Battling Obesity with Low Carbohydrate & Ketogenic Diets: Clearing the Confusion and Understanding The Science Behind Low Carbohydrate and Ketogenic Diets for Weight Loss

Robert Kress, RPh

Live Activity Handout
2 slides per page
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ACTIVITY DESCRIPTION
Obesity continues to climb at an alarming rate. In 1960, the percentage of the population in North America was at 12%, projections for percentage of the population that will be obese in 2020 is over 40%. Health costs are higher along with increased related disease states to an obese patient. The Ketogenic Diet is gaining more and more popularity in helping people lose weight. With the gaining popularity, it’s important for health care practitioners to understand how it works, and what is ketosis. Is the diet for everyone? Is it safe? Are there risk factors to be aware of? This presentation will cover how the body goes into ketosis from diet, with a food focused approach.

TARGET AUDIENCE
The target audience for this activity is pharmacists, pharmacy technicians, and nurses in hospital, community, and retail pharmacy settings.

LEARNING OBJECTIVES
After completing this activity, the pharmacist will be able to:
• Learn the roles that fats, carbohydrates, and proteins play in metabolism, insulin resistance, weight management and ketosis
• Review the role that insulin resistance plays in the overweight and obesity epidemic
• Describe the human evolutionary perspective of how fats and ketones served as a primary fuel source
• Recognize the nuances between a ketogenic and low carbohydrate diet
• Explain how simple food modifications can make a big impact on a patients body mass index

After completing this activity, the pharmacy technician will be able to:
• Learn the roles that fats, carbohydrates, and proteins play in metabolism, insulin resistance, weight management and ketosis
• Review the role that insulin resistance plays in the overweight and obesity epidemic
• Describe the human evolutionary perspective of how fats and ketones served as a primary fuel source
• Recognize the nuances between a ketogenic and low carbohydrate diet
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ABOUT THE AUTHOR

Robert Kress, RPh, graduated from Temple University School of Pharmacy in Philadelphia PA in 1994. After becoming disenchanted with chemical dominant based medical system, Robert took his passion for nutrition and became board certified in clinical nutrition through the Clinical Nutrition Certification Board, as well as trained as a compounding pharmacist through the Professional Compounding Centers of America.

During this time, with his wife Amy, opened their own compounding and nutritional clinic, which blossomed into a complete anti-aging clinic housing other integrative practitioners. Robert became certified in Quantum Reflex Analysis, a practice of kinesiology, as well as have trained and certified in other modalities such as Reiki and auricular acupuncture.

Currently, Robert consults with both with patients to enhance their health through lifestyle medicine as well other practitioners to help integrate, promote and implement natural medicine in their practices. Robert also provides regular educational Wellness Workshops and writes regularly on the topic of lifestyle medicine and integrative care.

Robert believes as pharmacists, we are offered the perfect opportunity to integrate natural medicine into our practices, as its core to the history of pharmacy. Patients are looking for natural solutions for their health, while practitioners are looking towards integrative care to help solve their clients problems and enhance their practices.

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BATTLING OBESITY WITH LOW CARBOHYDRATE & KETOGENIC DIETS.
CLEARING THE CONFUSION AND UNDERSTANDING THE SCIENCE BEHIND
LOW CARBOHYDRATE AND KETOGENIC DIETS FOR WEIGHT LOSS

Robert Kress,
RPh

BATTING OBESITY WITH LOW CARBOHYDRATE & KETOGENIC DIETS

Clearing the Confusion and Understanding The Science Behind Low Carbohydrate and Ketogenic Diets for Weight Loss
OBJECTIVES

- Identify the roles that fats, carbohydrates and protein play in metabolism, insulin resistance, weight management and ketosis
- Recognize the role that insulin resistance plays in the overweight and obesity epidemic
- Recognize the human evolutionary perspective of how fats and ketones served as a primary fuel source
- Recognize the nuances between a ketogenic and low carbohydrate diet

UNHEALTHY BODY MASS


- Percent of adults aged 20 and over with obesity: 37.9%
- Percent of adults aged 20 and over with overweight, including obesity: 70.7%
- Percent of adolescents aged 12-19 years with obesity: 20.6%
- Percent of children aged 6-11 years with obesity: 17.4%
- Percent of children aged 2-5 years with obesity: 9.4%

https://www.cdc.gov/nchs/data/hestat/obesityoverweight.htm
BODY FAT PERCENTAGES

Elite Athlete
• Men- 6 to 13%
• Women- 14 to 20%

Generally Fit
• Men- 14 to 17%
• Women- 21 to 24%

Average
• Men- 18 to 24%
• Women- 25 to 31%

Obese
• Men- 25% +
• Women- 32% +

UNHEALTHY BODY MASS

• BMI is a method of screening for underweight, normal or healthy weight, overweight, and obesity.
• BMI is moderately correlated with more direct measures of body fat obtained from skinfold thickness measurements, bioelectrical impedance, densitometry (underwater weighing), dual energy x-ray absorptiometry (DXA) and other methods.
• BMI appears to be strongly correlated with various metabolic and disease outcomes.
THE COST OF OBESITY

• Obesity-related conditions include heart disease, stroke, type 2 diabetes and certain types of cancer, some of the leading causes of preventable death.

• The estimated annual medical cost of obesity in the U.S. was $147 billion in 2008 U.S. dollars; the medical costs for people who have obesity were $1,429 higher than those of normal weight.

https://www.cdc.gov/obesity/data/adult.html
THE COST OF OBESITY

• Unhealthy body mass is one of the diagnostic factors to metabolic syndrome.
• Study of patients with metabolic syndrome compared to patients without in 3 different health plans, patients with metabolic syndrome had 60% higher costs ($5732 vs $3581).
• Study comparing overweight and obese vs those who were not ($4563 vs $4015) while costs where $2061 higher in overweight / obese patients meeting criteria for metabolic syndrome.

HISTORY

• 2.5 million years ago Homo erectus took charge of the food chain
• 160,000 years ago genetically identical Homo Sapiens in East Africa
• 60,000 years ago migration from East Africa across the earth.
• All the while, traveling through climate gates in a hunter-gatherer lifestyle, enduring environmental selective pressure which optimized our genetic blueprint.
• Fat was our primary source of energy, and ketones provided an emergency/backup energy source.
HISTORY

- 10,000 years ago, our ancestors switched to a grain based diet, which allowed for food storage, led to a more stationary society.
- Before agriculture, primal human beings lived to average 33 (suppressed due to rigors of life) belief could have lived to 90’s and beyond.
- After the agriculture age, human lifespan and health declined. The bronze age 3,300 BC to 1,200 BC- dropped to 18 (due to infectious disease, living in closed quarters, lack of sanitation, inferior nutrition than hunter-gatherer).

http://geographic.nationalgeographic.com/developmentofagriculture/

HISTORY

- Due to an increasing lack of selective pressure, our genes have stopped evolving – while our genetic requirements are identical to those of pre-civilization hunter gatherers.
- We evolved over millions of years to prefer hunter-gatherer fare, low in carbohydrates, although since the cultivation of grains, we transitioned away from hunter gatherer living to a carbohydrate dominant diet and sedentary lifestyle.
- Where fat had been primary source of energy throughout human evolution, until agriculture, a high carbohydrate/high insulin producing diet took over.

http://ajcn.nutrition.org/content/71/2/313.full
http://www.enth.ucsb.edu/lewis/green/papers/08urbanization001/pdfs.pdf
LOW CARB DIET HISTORY

- 1862- William Banting & Dr. Harvey.
- 1940s- Dr. Alfred Pennington and DuPont.
- 1965- Avogaro, Crepaldi and colleagues
- 1990’s- Dr. Di Pasquale Anabolic and Metabolic Diets
- 2003- Atkins Diet
- 2003- South Beach Diet
- 2004- Rosedale Diet
- 2009- Primal Blueprint
- 2018- Ketogenic Diet

CARBOHYDRATES, PROTEINS, FATS
ENERGY DENSITY

- Fats - 9 calories per gram
- Ketones - 5 calories per gram
- Carbohydrates - 4 calories per gram
- Protein - 4 calories per gram

CARBOHYDRATES AND GLUCOSE
CARBOHYDRATES AND GLUCOSE

• Glucose is derived from dietary carbohydrates or gluconeogenesis
• All dietary carbohydrates are converted into glucose by the liver
• Provide immediate energy needs for muscles, brain and red blood cells
• They are then either burned for fuel, stored in liver and muscles or converts to triglyceride’s in fat cells
• Liver can store around 100 grams glycogen
• Muscles can store 350-500 grams glycogen

GLUCOSE

• Brain and other organs require about 150 grams of glucose per day
• Fat or keto adapted can reduce requirements to 50 grams per day
• The liver can manufacture up to 150 grams per day via gluconeogenesis
• 20 Grams per day can be manufactured from glycerol, byproduct of fat metabolism
CARBOHYDRATE CURVE TO BODY MASS

- 0 to 50 gm’s per day - ketosis
- 50 to 100 gm’s per day - weight loss
- 100 to 150 gm’s per day - maintain healthy weight and muscle mass
- 150 gm’s to 300 gm’s per day - steps toward insulin resistance, systemic inflammation, on avg. people 25 to 55 gain 1.5 pounds of fat per year, and lose 1 lb of muscle
- Over 300 gm’s per day - Obesity, heart disease, fast track to diabetes

PROTEIN
PROTEIN

• Building blocks for all living tissue: build, repair, maintain
• Support muscle mass
• Support satiety
• Support healthy blood sugar levels in proper amounts
• Healthy brain function
• Heart health
• Bone mass

EXCESSIVE PROTEIN

• Optimal daily intake 0.5 gm to 1 gm per pound of lean body mass
• May precipitate progression of cardiovascular disease through increased lipid deposition and inflammatory and coagulation pathways
• Increase glucose output
• Decrease insulin and leptin sensitivity
• Increase levels of insulin and leptin
**HOW MUCH PROTEIN**

- Average Ideal amount = 0.5 gm-0.7gm/ pound of lean body mass
- Ex- Adult weights 180 lbs, with 20% body fat
  Lean body mass = total weight – 20% body fat = 144 pounds lean body mass

Thus, 144 pounds x 0.5 gm = 72 gm’s protein per day

**HEALTHY FATS**
FATS

• Primary fuel source for humans for 2.5 million years, until development of agriculture.
• Free fatty acids to be burned as fuel or triglycerides stored in fat cells.
• Insulin regulates whether fatty acids are available in the blood stream for burning or locked away in fat cells as triglycerides.
• High insulin producing diet = high triglycerides and stored fat, not burned.
• There are 3500 calories per pound of fat if we can access.

TYPES OF FATS

• Saturated fats- Animal fats, dairy, palm, coconut.
• Monounsaturated fats- Avocado, olive, nuts (ex- almonds, hazel, pecans, macadamia), seed oils, peanut, canola.
• Polyunsaturated fats- Omega 3’s, walnuts, sunflower, corn, soy, safflower, flax
• Trans and partially hydrogenated fats
**OMEGA 3 VS OMEGA 6**

• Both Omega 3 and Omega 6’s have benefits, although the problem comes with sources, and ratio.

• The Standard American Diet creates a omega-6 to omega-3 ratio of about 20:1 and even higher, which is very inflammatory- We are best with a 2:1 or even 1:1 ratio.

• There are links between chronic inflammation and obesity and metabolic syndrome.

• To obtain a better ratio, take away omega-6’s, especially vegetable oils, and increase omega-3’s.

**FORMULA FOR WEIGHT LOSS**

1. Estimate daily caloric expenditure using the Harris Benedict Equation
   
   Ex- person burns an estimated 2500 calories per day

2. Calculate desired fat reduction in 21 days, multiply by 3,500 calories = total fat loss in calories

3. Divide total by 21= average caloric deficit per day and total intake per day to achieve fat loss goal
FORMULA FOR WEIGHT LOSS

Ex- Desired fat loss = 4 pounds

3,500 calories per pound = 14,000 calories total deficit

14,000/21 days = 666 calorie deficit per day, to be derived from stored body fat

2500 estimated daily expenditure – 666 desired deficit = 1,834 (daily caloric intake to achieve fat loss goal)

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FORMULA FOR WEIGHT LOSS

4. Calculate carbohydrate and protein caloric intake per day

Protein: Ex- 140 pounds of lean mass, active person(.7gms) = 98 g/day x 4 calories/gram = 392 protein calories per day

Carbs: 75 grams of carb intake per day for weight loss via carbohydrate curve x 4 calories / gram = 300 carbohydrate calories per day

Total protein and carbohydrate intake per day = 692 calories
FORMULA FOR WEIGHT LOSS

5. Subtract daily caloric intake goal (1,834) from protein/carb total (692) to determine allowable fat calories per day to achieve weight loss goal

Ex- 1834 – 692 = 1142 fat calories per day
1142 / 9 = 126 grams of fat per day

6. Goal macronutrient intake to lose 4 pounds of fat in 21 days:
Protein 98 gm’s or 392 calories, carbohydrates 75 g or 300 calories, fat 126 grams or 1142 calories

KETOGENIC DIET
KETONES

• Ketones are a source of caloric energy that are used by the brain, heart and muscles in the same was as glucose.
• Ketones are produced in the liver as by-product of fat metabolism, under extreme carbohydrate restriction (less than 50 gm's/day).
• Ketosis is the burning of ketones due to ultra low carb, moderate protein, high fat diet.

KETONES

• Ketosis is not ketoacidosis (a condition where the body creates ketones in response to not being able to produce enough insulin- without insulin, body begins to breakdown fat as fuel)
• Hydroxybutyrate are external ketones which have shown benefits in lowering blood sugar levels and improving metabolic profiles.
KETOGENIC DIET BEYOND WEIGHT LOSS

• Pain and Inflammation
• Epilepsy
• Adjunct Cancer Therapy
• Cardiovascular Disease
• Insulin Resistance and Type II Diabetes
• Acne
• PCOS

• Alzheimer's
• Parkinson's
• Traumatic Brain Injury/Seizures
• Amyotrophic lateral sclerosis

INTERMITTENT FASTING

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4235472/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5048211/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4322435/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3826670/
INTERMITTENT FASTING

• Periods of 12 to 24 hours without eating—only when metabolically adapted
• Enables stored body fat to come to the forefront as the preferred energy source
• Gluconeogenesis and ketone burning fulfill the body’s glucose requirements

INTERMITTENT FASTING

• Slow the rate of cell division, slowing down the aging process
• Cellular repair enhanced
• Hormones responsible for growth, repair, and immune function are optimized
• Increased growth hormone
• Weight loss and reduces belly fat
• Reduce inflammation and oxidative stress
• Improves risk factors of metabolic syndrome
• Promotes brain health
Low Intensity Daily Movement

- Walks, stretch, mobility, yoga, Pilates, tai chi, - different types of exercise to use different muscles.
- Stand more than you sit
- Low level intensity burns fat, provides strength and flexibility, shown to reduce heart disease, diabetes, etc.
- Incorporate walking, hiking, cycling and easy cardio at a 55 to 75% of heart rate for 2 to 5 hours each week. Easy cardio can be found at a heart rate of 180-your age, and take an extra 10 off if on medications or have health issues. This keeps you in the aerobic fat burning stage

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3404815/
EXERCISE

Brief Intense Stressors

• Strength training/weight bearing- Lift heavy things/weight bearing exercise 1 to 3 times per week for 7 to 30 minutes.
• Sprints- All-out effort for 10 to 20 seconds, up to 6 cycles, once every 7 to 10 days. Optimizes gene expression, builds muscle, improves energy, accelerates fat metabolism

*All exercise should be based on ones current state of health. Reduce reps, do low impact, modify intensity and impact, etc.

http://care.diabetesjournals.org/content/early/2013/04/19/dc13-0084

EXERCISE PITFALLS

• Chronic Exercise- Problems with too much working out- gluconeogenesis and inflammation, muscle break down
• Chronic high intensity workouts (chronic cardio) pull glycogen out of liver, and deposit as sugar in blood. Often leads to hunger and increased eating patterns. These people constantly refuel with what their body burns- sugar. Can also lead to lazy “rest of day” patterns. You reach a point of diminished returns
SLEEP

• Natural pattern is up with sun and down with sun. Darkness triggers melatonin, light triggers serotonin and cortisol: decrease screen time at night, read, socialize.
• Only 35% Americans get the recommended 8 hours of sleep each night.
• 40% of Americans get less than 6 hours.
• Sleeping less that 6 hours per night increases risk of type 2 diabetes by 50%

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3128357/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2991337/

SLEEP

• Sleep deprivation affects the metabolism by how the body processes and stores carbohydrates, and alters hormones which affect appetite and metabolism
• Lack of sleep affects mood, memory, can increase blood pressure, stress hormone levels, lead to an irregular heartbeat, compromise immunity, lead to weight gain, premature aging, diabetes, heart disease, and even certain cancers
• Inadequate sleep causes insulin resistance in otherwise healthy people
• Inadequate sleep can lead to weight gain

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3128357/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1991337/
STRESS

• Chronic stress can cause insulin resistance and influence metabolic syndrome.
• Chronic elevated cortisol can cause diabetes, inflammation, weight gain, suppresses insulin secretion, elevates blood glucose.
• Even acute stressors shown to cause hyperglycemia and insulin resistance

VITAMIN D

• Helps the pancreas release insulin.
• Necessary for thyroid function.
• Help support weight loss in obese.
• 6682 volunteer participants, University Alberta Canada. After one year, those people who took 5,000 to 8,000 IU/day of vitamin D and achieved a final 25(OH)D of > 50 ng/ml cut their risk of developing metabolic syndrome by about 600%.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4586553/
Christopher Ochse, M.D., nutrition, weight loss and obesity expert, The Mount Sinai Hospital, New York City; Tania Markowicz, MS, RDN, registered dietitian nutritionist, Staten Island University Hospital, New York City; European Congress on Obesity, news release, May 7, 2015.
**PROBIOTICS**

- Both human and animal studies have found that normal-weight people have different gut bacteria than overweight or obese people.
- Overweight people had a different gut flora than normal weight.
- There are also some animal studies showing that when the gut bacteria from obese mice are transplanted into guts of lean mice, the lean mice get fat, change dietary choices.

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**FINAL THOUGHTS**

- Our evolutionary timeline provides insight and solutions for the modern day obesity problem through changes in lifestyle, exercise and dietary habits.
- Focusing on proper food ratio’s can help transition people to metabolize stored fat, while reducing other lifestyle disease factors such as insulin resistance and diabetes.
- There are various lifestyle and nutritional adjustments one can make to support a healthy body mass.