

The War on Obesity, Can We Win? Crisis in America 2001

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What is Wrong With This Picture?

- 61% of U.S. adults are overweight or obese.
- 26% are obese – this figure has doubled since 1980.
- Consumption of fat has steadily decreased over the same time period.
- Consumption of carbohydrates has increased over the same time period.
- \$110 billion is spent each year for treating obesity-related diseases.

The Most Direct System for Weight Loss

Switch the Metabolism From Glucose-Burning to Primarily Fat-Burning

- This lipolytic pathway is the body's second of the two primary pathways for energy. The body readily produces all the enzymes involved in fat-mobilization (lipolysis).
- When fat is being mobilized, it neither accumulates nor deposits.
- Ample quantities of non-carbohydrate foods may be consumed because they do not inhibit fat mobilization.

Controlled Carbohydrate Rationale: Alternate Metabolic Pathway

- Stored fat serves as the back-up fuel system.
- The human body cannot store more than a two-day supply of carbohydrate (glycogen).
- When carbohydrate is not available, fat becomes the primary energy fuel.
- Triglyceride is fat.
- When fat is the primary fuel, triglycerides (both stored and in blood) are lowered.
- When fat is the primary fuel, individuals experience increased energy and decreased appetite.

Restricting Carbohydrates Curbs Hunger

- A decrease in hunger was noted after day two of a fast and was attributed to high levels of ketones. “In every case, there was a relationship between hyperketonemia and the loss of appetite.”¹
- The same degree of ketosis was achieved with protein and fat containing foods and restriction of carbohydrate.²
- Therefore, carbohydrate restriction will suppress appetite.

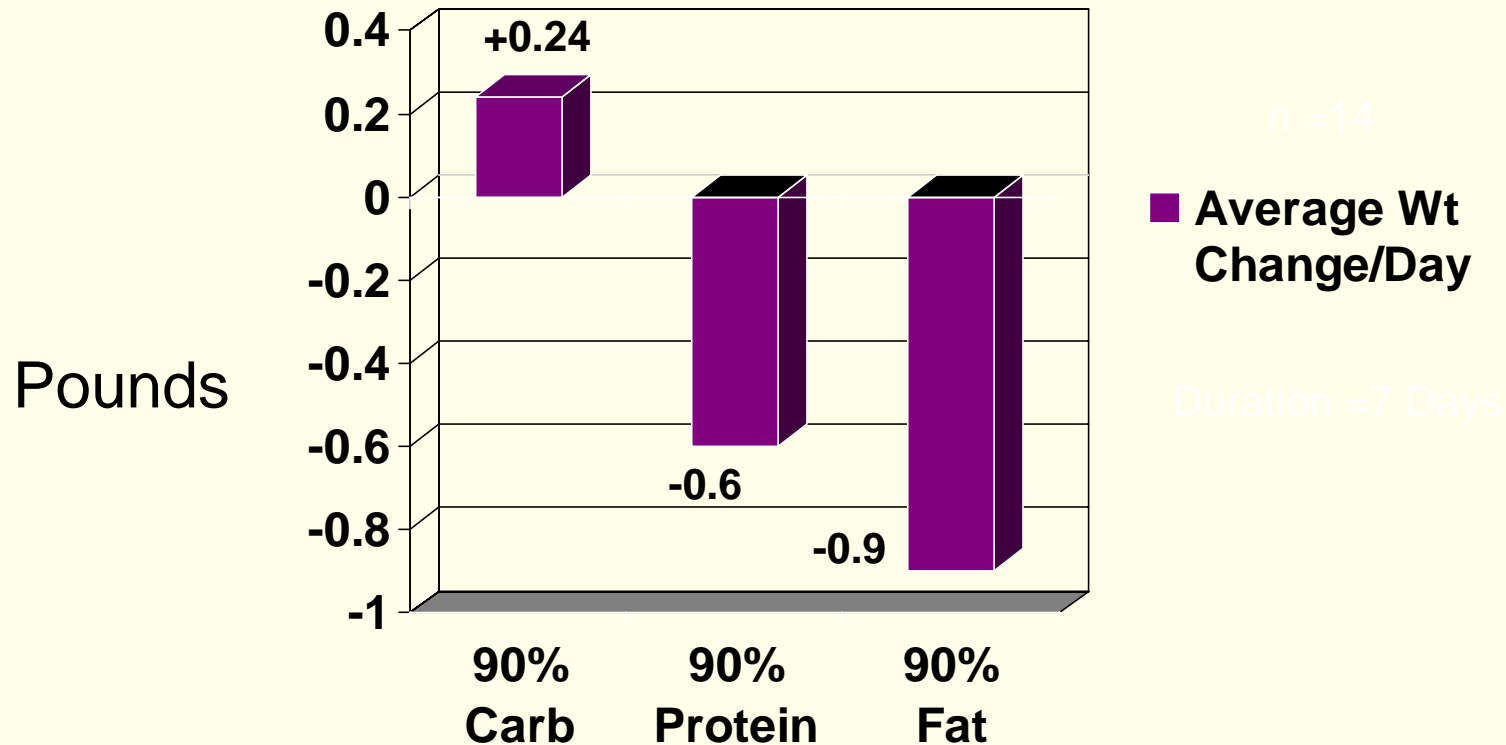
¹ Duncan, G.G., Jenson, W.K., Cristofori, F.C., et al., “Intermittent Fasts in the Correction and Control of Intractable Obesity,” *The American Journal of the Medical Sciences*, 1963, pages 515-520.

² Azar, G.J., Bloom, W.L., “Similarities of Carbohydrate Deficiency and Fasting,” *Archives of Internal Medicine*, 112, 1963, pages 338-343.

The Evidence for “Metabolic Advantage” of Controlled Carbohydrate Approach

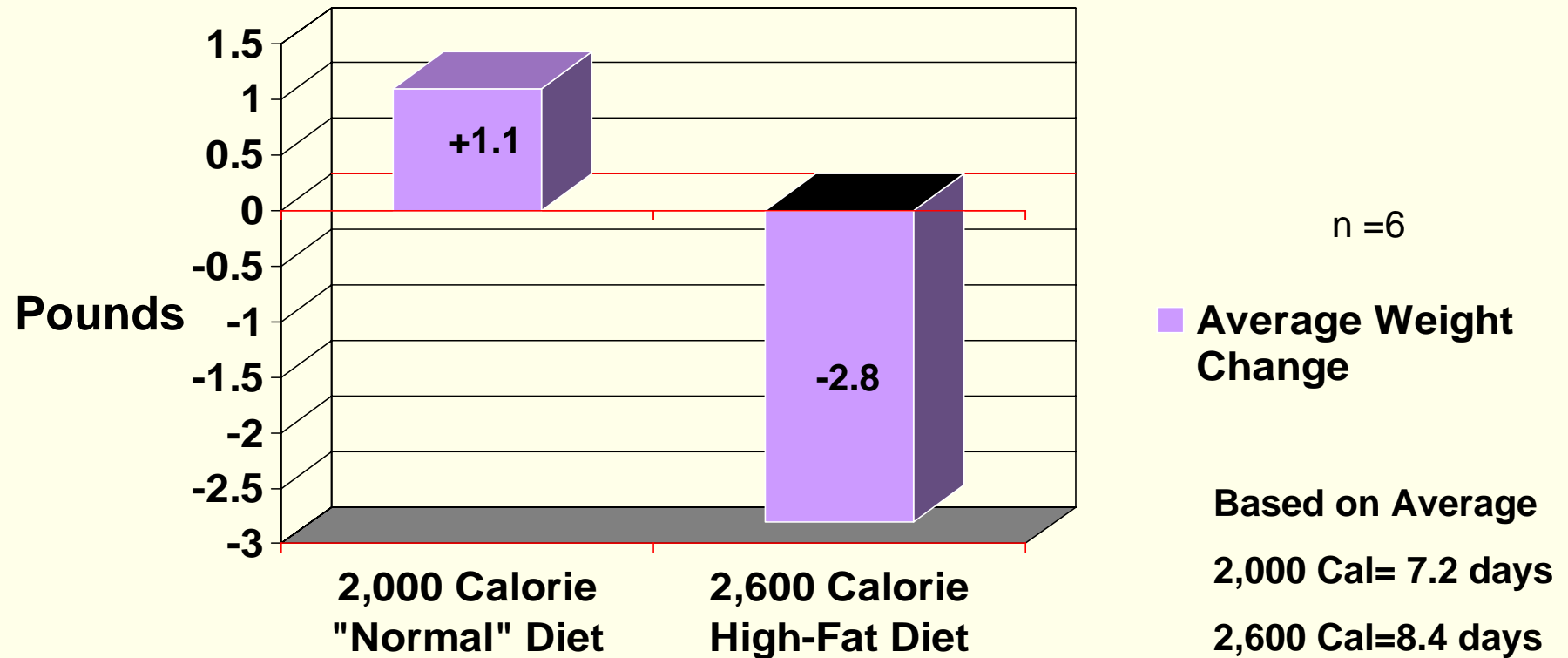
- Kekwick and Pawan showed a metabolic advantage of 2,350 calories per day.
- Benoit et al. demonstrated that a 1,000-calorie weight loss program doubled the loss of body fat vs. total fat.
- Young et al. showed that weight loss and body fat correlated with decreasing carb intake.
- Sondike et al. showed a metabolic advantage of 1,160 calories per day in obese adolescents.

Daily Weight Changes on 1,000-Calorie Diets of Different Composition



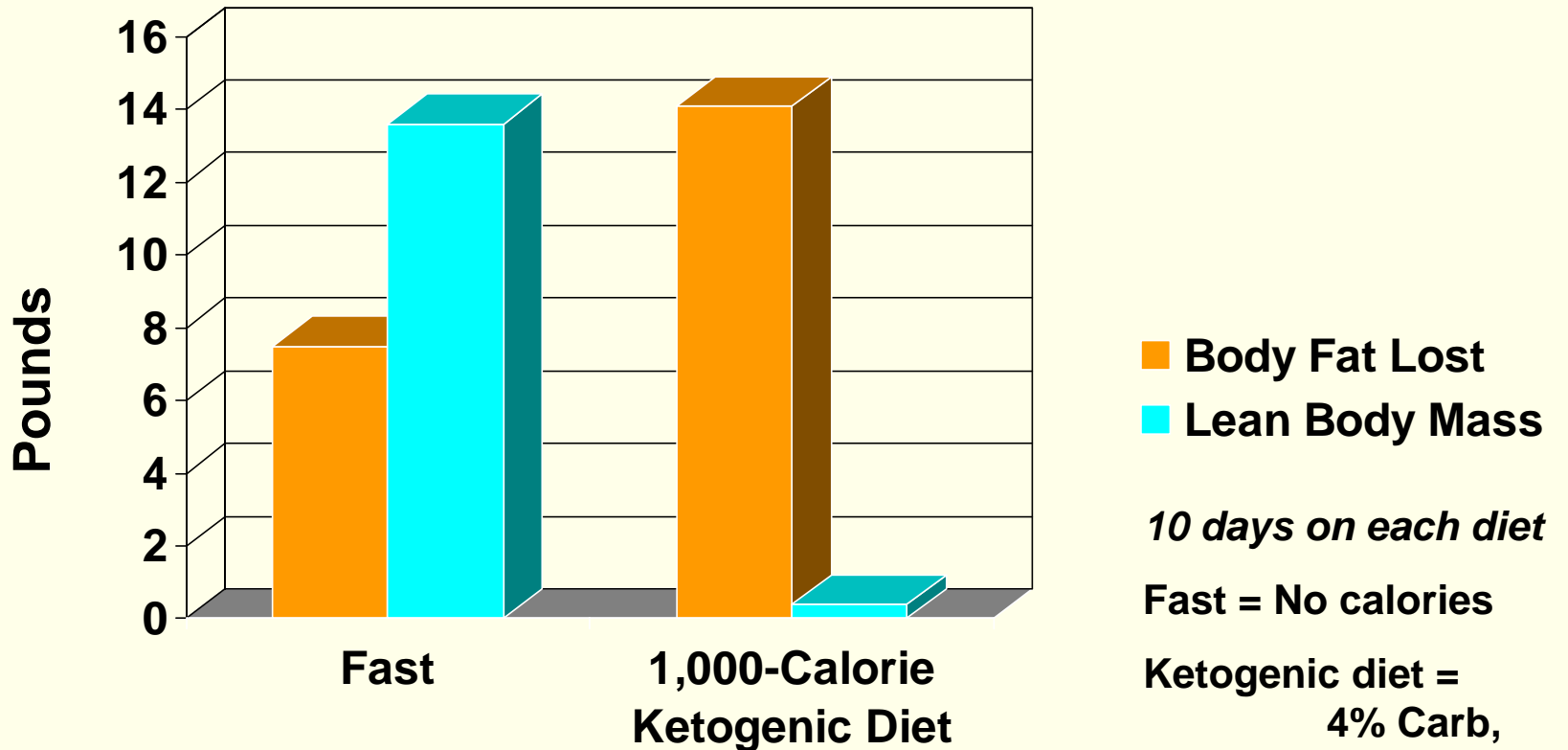
Kekwick, A., Pawan, G.L.S., "Calorie Intake in Relation to Body Weight Changes in the Obese," *The Lancet*, July 28, 1956, pages 155-161.

Weight Changes With “Normal” 2,000-Calorie and High-Fat 2,600-Calorie Diets



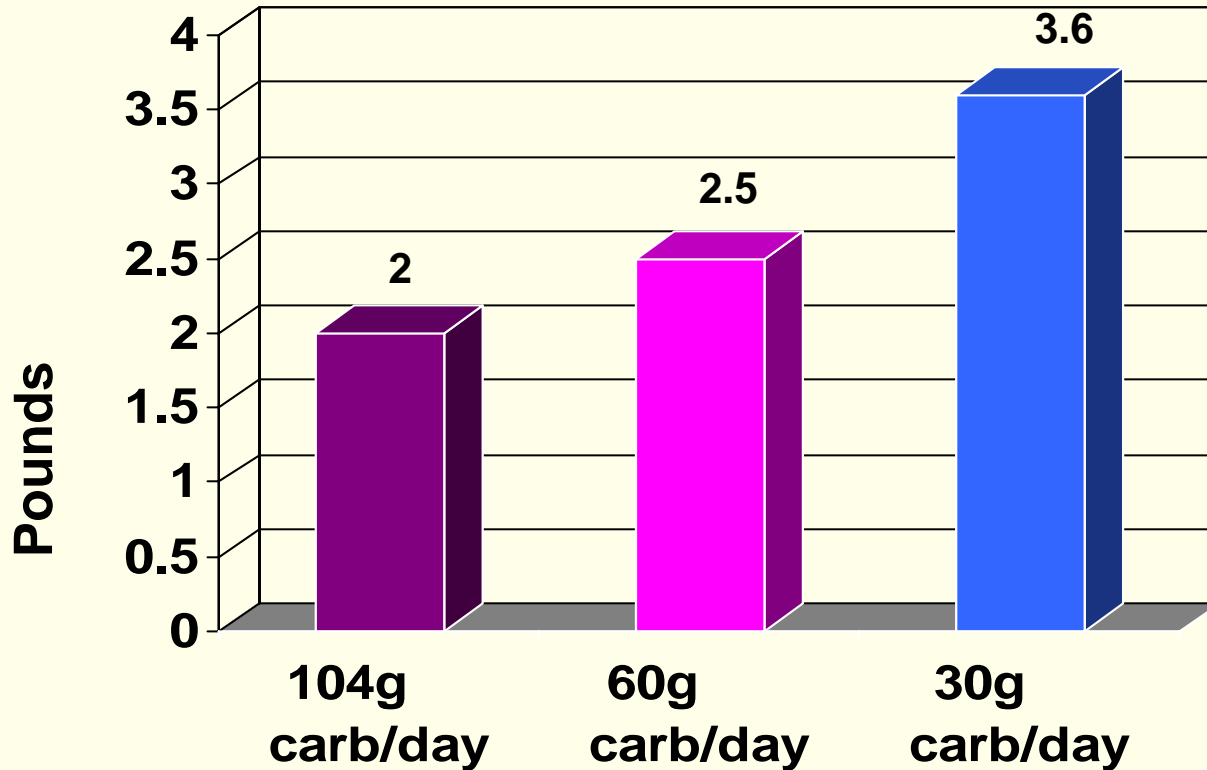
Kekwick, A., Pawan, G.L.S., “Calorie Intake in Relation to Body Weight Changes in the Obese,” *The Lancet*, July 28, 1956, pages 155-161.

Metabolic Effects of Fasting and a Ketogenic Diet



Benoit, F.L., Martin, R.L., Watten, R.H., "Changes in Body Composition During Weight Reduction In Obesity: Balance Studies Comparing Effects of Fasting and a Ketogenic Diet," *Annals of Internal Medicine*, 63(4), 1965, pages 604-612.

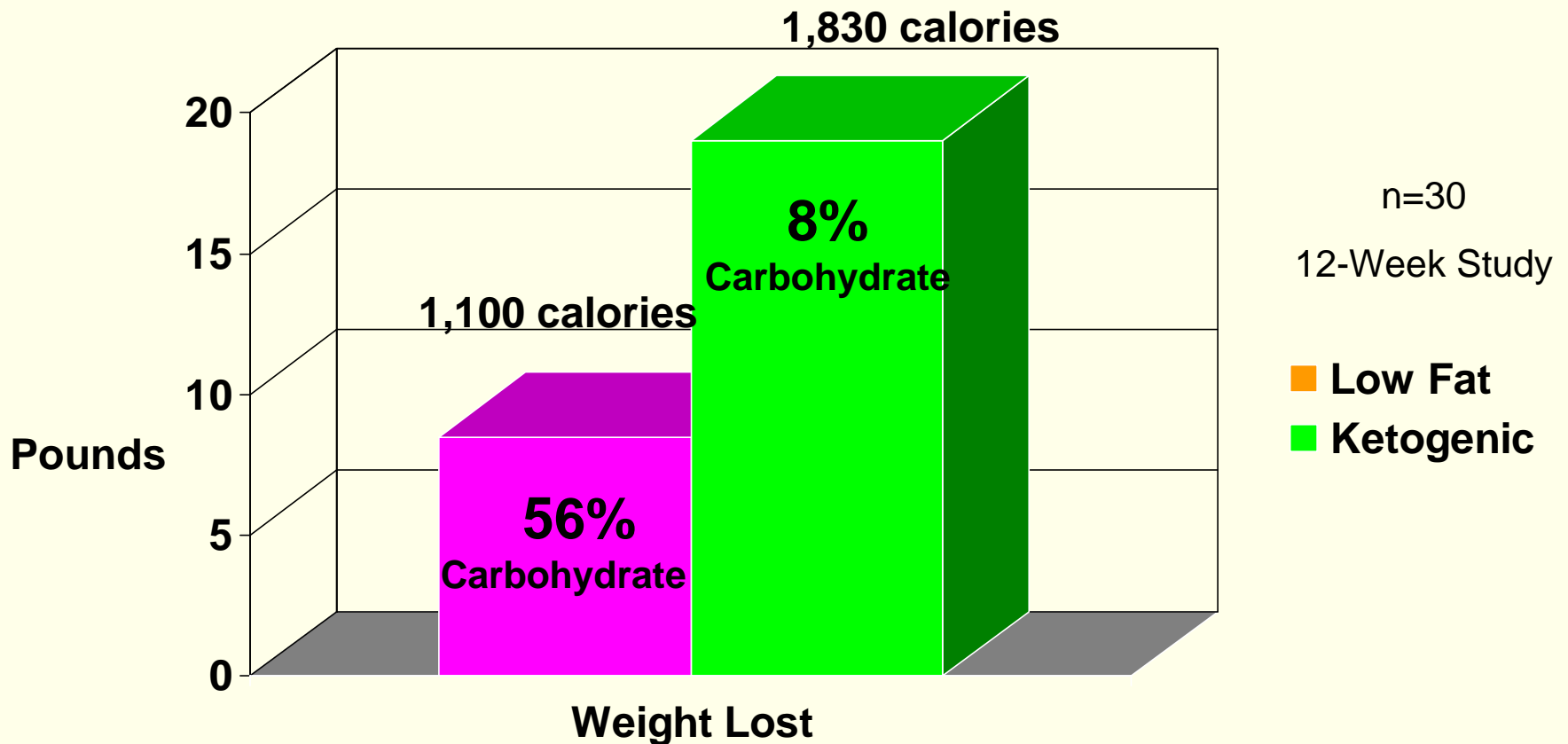
Pounds of Body Fat Lost Per Week on Varying Grams of Carbohydrate Intake



9-Week Study
n= 8 Obese Young Men
1,800 Calorie Diet

Young, C.M., Scanlan, S.S., Im, H.S., et al., "Effect on Body Composition and Other Parameters in Obese Young Men of Carbohydrate Level of Reduction Diet," *American Journal of Clinical Nutrition*, 24, 1971, pages 290-296.

Comparison of Low-Fat Diet Therapy With Controlled Carbohydrate, Ketogenic Approach in Obese Adolescents



Sondike, S.B., Copperman, N.M., Jacobson, M.S., "The Ketogenic Diet Increases Weight Loss But Not Cardiovascular Risk in Obese Adolescents: A Randomized Controlled Trial. *Journal of Adolescent Health*, 26, 2000, page 91.

Misconceptions About Controlled Carbohydrate Nutritional Approach

- Just another low-calorie diet.
- Water loss accounts for weight loss.
- Not sustainable for long-term adherence.
- Elevated cardiac risk factors.
- Produces renal damage and kidney stones.
- Ketosis is dangerous.

The Role of Ketones

- Fat delivers energy via ketones just as carbohydrate delivers energy via glucose.
 - Enzymes are present within all cells, including the brain, to convert ketones into fuel.
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Ketones as a Fuel Source

- Results in decrease in appetite.
 - Insulin is not involved in ketone production.
 - Lowered insulin requirements decrease:
 - Triglycerides
 - Blood pressure
 - Adrenaline, cortisol
 - PCOS, breast cancer death rate
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Ketone Body Metabolism

- Low-carbohydrate diets result in increased ketone production in liver (ketogenesis).
- Nearly every cell in the body can use ketones as an alternative energy source (ketolysis).
- “Physiological” versus “diabetic” hyperketoacidosis:

Fed State:	0.1 mmol/L
Overnight Fast:	0.3 mmol/L
Ketogenic Diet:	1-3 mmol/L
>20 Days Fasting:	10 mmol/L
Uncontrolled Diabetes:	>25 mmol/L
- Urinary ketone excretion is in direct proportion to plasma concentrations.

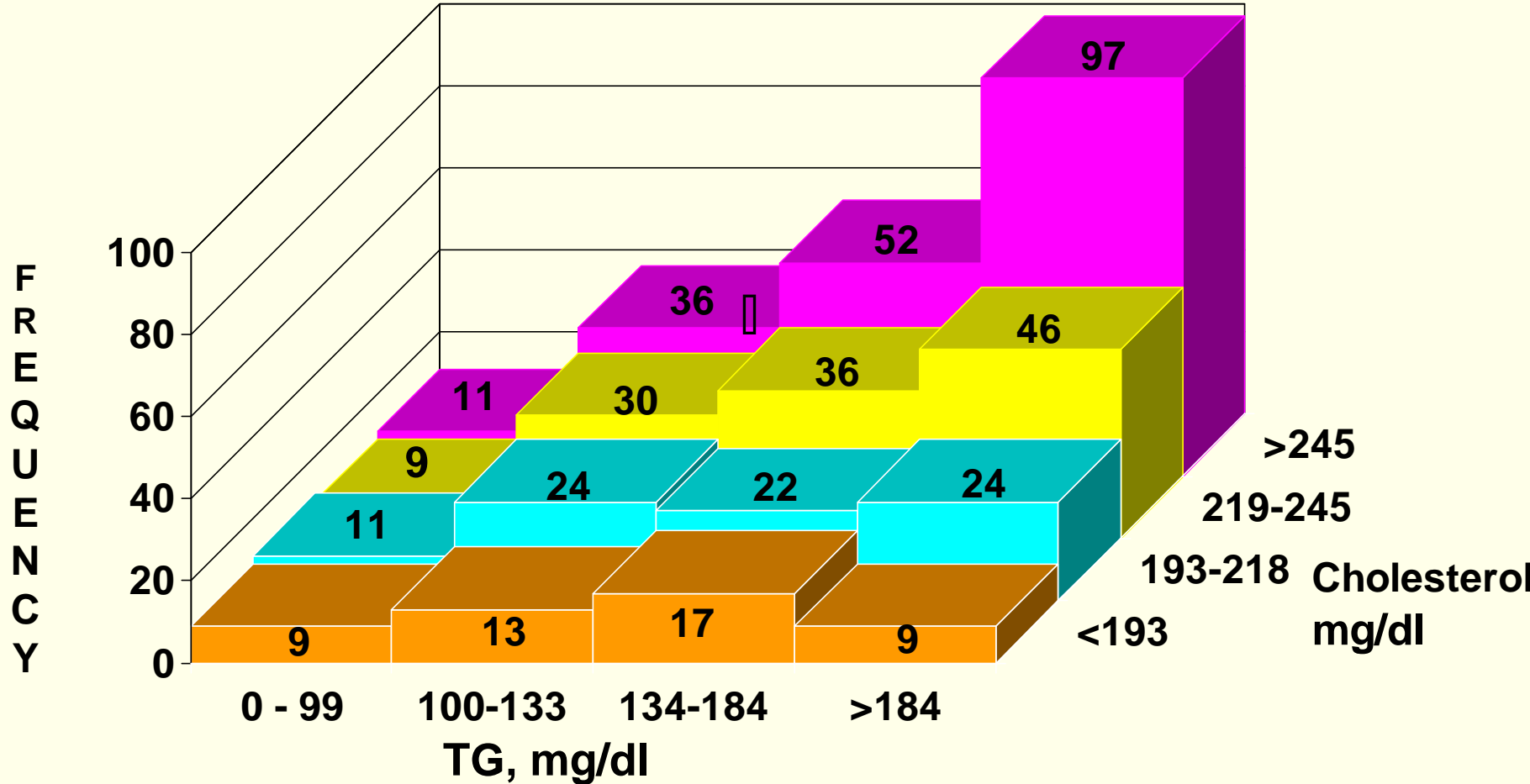
The Human Metabolic Response to Chronic Ketosis Without Caloric Restriction: Physical and Biochemical Adaptation

“In view of the tests done to screen for ill effects of the eucaloric ketogenic diet, the remarkably benign nature of a diet providing 85% of calories as fat is notable. After four weeks there was no measurable impairment of hepatic, renal, cardiac, or hematopoietic function.”

Phinney, S.D., Bistrian, B.R., Wolfe R.R., et al., “The Human Metabolic Response to Chronic Ketosis Without Caloric Restriction: Physical and Biochemical Adaptation,” *Metabolism*, 32(8), 1983, pages 757-768.

Frequency of Heart Attacks by Cholesterol and Triglyceride (TG)

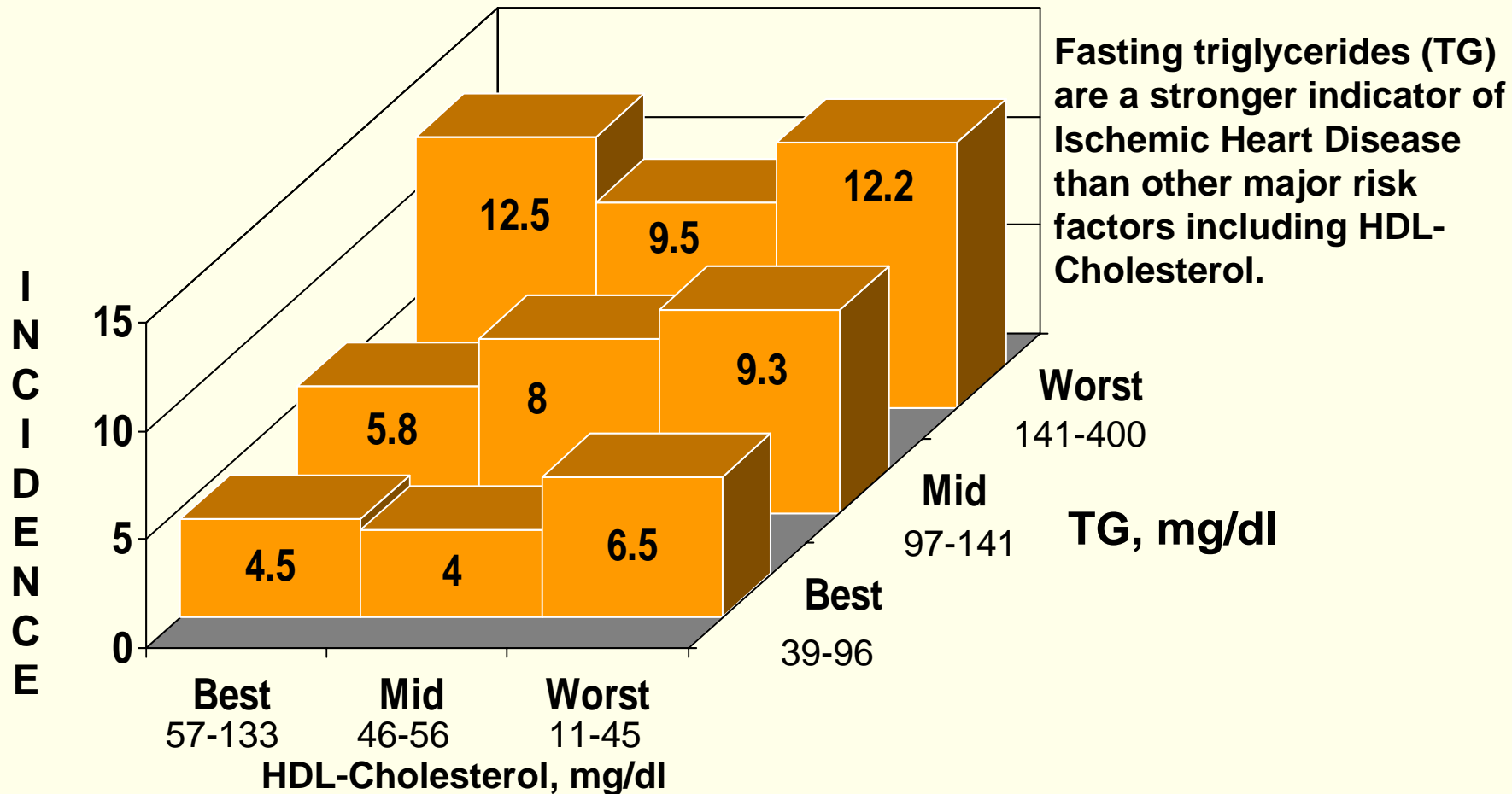
Strong Interaction Between Cholesterol and TG on the Risk for Heart Attack



Stavenow, L., Kjellstrom, T., "Influence of Serum Triglyceride Levels on the Risk for Myocardial Infarction in 12,510 Middle Aged Males: Interaction with Serum Cholesterol." *Atherosclerosis*, 147, 1999, pages 243-247.

The Copenhagen Male Study

2,906 Men Without Heart Disease: An 8-Year Follow-up Study



Jeppesen, J., Hein, H.O., Suadicani, P., et al., "Triglyceride Concentration and Ischemic Heart Disease An Eight-Year Follow-up in the Copenhagen Male Study," *Circulation*, 97(11), 1998, pages 1029-1036.

Who is at Risk for Insulin Resistance?

- Diabetics
- Obese and overweight individuals
- Individuals who are hypertensive
- Those with sedentary lifestyles
- Those with a genetic predisposition
- Smokers

Characteristics of Syndrome X

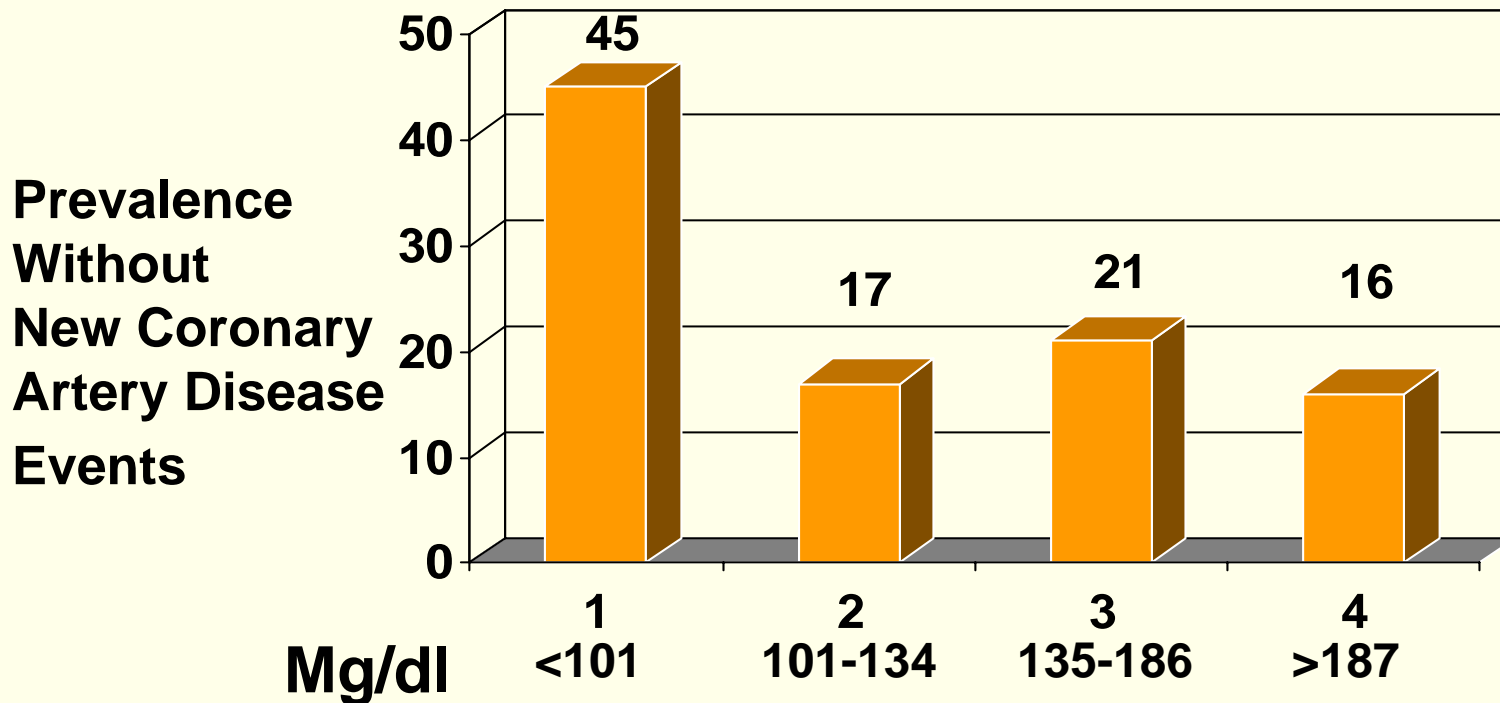
- High triglycerides
 - Increased glucose and increased insulin levels
 - Smaller and denser LDL (“bad”) and VLDL (very-low-density lipoprotein) cholesterol
 - Increased plasminogen activator-1 (decreased ability to break up blood clots)
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Characteristics of Syndrome X (cont'd)

- Carbohydrate cravings
- High blood pressure
- Family history of diabetes
- Truncal obesity
- Increased body mass index (BMI)
- Low HDL (“good”) cholesterol
- High uric acid levels

Low Triglycerides Protect Against Heart Disease

Triglyceride Quartile

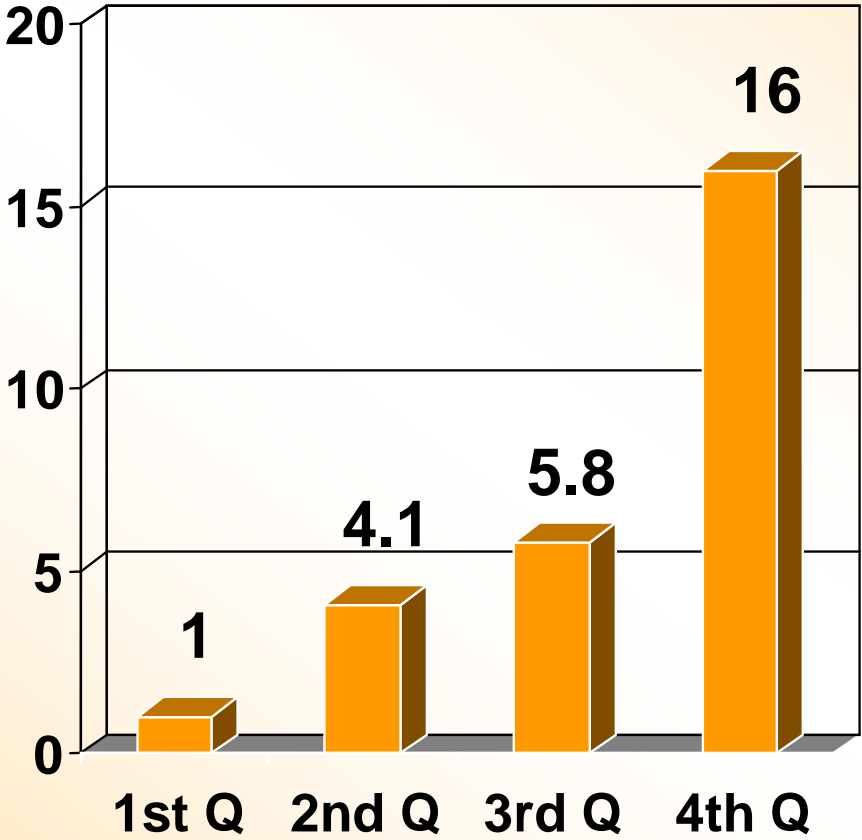


Miller, M., Seidler, A., Moalemi, A., et al., "Normal Triglyceride levels and Coronary Artery Disease Events: The Baltimore Coronary Observational Long-Term Study," *Journal of the American College of Cardiology*, 31(6) 1998, pages 1252-1257.

Relative Risk of Heart Attack Quartile of Log Triglyceride Level/HDL (“good”) Cholesterol Level

Mean Triglyceride Levels

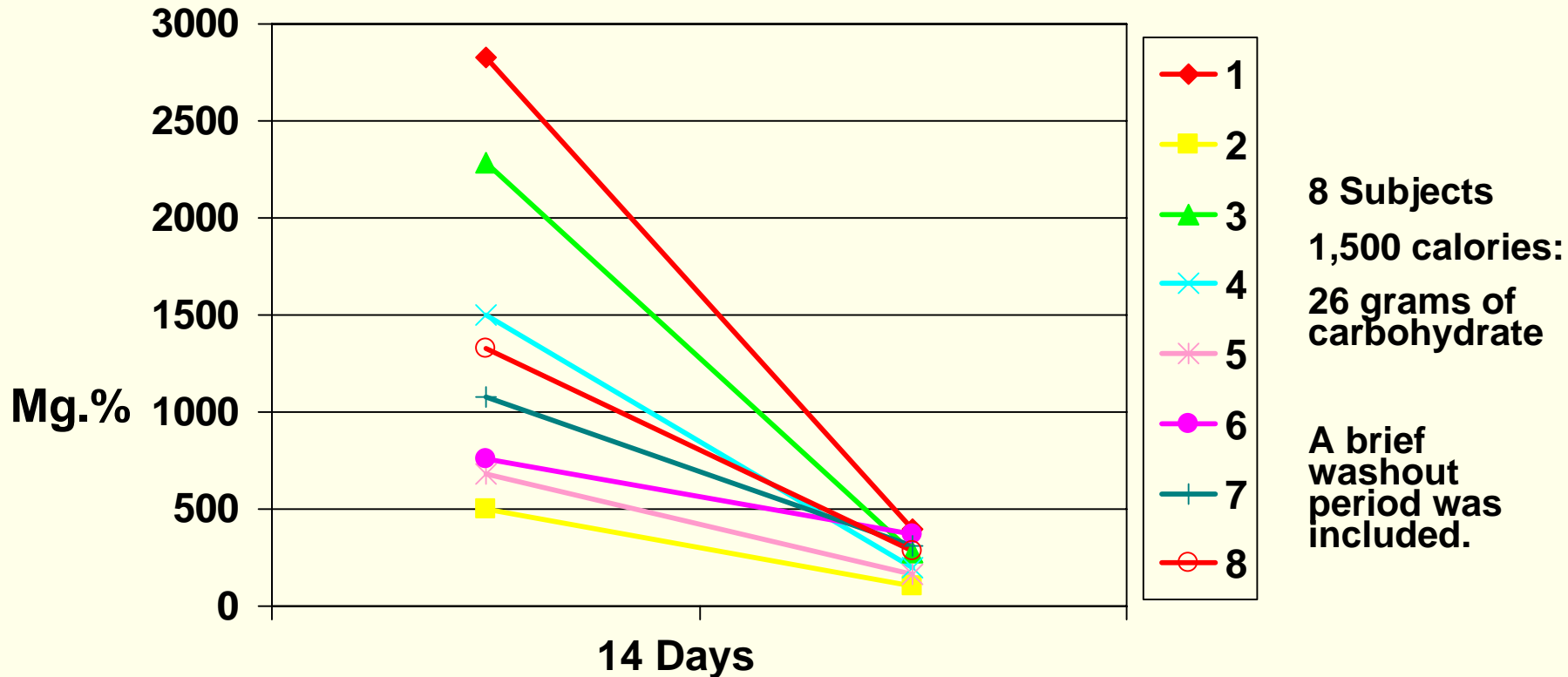
1st Q=70.1
2nd Q=108.5
3rd Q=138.7
4th Q=278.9



Relative Risk

Gaziano, J.M., Hennekens, C.H., O'Donnell, C.J. et al., "Fasting Triglycerides, High-Density Lipoprotein, and Risk of Myocardial Infarction," *Circulation*, 96(8), 1997, pages 2520-2525.

Triglyceride Changes on a Controlled Carbohydrate, High-Fat Regimen



Reissell, P.K., Mandella, P.A., Poon-King, T.M.W., et al., "Treatment of Hypertriglyceridemia," *The American Journal of Clinical Nutrition*, 19, 1966, pages 84-98.

Clinical Indications of Syndrome X

- Fasting glucose between 110-126 (impaired fasting glucose)
- Fasting triglycerides of 150mg/dL or more
- HDL (“good”) cholesterol under 40mg/dL

Insulin Resistance

- 33 - 40 million people are insulin resistant (25 – 30% of total US population)
- Exclusive of those individuals not diagnosed with diabetes, obesity or high blood pressure

Medications That Increase Metabolic Resistance

- Hormones
- Non-steroidal anti-inflammatory drugs
- Psychotropics
- Diuretics and other anti-hypertensives
- Steroids
- Antibiotics
- Insulin
- Drugs that elicit an insulin response
- Prior history of diet pill use

Clinical Uses for Restricting Carbohydrate Intake

- Obesity
- Blood sugar control
- Correction of hyperinsulinism
- Correction of edema
- Reduction of gastro-intestinal activity
- Control of yeast overgrowth
- Decreasing risk of some cancers

Blood Sugar Stabilization Benefits

- Provides constant physical energy
 - Eradicates “brain fog”
 - Decreases sleep apnea, snoring
 - Prevents mood swings
 - Avoids panic attacks, phobias
 - Avoids spontaneous heart rhythm problems
 - Effective treatment for epilepsy
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Hyperinsulinism-Based Problems

- Obesity
- Diabetes mellitus Type II
- Hypertension
- High triglycerides
- Low HDL (“good”) cholesterol
- Polycystic ovary syndrome
- Breast cancer survival

High-Fat Controlled Carbohydrate Approach Improves Lipid Profile

Seven Subjects Studied

	Baseline	12 Mo.	% change
Weight (lbs)	225	184	-18
Total Chol (mg/dl)	285	204	-28
TG (mg/dl)	280	190	-32
HDL (mg/dl)	40	52	+30
LDL (mg/dl)	176	115	-35
VLDL (mg/dl)	49	39	-20

Reed, T., Shakir, K.M.M., Harari, A.E., et al. "High-Fat Low Carbohydrate Diet Improves Symptoms of Postprandial Hypoglycemia," 2000, *Abstract of the 81st Annual Meeting of The Endocrine Society*.

Preliminary Results of The Atkins Center In-House Retrospective Study*

	Time	Weight	Blood Pressure		Triglycerides	Total Chol.
	Months	Lbs.	Sys	Dias.	Mg/dl	Mg/dl
Baseline	0	199.3	155.8	87.3	242.4	254.5
Recall 4	8-16	182.3	139.2	80.8	120.3	231.5
Mean Change		-17.0	-16.6	-6.5	-122.1	-23.0

*Mean Values for 319 Patients: selection criteria was based on a BMI of ≥ 23 for males and ≥ 24 for females and patient at The Atkins Center for at least 1 year.

**Data for all 319 patients. Patients have not yet been separated based on degree of compliance.

Effect on Serum Lipids

<u>Variables (mg/dl)</u>	<u>Baseline mean (SD)</u>	<u>Week 16 mean (SD)</u>	<u>% Change</u>
Cholesterol	212.0 (34.4)	201.4 (40.5)	- 5.6
LDL	132.9 (28.8)	129.8 (37.5)	NS
HDL	53.4 (13.6)	55.9 (12.4)	+ 8.8
Chol/HDL	4.2 (1.3)	3.7 (1.6)	- 16.7
Triglycerides	122.3 (59.6)	78.6 (35.1)	- 42.6

n=40 overweight males and females 6-month prospective clinical trial

* *p* < 0.05, comparing change from baseline to week 16

Yancy, W.S., Bakst, R., Bryson, W., et al., "Effect of a Very-Low-Carbohydrate Diet Program Compared With a Low-Fat, Low-Cholesterol, Reduced Calorie Diet," October, 7, 2001, North American Association for the Study of Obesity Annual Meeting, Quebec City, Canada.

The Ideal Controlled Carbohydrate Nutritional Approach: Therapeutic Principles

- Every person has a level of carbohydrate intake below which weight loss is automatic and a level below which weight maintenance is automatic.
- Find the Critical Carbohydrate Level for Losing (CCLL) and stay at or below this level until goal weight is achieved.
- Once at goal weight, find the Critical Carbohydrate Level for Maintenance (CCLM) and stay at or below it.
- Make the most nutrient-dense selections of carbohydrates, fats and proteins within the established levels.

How to Achieve Long-Term Success in Weight Control

- Choose a nutritional approach suitable to serve as part of a long-term lifestyle change.
- Choose a nutritional approach that is physically satisfying and suppresses hunger.
- Select a regimen that creates better health and enhanced well-being.
- Attain and maintain goal weight by eating foods that are so enjoyable, there is no desire to change.

The Controlled Carbohydrate Advantage for Long-Term Weight Control

- Provides a metabolic advantage:
 - More fat is burned than on other weight loss programs (calorie for calorie).
- Acts as an appetite suppressant.
- Suitable for long-term adherence:
 - Increased satiety
 - No calorie counting
 - Low-fat food choices not necessary
 - Abundant in basic nutrients

The Controlled Carbohydrate Advantage for Long-Term Weight Control

- Physical improvements noted:
 - Improved lean body mass to fat mass ratio
 - Increased capacity to exercise
 - Weight loss maintenance without negative side-effects
- Prevents/corrects hyperinsulin-related conditions:
 - Diabetes
 - Hypertension
 - Cardiac risk factors (high triglycerides, low HDL)

The Controlled Carbohydrate Advantage for Long-Term Weight Control

- Other benefits observed in clinical setting:
 - Less need for sleep
 - Improvement in gastro-intestinal symptoms (irritable bowel syndrome, gastro-esophageal reflux disease, bloating, flatulence)
 - Diminished/eliminated cravings for sweets
 - Improvement in mood
 - Increase in energy

Daily Menu With 20 Grams of Carbohydrate

Breakfast

Three-Egg Omelet With Avocado,
Mozzarella Cheese and Tomato
Organic Nitrate-Free Bacon (2 Strips)
Decaffeinated Coffee With Cream

Lunch

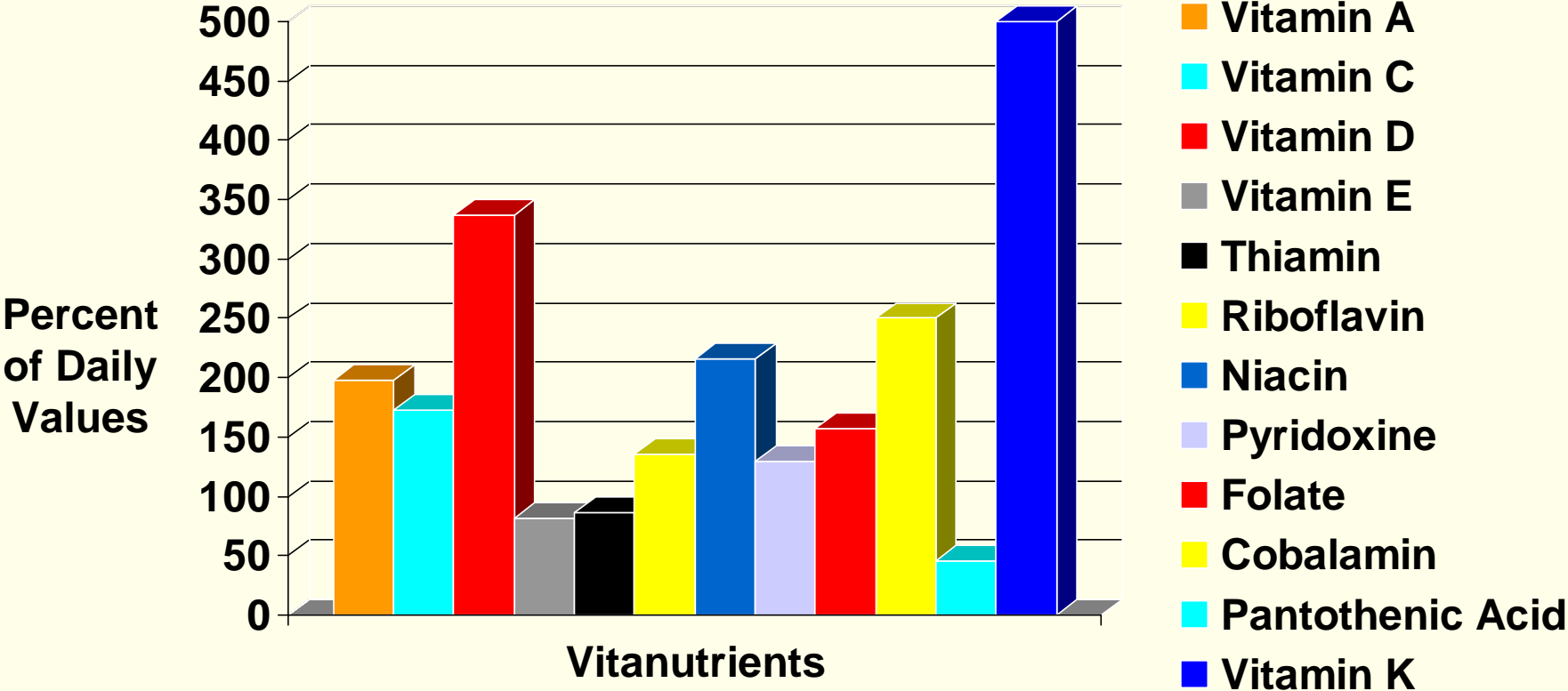
Beef Round (8 oz.)
Spinach and Mixed Greens Salad
With Mushrooms, Onions, Celery
and Parmesan Cheese
Club Soda

Dinner

Broiled Salmon (9 oz.)
Kale Topped With Garlic, Lemon and Sesame Seeds
Spring Water

Nutrient Analysis of Sample Menu With 20 Grams of Carbohydrate Based on Daily Values/RDI

2,000 Calories



Nutrient Analysis of Sample Menu With 20 Grams of Carbohydrate Based on Daily Values/RDI

2,000-Calorie Diet

