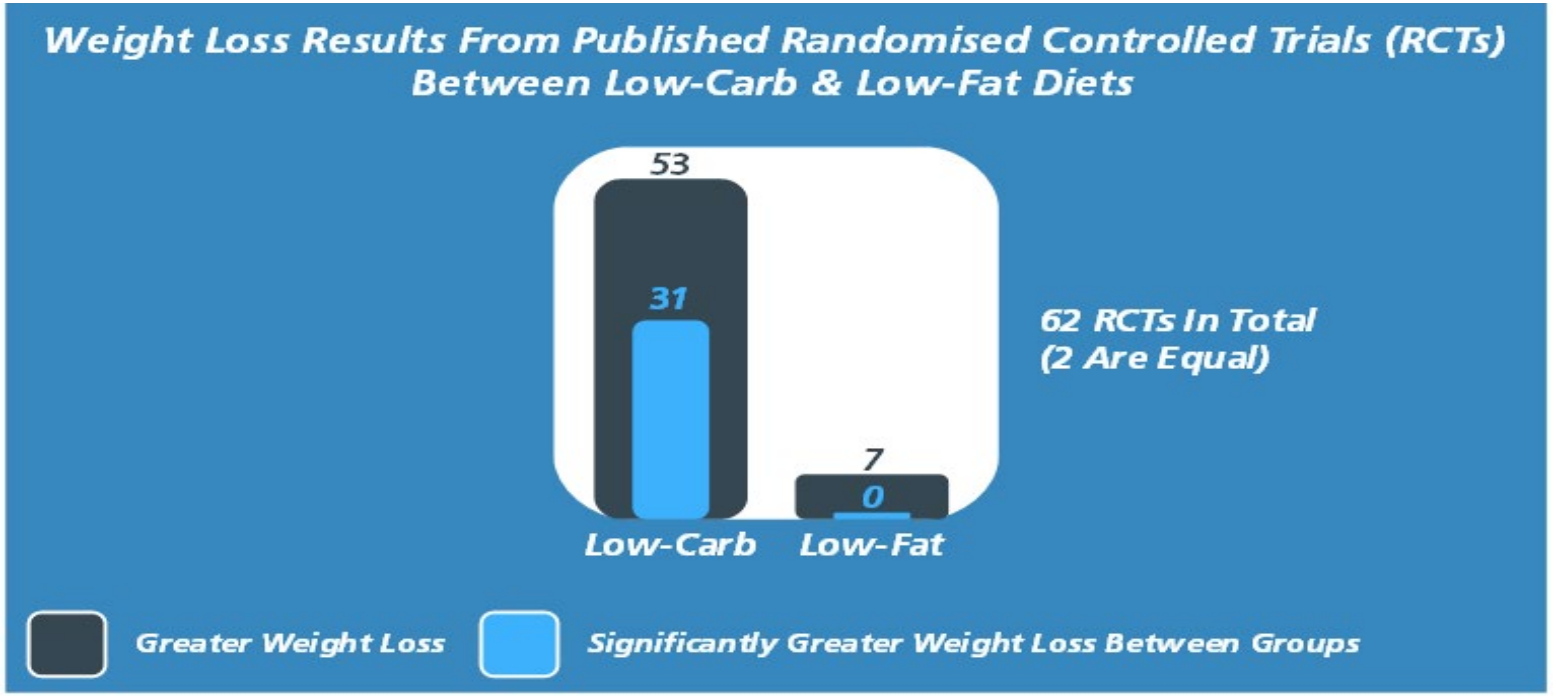


n=146

VA outpatients

Yancy WS Jr, Arch Intern Med, 2010.

RCTs Comparing Low-fat to Low-carb Diets



Body of evidence surpasses FDA Phase 3 requirements for approval of new drugs.

That is, if it were a drug it would be FDA approved!

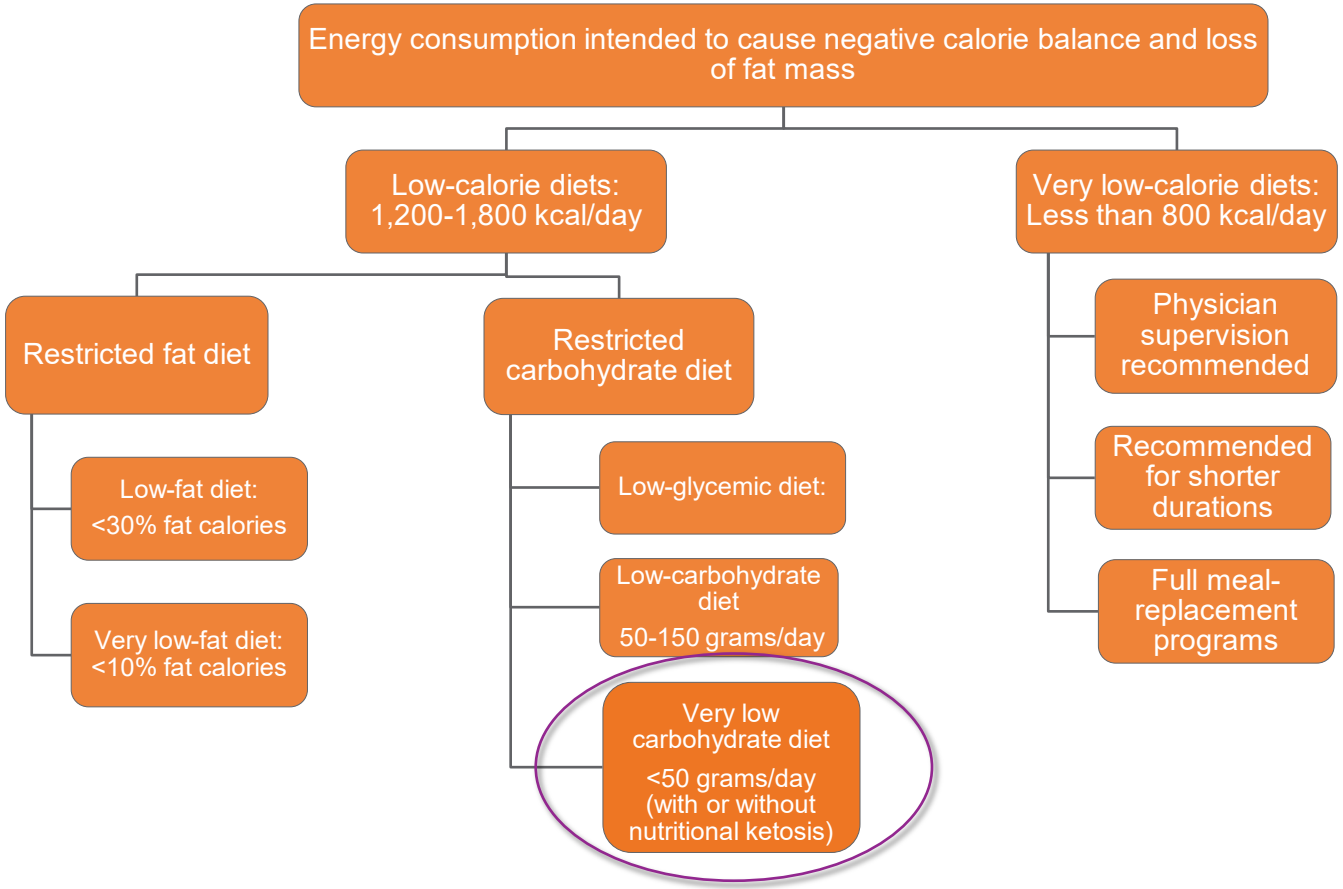
2014

Woman's World
More for your money! $1.79
Bonus! Your 2014 year-ahead horoscope!
COMFORT FOOD bliss without the calories!
SUGAR-BLOCKER TEA!
Herbal brew blocks sugar cravings – and heals diabetes!
CUT A COLD in half!
This supplement trio actually cures colds!
Eric Westman, M.D.
LOSE 20 LBS in two weeks on the
DUKE DIET DOCTOR'S LAST-CHANCE DIET!
• Cures extreme obesity!
• Melts off 100 lbs a year!
• Works when nothing else does!
• Reverses diabetes and heart disease!
The easy-grow houseplant that
CURES BELLYACHES!
SURPRISE INSOMNIA BREAKTHROUGH!
The moon keeps women awake . . . but this cure helps you sleep!
REGROW THINNING HAIR
and make it look thicker right now!
Sweeten your
Give it as a gift!

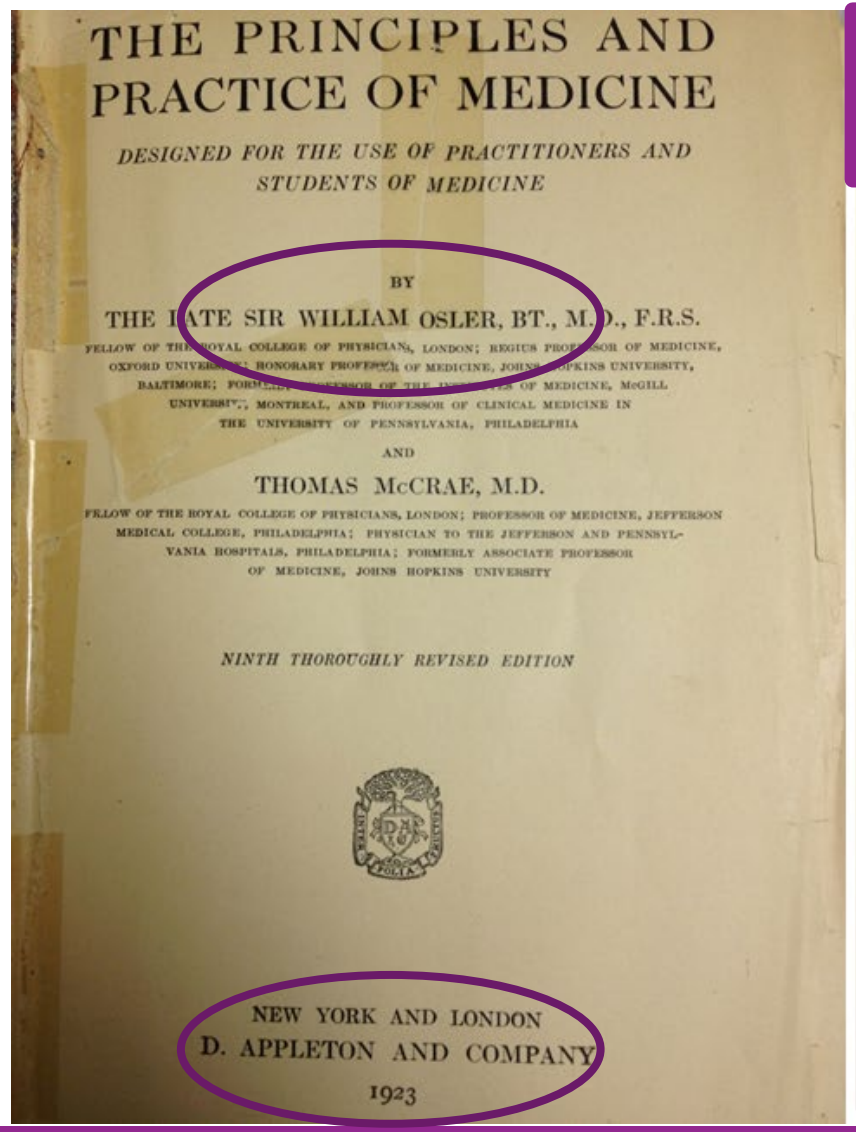
2021

February 1, 2021
God Bless America
Woman's World
Make it a great week!
How to spot a PENNY WORTH $60,000 & other hidden treasures
Must try! Harvard MD's easy slow-cooker tip
PROTECTS LUNGS FROM COVID-19
PRESCRIPTION-STRENGTH KETO
A small squeeze does it!
NO MORE DIZZY SPELLS
LOSE 60 LBS THIS MONTH
"If this plan were a drug, it would be approved by the FDA!" —Eric Westman, MD
Nutrient works like meds!
RELIEF FOR RESTLESS LEGS
Judy Tucker lost 135 lbs & got off 10 prescriptions at 68 years old!
CABIN FEVER CURE
So delicious!
$2 weeknight meal magic!
Toss together & enjoy!

Very Low Carbohydrate Diet in the Algorithm Guideline of the Obesity Medicine Association



Low Carb Diets and Diabetes, 1923



THE PRINCIPLES AND PRACTICE OF MEDICINE

DESIGNED FOR THE USE OF PRACTITIONERS AND STUDENTS OF MEDICINE

BY

THE LATE SIR WILLIAM OSLER, BT., M.D., F.R.S.

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS, LONDON; REGIUS PROFESSOR OF MEDICINE, OXFORD UNIVERSITY; HONORARY PROFESSOR OF MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE; FORMERLY PROFESSOR OF THE INSTITUTES OF MEDICINE, McGILL UNIVERSITY, MONTREAL, AND PROFESSOR OF CLINICAL MEDICINE IN THE UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA

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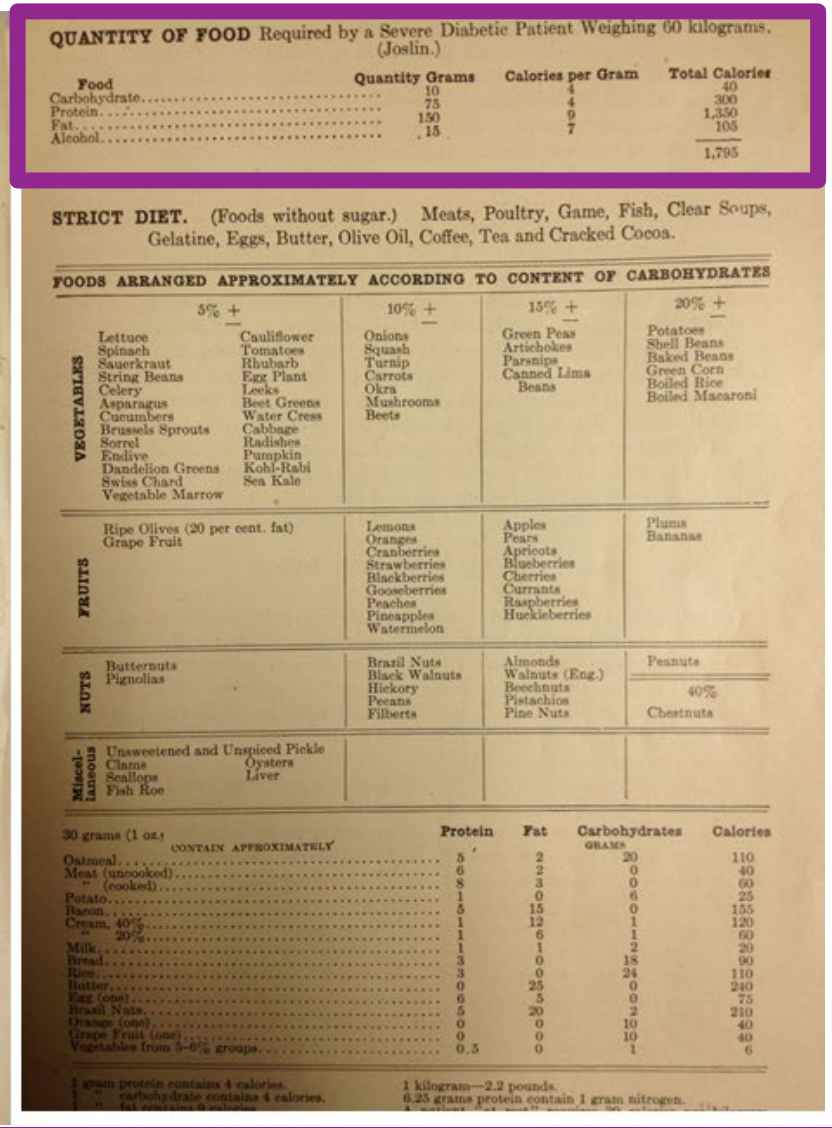
NINTH THOROUGHLY REVISED EDITION

NEW YORK AND LONDON
D. APPLETON AND COMPANY
1923



QUANTITY OF FOOD Required by a Severe Diabetic Patient Weighing 60 kilograms. (Joslin.)

Food	Quantity Grams	Calories per Gram	Total Calories
Carbohydrate	10	4	40
Protein	75	4	300
Fat	150	9	1,350
Alcohol	15	7	105
			1,795

STRICT DIET. (Foods without sugar.) Meats, Poultry, Game, Fish, Clear Soups, Gelatine, Eggs, Butter, Olive Oil, Coffee, Tea and Cracked Cocoa.

FOODS ARRANGED APPROXIMATELY ACCORDING TO CONTENT OF CARBOHYDRATES

	5% +	10% +	15% +	20% +
VEGETABLES	Lettuce, Spinach, Sauerkraut, String Beans, Celery, Asparagus, Cucumbers, Brussels Sprouts, Sorrel, Endive, Dandelion Greens, Swiss Chard, Vegetable Marrow, Cauliflower, Tomatoes, Rhubarb, Egg Plant, Leeks, Beet Greens, Water Cress, Cabbage, Radishes, Pumpkin, Kohl-Rabi, Sea Kale	Onions, Squash, Turnip, Carrots, Okra, Mushrooms, Beets	Green Peas, Artichokes, Parsnips, Canned Lima Beans	Potatoes, Shell Beans, Baked Beans, Green Corn, Boiled Rice, Boiled Macaroni
FRUITS	Ripe Olives (20 per cent. fat), Grape Fruit	Lemons, Oranges, Cranberries, Strawberries, Blackberries, Gooseberries, Peaches, Pineapples, Watermelon	Apples, Pears, Apricots, Blueberries, Cherries, Currants, Raspberries, Huckleberries	Plums, Bananas
NUTS	Butternuts, Pignolias	Brazil Nuts, Black Walnuts, Hickory, Pecans, Filberts	Almonds, Walnuts (Eng.), Beechnuts, Pistachios, Pine Nuts	Peanuts, 40%, Chestnuts
Miscellaneous	Unsweetened and Unspiced Pickle, Clams, Oysters, Scallops, Liver, Fish Roe			

30 grams (1 oz.) CONTAIN APPROXIMATELY	Protein GRAMS	Fat	Carbohydrates	Calories
Oatmeal	5	2	20	110
Meat (uncooked)	6	2	0	40
" (cooked)	8	3	0	60
Potato	1	0	6	25
Bacon	5	15	0	155
Cream, 40%	1	12	1	120
" 20%	1	6	1	60
Milk	1	1	2	20
Bread	3	0	18	90
Rice	3	0	24	110
Butter	0	25	0	240
Egg (one)	6	5	0	75
Brazil Nuts	5	20	2	210
Orange (one)	0	0	10	40
Grape Fruit (one)	0	0	10	40
Vegetables from 5–6% groups	0.5	0	1	6

1 gram protein contains 4 calories.
1 " carbohydrate contains 4 calories.
1 " fat contains 9 calories.

1 kilogram—2.2 pounds.
6.25 grams protein contain 1 gram nitrogen.

1923

Osler Textbook of Medicine

Quantity of food required by a severe diabetic patient weighing 60 Kg:

Carbohydrate 10 grams per day

Very Low Carbohydrate Diet Supported by the American Diabetes Association

Nutrition Therapy for Adults With Diabetes or Prediabetes: A Consensus Report

Diabetes Care 2019;42:731–754 | https://doi.org/10.2337/dci19-0014

Alison B. Evert,[1] Michelle Dennison,[2] Christopher D. Gardner,[3] W. Timothy Garvey,[4,5] Ka Hei Karen Lau,[6] Janice MacLeod,[7] Joanna Mitri,[8] Raquel F. Pereira,[9] Kelly Rawlings,[10] Shamera Robinson,[11] Laura Saslow,[12] Sacha Uelmen,[11] Patricia B. Urbanski,[13] and William S. Yancy Jr.[14,15]

This Consensus Report is intended to provide clinical professionals with evidence-based guidance about individualizing nutrition therapy for adults with diabetes or prediabetes. Strong evidence supports the efficacy and cost-effectiveness of nutrition therapy as a component of quality diabetes care, including its integration into the medical management of diabetes; therefore, it is important that all members of the health care team know and champion the benefits of nutrition therapy and key

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Clinical Guidelines

These guidelines provide clinicians with a general protocol for implementing therapeutic carbohydrate restriction as a dietary intervention in hospitals or clinics. These guidelines are meant to be applied as a dietary intervention for specific conditions for which carbohydrate reduction has been shown to offer therapeutic benefits.

Clinical Guidelines for Therapeutic Carbohydrate Restriction

LowCarbUSA
Turning consensus on its head!

https://www.lowcarbusa.org/clinical-guidelines/

Therapeutic Carbohydrate Restriction: General Intervention

1. Introduction

These guidelines provide clinicians with a general protocol for implementing therapeutic carbohydrate restriction as a dietary intervention in hospitals or clinics. These guidelines are meant to be applied as a dietary intervention for specific conditions for which carbohydrate reduction has been shown to offer therapeutic benefits. In providing a clinical protocol for using therapeutic carbohydrate restriction, these guidelines offer the foundations for a shared language for clinicians to use in discussing and comparing interventions, improving protocols, and managing shared concerns.

The following text is based on biomedical literature as well as expert opinion. These guidelines are intended to inform and supplement a clinician's own expertise and experience in providing evidence-based therapeutic nutrition.

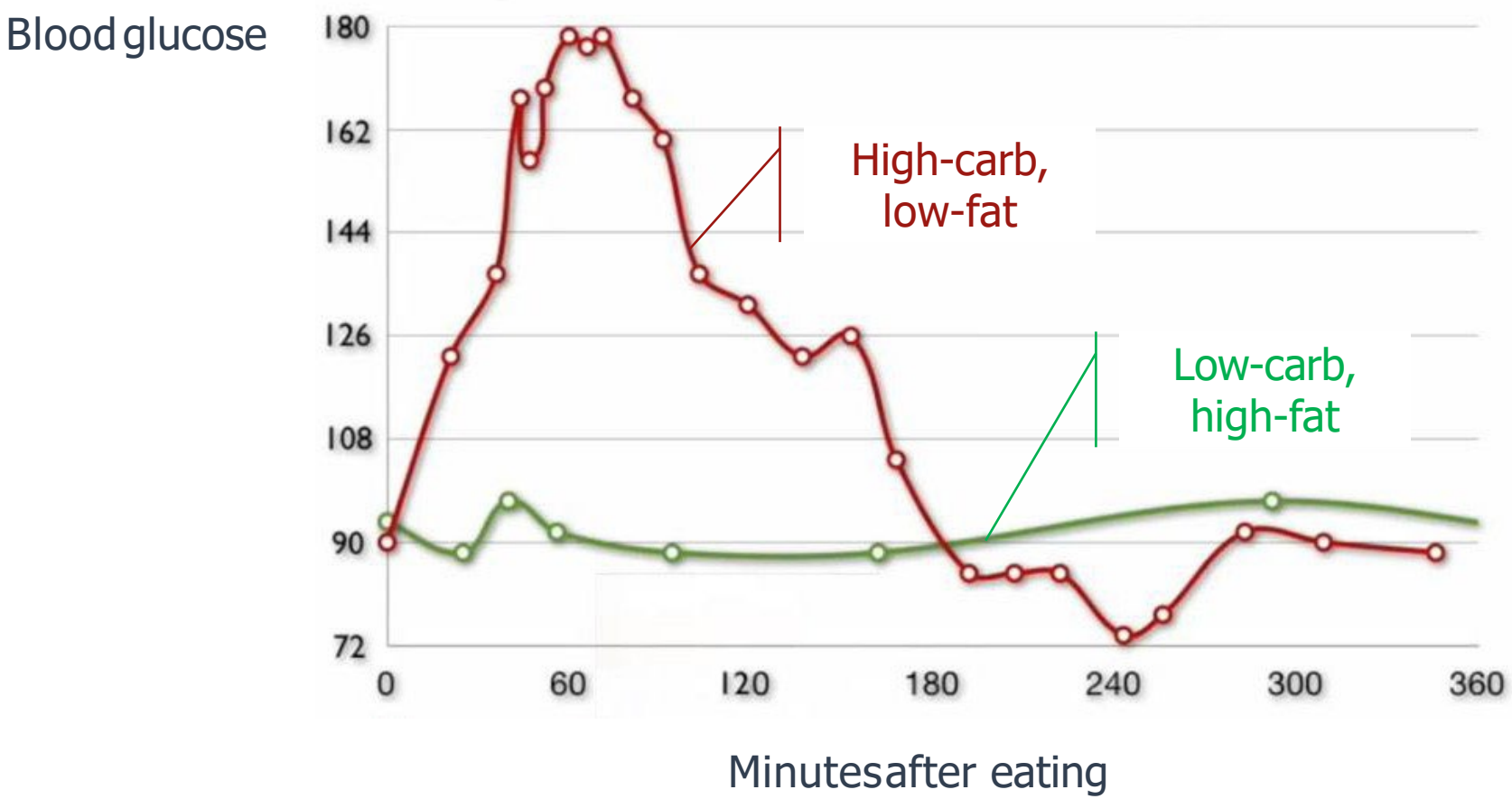
1.1 First principles

Carbohydrate restriction is an effective clinical intervention that clinicians may use to help patients achieve therapeutic goals for specific conditions to be designated in "condition-specific protocols."

Carbohydrate restriction targets specific conditions and patient populations. Carbohydrate reduction is not a "cure all," nor is it an appropriate intervention for all individuals.

Carbohydrate restriction should be tailored to the individual patient. It is not a "one-size-fits-all" approach to care. Clinicians should adapt carbohydrate-restricted dietary interventions to the specific needs and health goals of their patients, in keeping with their own expertise, experience, and clinical judgment.

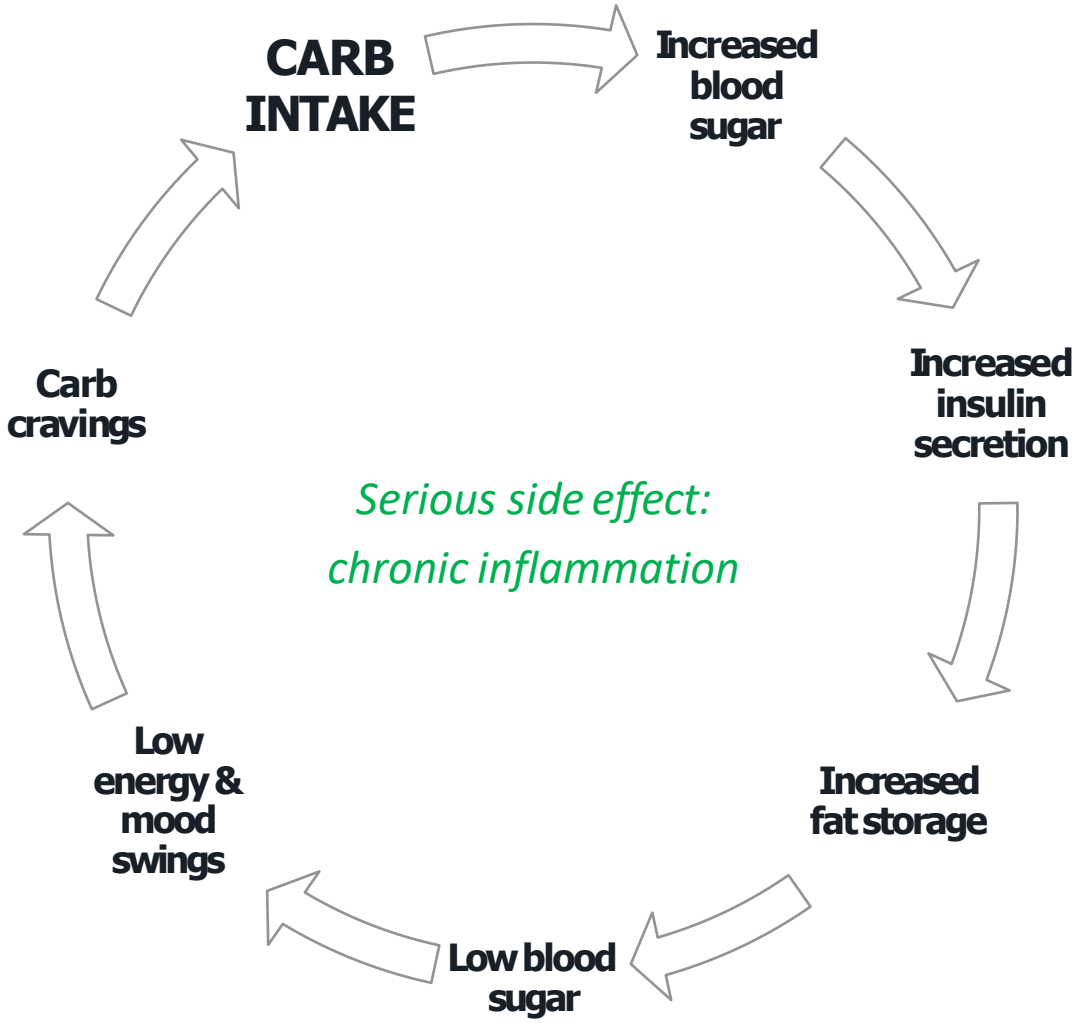
The basics: High-carb food spikes blood glucose level



The Food Revolution documentary by Dr Andreas Eenfeldt

Obesity & type 2 diabetes have a common cause: excessive dietary carbs

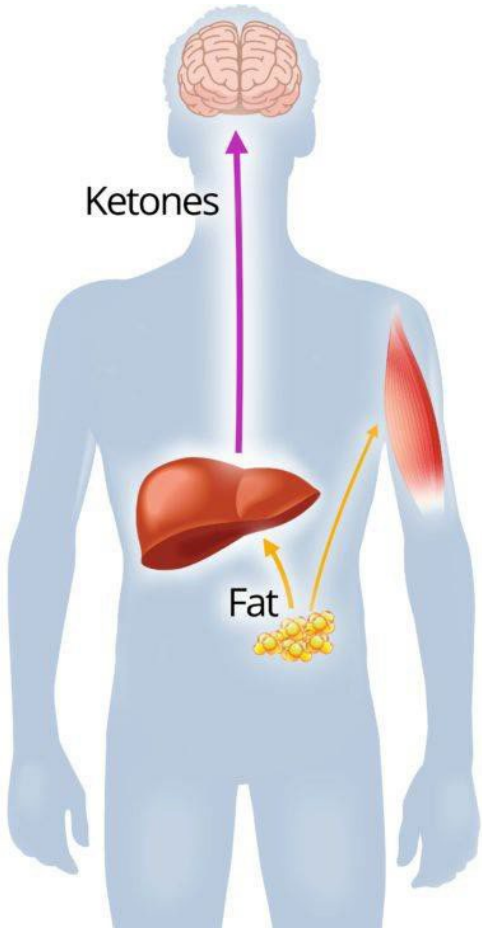
The carbs–glucose–insulin–fat cycle



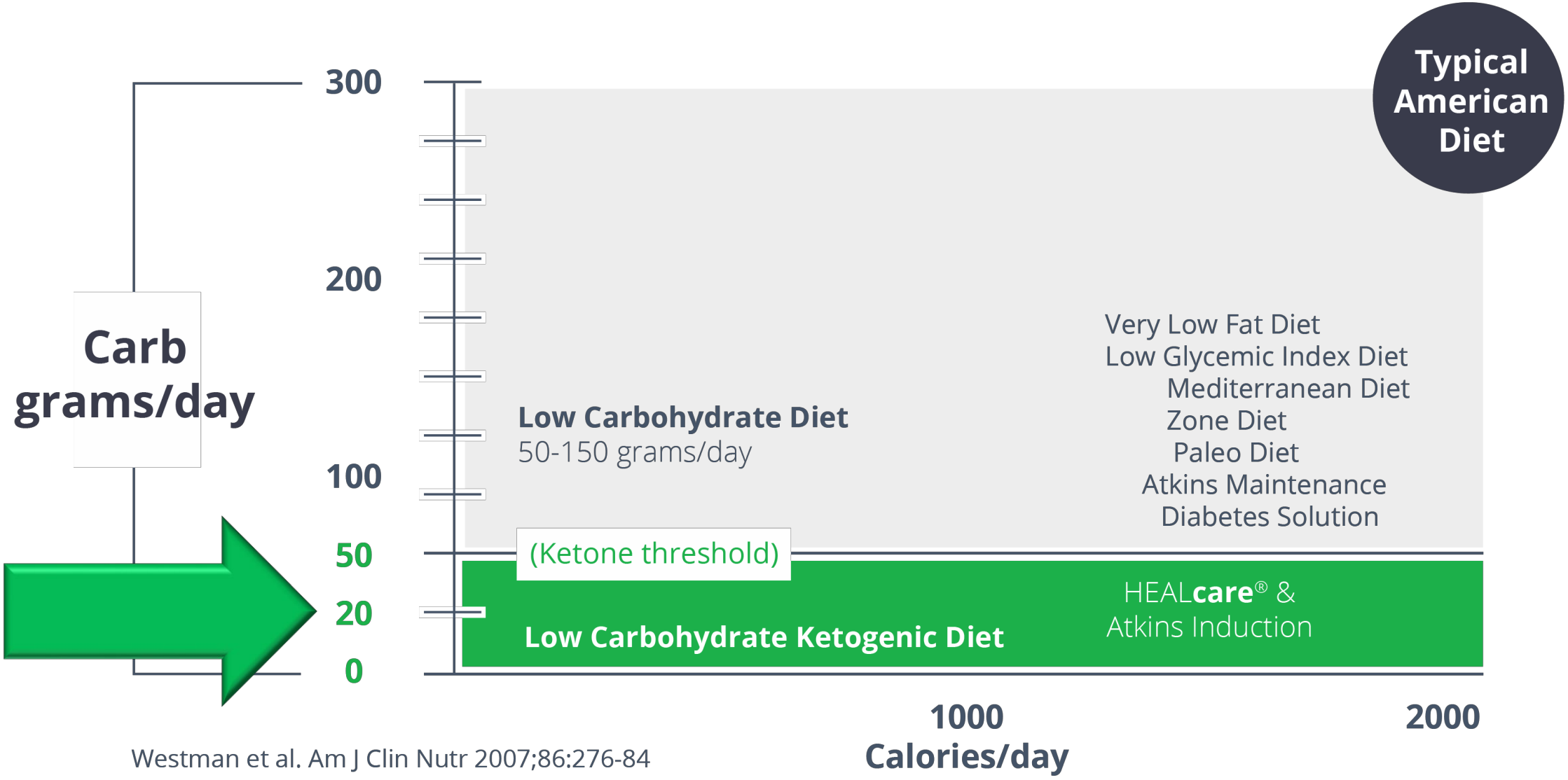
Nutritional Ketosis: fatty acids mainly used for fuel (energy) and ketones used in the place of glucose

Ketogenic eating triggers ketosis

- **Reduction in dietary carbohydrate signals liver to use fat and to convert fat into ketones**
  - Fat is from either food or body's fat tissue
- **In nutritional ketosis, there is no keto*acidosis***
  - Very small amounts of insulin dampen ketones
  - Ketones not used are excreted by the kidneys
- **Safe & desirable**
  - Brain prefers ketones over glucose
  - Babies are born in state of ketosis



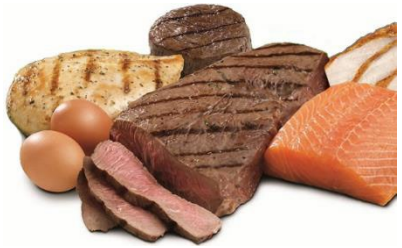
Not all low-carb diets are 'keto'



Westman et al. Am J Clin Nutr 2007;86:276-84

"Going keto" is simple

Tasty, satiating, affordable…
and good for you!



EAT AS MUCH AS YOU WISH OF THESE

Meat: Beef, lamb, veal, pork, ham, bacon, any game meat.

Poultry: Chicken, turkey, duck, pheasant or other game birds.

Seafood: Any fish or shellfish including salmon, halibut, cod, oolichan, crab, prawns, clams, oysters, mussels, squid, octopus, any smoked, dried or plain canned fish or seafood (not cured with sugar), roe and roe-on-kelp.

Eggs: whole eggs (do not eat whites without yolks).

LIMIT THESE UNTIL DIABETES ISIMPROVED OR ELIMINATED

Salad greens: 2 cups a day. Any leafy vegetable including lettuce or other salad greens, parsley, spinach, the tops of green onions, sprouts, fiddleheads, seaweed. (If it is a leaf—you can eat it.)

Vegetables: 1 cup (measured uncooked) a day. Vegetables that grow above the ground, including asparagus, beet greens, bok choy, broccoli, Brussel sprouts, cabbage, cauliflower, celery, chard, Chinese cabbage, cucumber, eggplant, green beans, kale, leeks, mushrooms, peppers, spinach, string beans, squash, tomatoes, turnips, wax beans and zucchini.

YOU MUST EAT VEGETABLES EVERY DAY

Limited amounts of cheese, cream, oils, mayonnaise, oliv
avocado, etc.

NO SUGAR

Not always obvious where it's "hiding"

One large (136g) banana can contain 17g (4.25 teaspoons) of sugar.

Two tablespoons of ketchup contains 8g (two teaspoons) of sugar.

One cup of Froot Loops contains 13g (3.25 teaspoons) of sugar.

One 355mL glass of orange juice contains 33g (8.25 teaspoons) of sugar.

One 355mL can of Coca-Cola contains 42g (10.5 teaspoons) of sugar.

One cup of grapes contains 15g (3.75 teaspoons) of sugar.

Two tablespoons of peanut butter contains 2.5g (0.625 teaspoons) of sugar.

Grains, pasta & starches =sugar

Fruits& nuts ="nature's candy"

Agro-engineered for sweetness – that is, sugar

What about "food quality"?

The top priority always is a nutritious LCHF diet

- Grass-fed beef *vs* grain-fed beef
- Farmer's market *vs* fast food
- No processed foods *vs* deli meats
- No artificial sweeteners *vs* artificial sweeteners
  - Only stevia?

Lose the bread & ketchup

Unlearning almost everything you've been told is good & bad

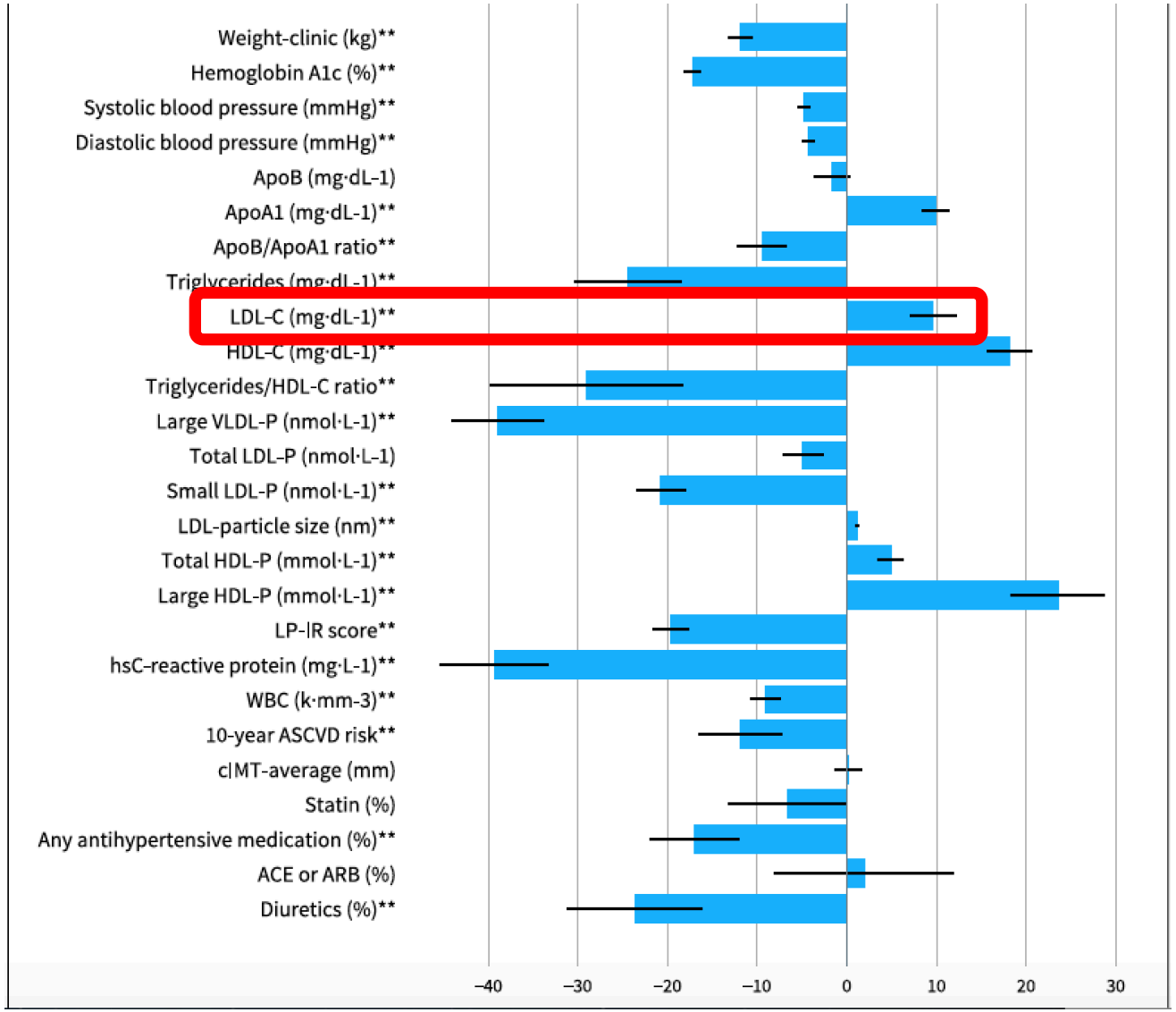
KETO

"You went on ~~Atkins~~ and lost 90 pounds, lowered your cholesterol, cured your high blood pressure, and now you're walking five miles a day. But I'm warning you, a low-carb diet is bad for your health!

Yes, you can succeed! Even if takes some effort

You don’t need a magic wand to “reprogram” your mind

Nutritional Ketosis: Everything gets better except…



Bhanpuri et al. Cardiovasc Diabetol 2018, 17:56.

Keto Addresses Insulin Resistance and the Metabolic Syndrome

Cardiometabolic Risk Factors	Total/LDL-cholesterol "old normal"	Metabolic Syndrome "new keto-normal" *
Elevated LDL-cholesterol	✓	-
Elevated Total cholesterol	✓	-
Elevated Triglycerides	-	✓
Reduced HDL-cholesterol	-	✓
Abdominal obesity	-	✓
Elevated blood pressure	-	✓
Elevated blood glucose	-	✓

*Reaven GM. Am J Med 1976;60:80-8.
*Volek JS. Lipids 2009;44:297-309.

Keto is therapeutic & preventive beyond obesity & diabetes

Strong evidence

Epilepsy
GERD
PCOS
NAFLD
IBS

Glycogen Storage Disease (McCardle's)

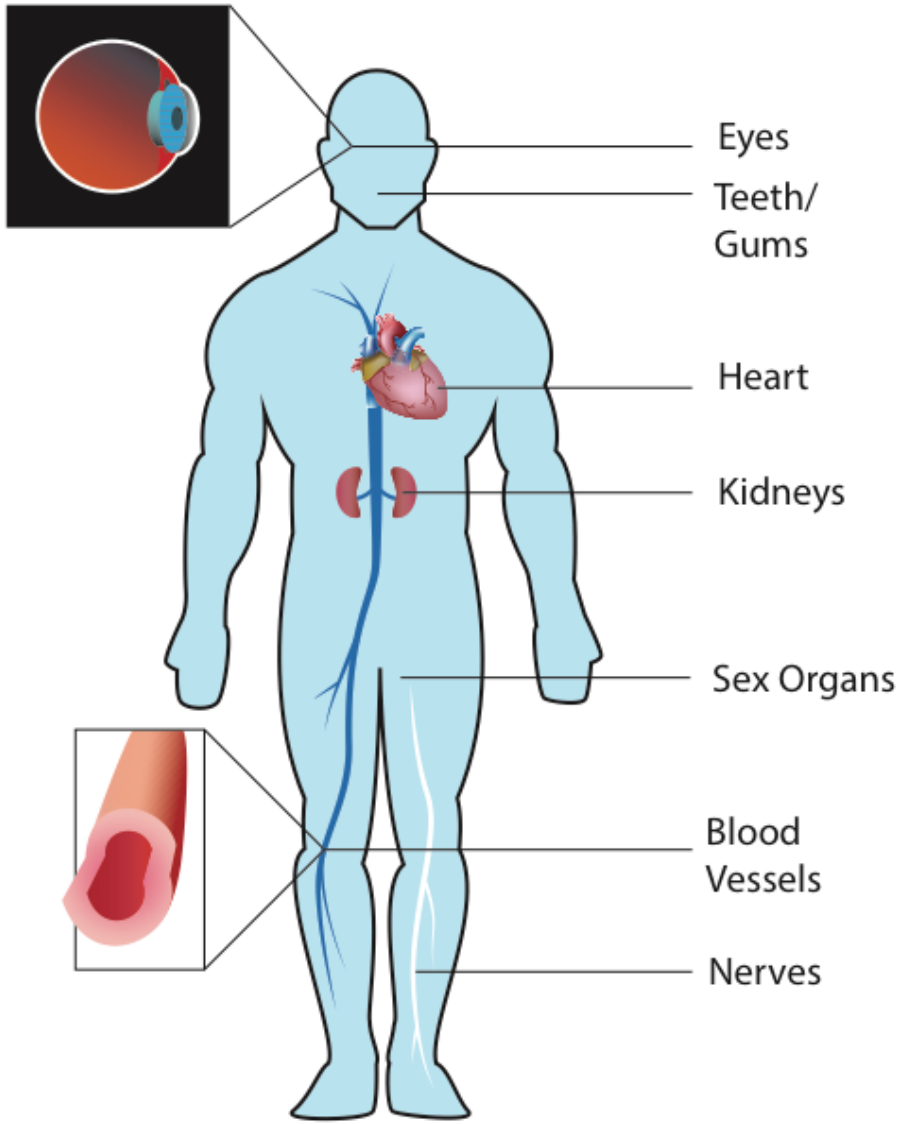
Traumatic brain injury

Evolving evidence

Alzheimer's Disease
sometimes called type 3 diabetes

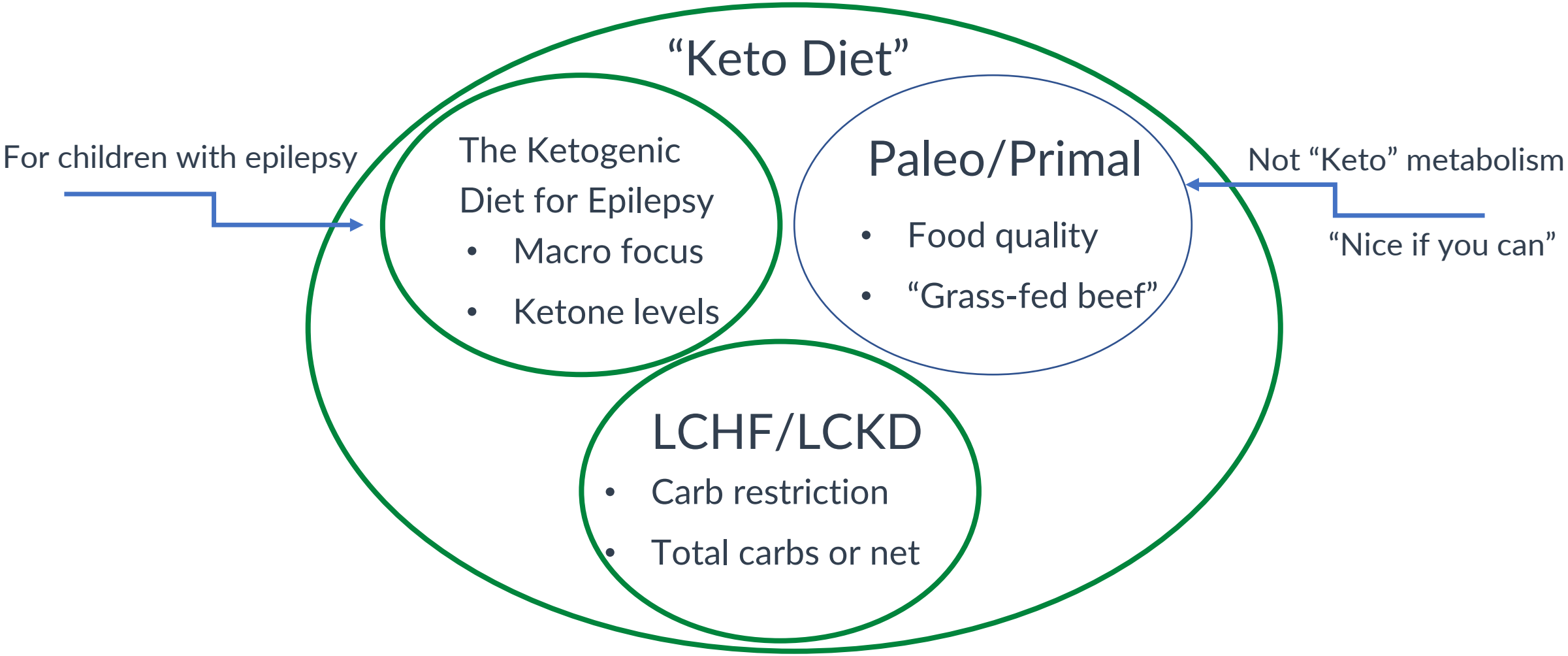
Cancer

Excess blood glucose & insulin → inflammation & toxicity → many diseases



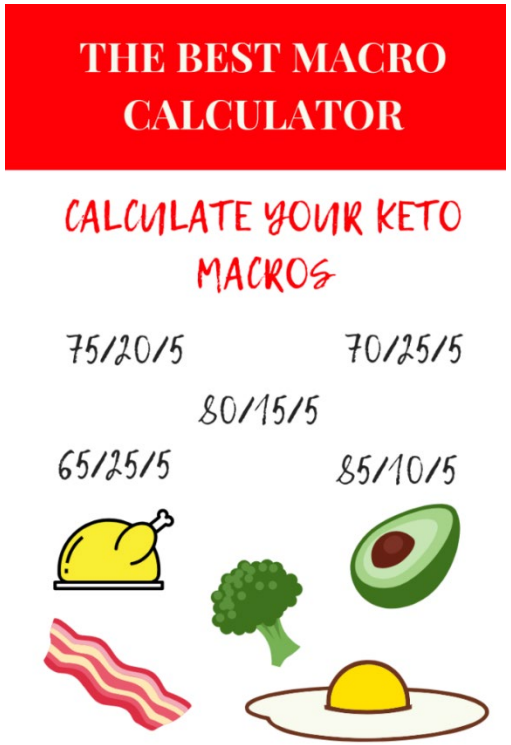
Internet Keto

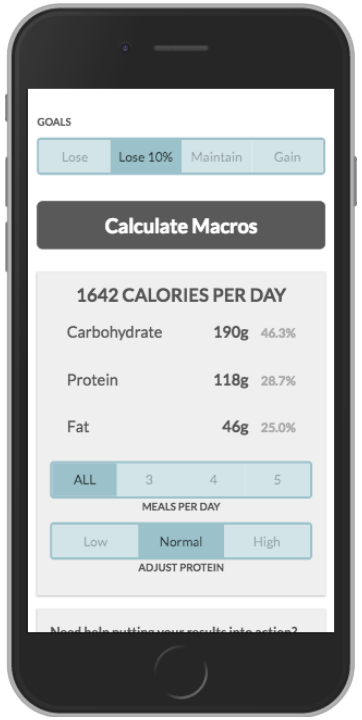
Internet Keto



#10 Measuring Ketones is not Required

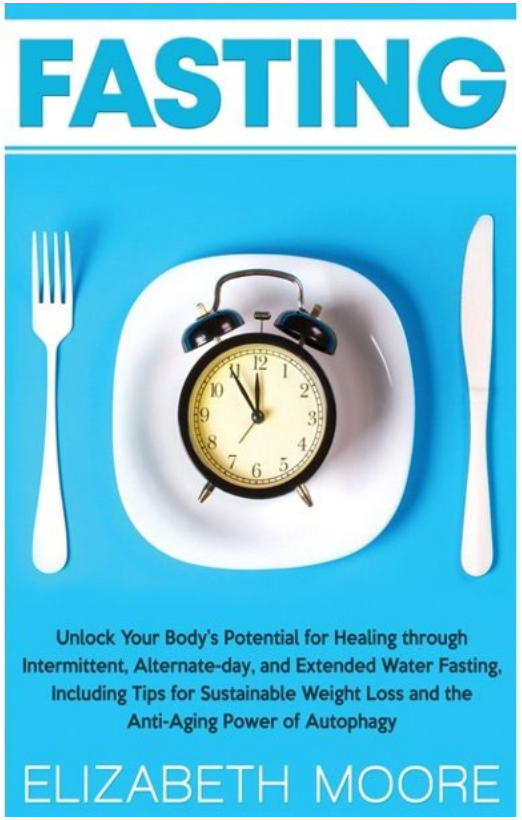
#9 Macro Calculation is not Required

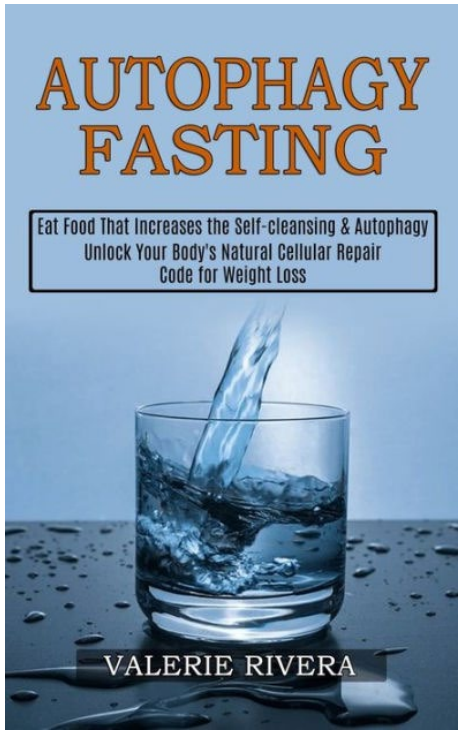




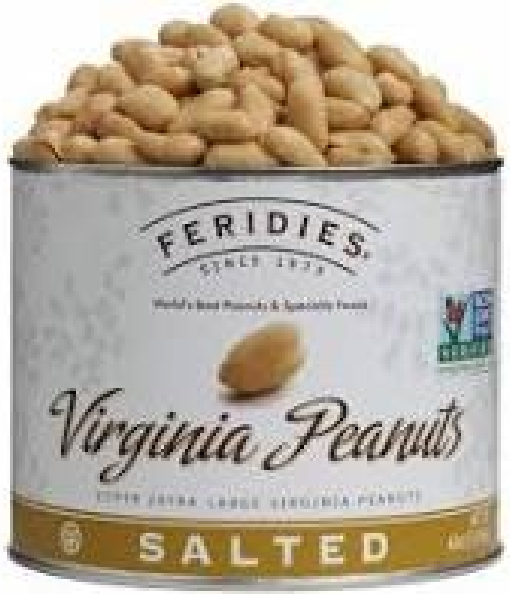
#8 Medium Chain Triglyceride Oils or Ketone Drinks or Pills are not Required

#7 Fasting is not Required





#6 Nuts, Nut flour, and Nut Butter are NOT OKAY



NO ALMOND FLOUR

NO PEANUT BUTTER

#5 Vegetables are not Unlimited

#4 Use “Total Carbs,” not “Net Carbs”

Nutrition Facts

14 servings per container

Serving Size 1 slice (1oz)

Calories per serving **45**

Amount/serving	%DV	Amount/serving	%DV
Total Fat 2g	3%	**Total Carb.** 7g	3%
Sat. Fat 1g	5%	Fiber 7g	25%
Trans Fat 0g		Total Sugars 0g	
Cholest. 0mg	0%	Incl. 0g Added Sugars	0%
Sodium 90mg	4%	**Protein** 7g	14%

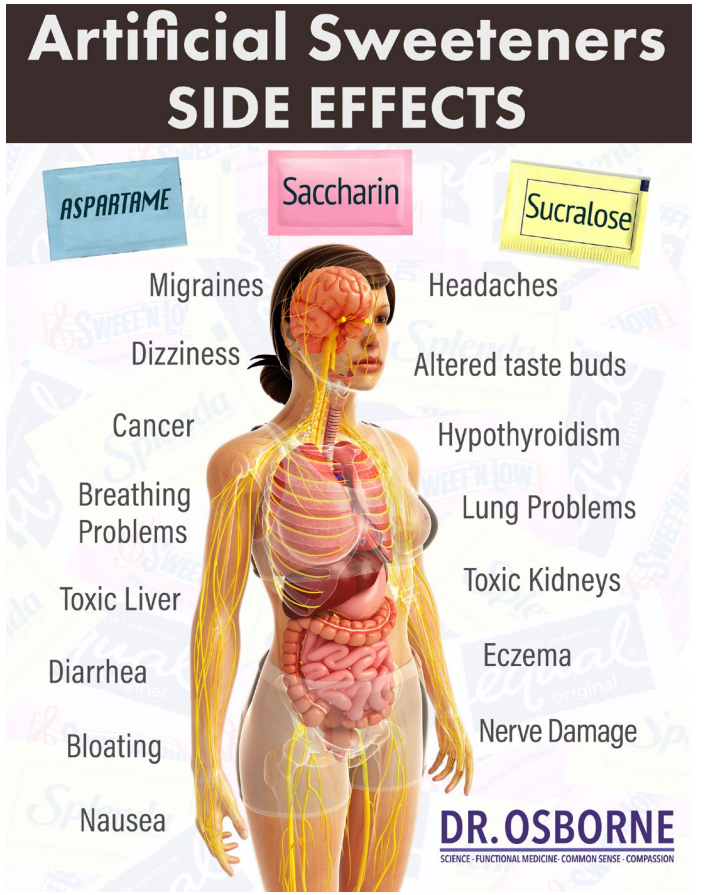
Vitamin D 0% • Potassium 0% • Calcium 0% • Iron 0%

NON-GMO INGREDIENTS: wheat protein isolate, vital wheat gluten, oat fiber, modified wheat starch, olive oil, chicory root, yeast, salt, enzyme.

Contains: Wheat. Baked in a facility that uses wheat, soy, peanuts, tree nuts.

Enjoy toasted. *Zero net carbs calculated as total carbs minus fiber.

#3 Artificial Sweeteners are not Forbidden



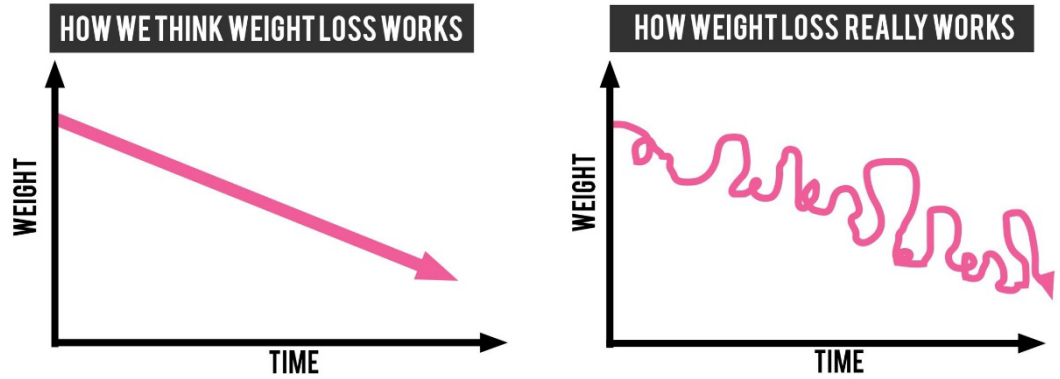
#2 Expensive, “Clean” Food is not Required

#1 Cheese, Fats and Oils are Limited

"Keto is not working for me!"

Mmmm, let's figure out why

- Any hidden carbs?
- Did you have a keto lapse?
- Any new meds from another doctor?
- Being a bit impatient?
- Success path not a straight line with exact timelines



Where do you start?

If at least one applies:

Insulin

Blood-glucose-control medication

High blood pressure

BMI over 50

- **See medical provider who knows keto!**

  Society of Metabolic Health Practitioners

  Obesity Medicine Association

  Duke Keto Medicine Clinic 919-471-8344

Otherwise, two options

- **Guided program with trained coaches**

  e.g., Adapt Your Life Academy Keto Made Simple Masterclass

  (www.adaptyourlifeacademy.com)

- **Do-it-yourself**

  Must learn what's factual & be very self-motivated – lots of misinformation, especially in Facebook

THE THERAPEUTIC BENEFITS OF A LOW CARB / KETO LIFESTYLE

ERIC C. WESTMAN, MD MHS
Duke Keto Medicine Clinic

Keto Salt Lake

April 15, 2022