“Good Carbs vs. Bad Carbs”
Nutrition’s Effect on Blood Sugars

By Michael Lynch
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Valley Lifestyle Medicine
Photosynthesis

Green plants use sunlight to synthesize foods from carbon dioxide and water.

Plants produce sucrose in their leaves, from glucose (\( \text{C}_6\text{H}_{12}\text{O}_6 \)) made during photosynthesis.
What is a Carbohydrate?

Monosaccharides
Various forms of $\text{C}_6\text{H}_{12}\text{O}_6$

Sugars & Carbohydrates

Fructose  Glucose  Galactose

Carbohydrates

- Monosaccharide
  - Glucose
  - Fructose
  - Galactose
- Disaccharide
  - Maltose
  - Sucrose
  - Lactose
- Polysaccharide
  - Starch
  - Glycogen
  - Cellulose
Levels of Carbohydrate Complexity

Disaccharides

- Sucrose
  - Glucose & Fructose
- Lactose
  - Glucose & Galactose
- Maltose
  - Glucose & Glucose
Levels of Carbohydrate Complexity with Examples
Nutrient Density

Nutrient Density:

• Relativity of (phyto) nutrients for the number of calories contained

• High nutrient dense food
  – sweet potato
    • Vit. A, potassium

• Low nutrient dense food
  – doughnut
    • Refined sugar
Nutrient Density

- Vitamins, minerals, fiber, phytochemicals
## Nutrients in Carbohydrates

<table>
<thead>
<tr>
<th>Food</th>
<th>Serving Size</th>
<th>Carbohydrate (g)</th>
<th>Protein (g)</th>
<th>Fiber (g)</th>
<th>Vitamin A (ug)</th>
<th>Vitamin C (mg)</th>
<th>Potassium (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1% Milk</td>
<td>1 cup</td>
<td>12</td>
<td>8</td>
<td>0</td>
<td>144</td>
<td>2</td>
<td>366</td>
</tr>
<tr>
<td>Kidney beans</td>
<td>½ cup</td>
<td>20</td>
<td>7</td>
<td>18</td>
<td>0</td>
<td>2</td>
<td>1208</td>
</tr>
<tr>
<td>Apricots</td>
<td>6</td>
<td>24</td>
<td>2</td>
<td>3</td>
<td>554</td>
<td>22</td>
<td>556</td>
</tr>
<tr>
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<td>69</td>
</tr>
<tr>
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Simple Carbohydrates

• Simple carbohydrates
  – Simple carbohydrates are made of just one or two sugar molecules
• They are the quickest source of energy
• Most rapidly digested and absorbed into the bloodstream
### Simple Carbohydrates

**Healthy Simple Carbohydrates**
- **Fruits**
  - Bananas, mangos, raisins, oranges, kiwi, grapefruit, strawberries
- **Vegetables**
  - Peppers, carrots
- **Milk**
  - Yogurt
- **Honey**
  - Natural/local

**Unhealthy Simple Carbohydrates**
- **Refined Sugar(s)**
  - Table sugar
  - High fructose corn syrup
- **Processed Grains**
  - White rice, bread, pasta
- **Soda**
- **Candy**
- **Pastries**
## Complex Carbohydrates

### Sources
- Legumes
- Starchy vegetables
- Sweet potatoes, zucchini
- Whole wheat
- Breads, pastas
- Brown Rice
- Quinoa
- Fruits
  - Berries, Apples, Pears

### Considered Healthy
- Slow Digesting
- High in Fiber
- Anti-oxidant rich
- Anti-inflammatory
- Reduce Disease Risk
  - Cardiovascular, Cancer, Diabetes
Good Carbs vs. Bad Carbs

• Bread
• Rice
• Potatoes
Good Carbs vs. Bad Carbs

White Bread

Wheat Bread

**Nutrition**

Serving Size: 1

<table>
<thead>
<tr>
<th>Amount Per Serving</th>
<th>Calories</th>
<th>Total Fat</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>70</td>
<td>0.95</td>
<td></td>
</tr>
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</table>

**Ingredients:**

- Enriched Malted Barley Flour
- Thiamine Mononitrate
- Water, High Fructose Corn Syrup, Soybean Oil, Salt (PRESERVATIVE), Monoglycerides, Calcium Sulfate, Vinegar, Monocalcium Phosphate, Lecithin, Citric Acid, Iodate, Potassium Iodide.

**Contains:** Soy, Wheat, Preservatives.

**Anatomy of a Grain of Wheat**

- **BRAN** protects seed
  - fiber
  - b vitamins
  - trace minerals

- **FLOUR** provides energy
  - carbohydrates
  - protein
  - b vitamins

- **GERM** provides nourishment
  - phytonutrients
  - vitamin e
  - b vitamins
  - antioxidants
# Good Carbs vs. Bad Carbs

## Rice

<table>
<thead>
<tr>
<th>Serving size</th>
<th>Carbohydrate (g)</th>
<th>Fiber (g)</th>
<th>Protein (g)</th>
<th>Potassium (mg)</th>
<th>Magnesium (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown Rice</td>
<td>1 cup</td>
<td>40</td>
<td>4</td>
<td>5</td>
<td>84</td>
</tr>
<tr>
<td>White Rice</td>
<td>1 cup</td>
<td>35</td>
<td>1</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>
Good Carbs vs. Bad Carbs

Potatoes

- **Nutrition**
  - Vitamin C (36%), B Vitamins (13%), Magnesium (15%)
  - Copper (14%), Phosphorus (14%), Manganese (15%), Potassium (27%)

283 kcals, 64 g carb, 8 g fiber  

163 kcals, 37 g carb, 5 g fiber
Carbohydrates & Weight Loss/Gain?

3 parts water to 1 part glycogen

Fast weight loss is water weight

Undermines and slows metabolic rate
Prevalence of Lactose Intolerance

70% of world's population lactose intolerant

Adolescents 5-10% lactase activity at birth

- Southeast Asians
- Native Americans
- African Americans
- Mediterranean People’s
- Inuits
- Hispanics
- Caucasians
- Northern Europeans

- >80%
- 80%
- 75%
- 70%
- 60%
- 50%
- 20%
- <10%
Fructose

In Nature

Fruit Sugar

- 7 g fructose (240 calories)
  - 9 cups of strawberries
  - 3 apples
  - 89 cherries

In Products

High Fructose Corn Syrup (HFCS)

- Derived from corn starch
  - Enzymes added to corn syrup
  - Some glucose to fructose
    - 42 or 55% fructose (55% mostly)
  - Glucose and fructose not joined

20 ounce cola

- 36 g fructose
  - 240 calories, 65 g sugar
Same Page on... Carbohydrates

We’re talking about these carbs

Beautiful
Colorful
Healthy
Exciting!

And not these carbs....

Beautiful?
Colorful?
Healthy?
Exciting?
Nutrition & the Effects on Blood Sugar

Weight Loss

Blood Sugar

Health

Glucose Metabolism
Nutrition & the Effects on Blood Sugar

• Total glucose Load
  – Overall daily carbohydrate intake
• A Carbohydrate is not a carb is not a carb
  – Healthy Carbohydrates = Healthy Eating!!
  – Carbohydrates do not negatively impact IS!
    • Higher healthy carb intake reduces insulin resistance
• Fats
  – Chronic higher intake of saturated (and trans) fats are associated with higher insulin resistance

Protein

• High protein diets
  • low nutrient intake/fiber
  • High saturated fat
Fats

HEALTHY

Mono & Poly- Unsaturated Fats

• Oils
  – Olive, Canola

• Nuts
  – Walnuts, almonds, peanuts

• Seeds
  – Flax, sunflower

• Fish
  – Salmon, mackerel, sardines

• Avocados

UNHEALTHY

Saturated (most) & Trans Fats

• Red meats
  – Beef, pork, lamb, ham/bacon

• “Partially hydrogenated oil”
  – processed
  – cookies, pastries, fast-food French fries

• Cheese!
  – Pizza

• Milk
  – Ice cream, yogurt, butter

Coconut oil
  – Use sparingly
Healthy Fats

GOOD FATS vs. BAD FATS
Fats and Effects on Blood Sugars

• 20-30% overall intake
• No Trans Fats
• Saturated Fats
  – < 7% energy intake
  – 1800 kcal/day =
    • 14 g saturated fat
• Higher intake does not slow down carbohydrate digestion
  – Unless above 50 g/meal (big mac = 33 g)

Healthy fats improve
  – insulin sensitivity
  – Lowers inflammation
Marian Franz, RD, CDE

• Nor is there good evidence that insulin resistance from eating a diet rich in starchy foods and sugar is the cause of obesity.

• Increased physical activity, energy restriction and/or moderate weight loss, and controlling fat intake have been shown to improve insulin sensitivity, not changes in the protein-to-carbohydrate ratio.
Proteins Sources

**Animal**
- Meats
- Fish
- Poultry
- Milk
- Diary products
  - Yogurt
  - Cheese
- Eggs

**Plant**
- Beans
  - chickpeas, black beans,
- Lentils
- Grains
  - Quinoa, whole grains
- Nuts
- Seeds
- Vegetables
- Soy
  - Tofu
  - Edamame
Protein and our diets

• 10-25% total caloric intake
• 1 g/kg (1 g/lb)
• Typically, in the United States people get more than enough protein to meet their needs. It's rare for someone who is healthy and eating a varied diet to not get enough protein. - (CDC)

• High Protein Diets
  – Low in phytonutrients
    • B vitamins, vitamins C & D, Magnesium, Potassium, copper, calcium
  – Low in fiber
    • Less than 25 g/day
  – High in (saturated) fat
## Calories of Protein, Fat, & Carbohydrates

**Table 1**

<table>
<thead>
<tr>
<th>Type of Food</th>
<th>Calories from protein</th>
<th>Calories from fat</th>
<th>Calories from carbohydrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very lean meats (shrimp, 3 oz)</td>
<td>71</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Lean meats (chicken, fish, lean beef, veal, ham, 3.5 oz)</td>
<td>124</td>
<td>41</td>
<td>0</td>
</tr>
<tr>
<td>Medium-fat meats (extra-lean ground beef, beef or pork roasts, pork chops, 3.5 oz)</td>
<td>102</td>
<td>147</td>
<td>0</td>
</tr>
<tr>
<td>High-fat meats (processed meats, cheese, 1 oz)</td>
<td>12</td>
<td>74</td>
<td>2.5</td>
</tr>
<tr>
<td>2% milk, 1 cup</td>
<td>32</td>
<td>42</td>
<td>48</td>
</tr>
<tr>
<td>Lentils, 1 cup</td>
<td>72</td>
<td>7.2</td>
<td>160</td>
</tr>
</tbody>
</table>
## High in protein or high in fat?

### Table 2. Protein and Fat in Meat and Meat Substitutes

<table>
<thead>
<tr>
<th>Item</th>
<th>Calories from protein</th>
<th>Calories from fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low fat meat, 1 oz</td>
<td>28</td>
<td>27</td>
</tr>
<tr>
<td>Beef jerky, 1 oz</td>
<td>64</td>
<td>50</td>
</tr>
<tr>
<td><strong>Beef bologna, 1 oz</strong> slice**</td>
<td>12</td>
<td>75</td>
</tr>
<tr>
<td>Cheese, 1 oz</td>
<td>28</td>
<td>85</td>
</tr>
<tr>
<td>Nuts (almonds), 1 oz</td>
<td>22</td>
<td>131</td>
</tr>
<tr>
<td>Peanut butter, 2 Tbsp</td>
<td>32</td>
<td>144</td>
</tr>
<tr>
<td>Hot dog, 1</td>
<td>28</td>
<td>147</td>
</tr>
</tbody>
</table>
Protein and Blood Sugars

• 10-25% intake
• 0.8 – 1.0 g protein per kg/body weight
  – 50-70 grams/day
• High protein diets are not recommended
  – Low in phytonutrients
    • B vitamins, vitamins C & D, Magnesium, Potassium, copper, calcium
  – Low in fiber
  – High in (saturated) fat
• D-MNT
  – Does not influence peak glucose disposal
  – May increase net blood sugars
  – Added calories
  – Has same insulin response as carbohydrates
Marian Franz, RD, CDE

- No long-term research is available to document that high-protein, low-carbohydrate diets maintain weight loss any better than traditional weight-loss diets,\textsuperscript{51} what are other concerns?

- A major concern is that foods with proven health benefit are eliminated. There are health needs for the nutrients found in grains, fruits, vegetables, milk, and other carbohydrate-containing foods.
Nutrition & the Effects on Blood Sugar

• Diabetes Medical Nutrition Therapy (D-MNT)
• Maintaining Healthy Blood Sugars as much as possible (70-110 mg/dl, below 180 mg/dl post-prandial)
  – Glycemic control
  – Balancing carbohydrate intake with medications/activity
    • Type 1 (auto-immune – insulin therapy)
    • Type 2 (lifestyle/insulin resistance – oral medications and/or insulin therapy)

• No one single diet protocol
• Distribution of macronutrients
  – Carbohydrate (45-65%)
  – fats (10-35%),
  – proteins (10-25%)

Overall healthy eating
• Nutrient density
  – Nutrients/calorie
Diabetes MNT & Carbohydrates

• 45-65 % of energy
  – < 130 grams carbohydrate/day
• Fruits, vegetables, whole grains, legumes, low-fat diary foods
• Nutrient dense foods
• Carbohydrate counting
• Monitoring portion sizes
• Consistently distributed throughout the day, on a day to day basis
Portion (Distortion) Sizes

<table>
<thead>
<tr>
<th>20 Years Ago</th>
<th>Today</th>
<th>Difference</th>
<th>20 Years Ago</th>
<th>Today</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>330 Calories</td>
<td>45</td>
<td>275 MORE Calories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>500 Calories</td>
<td>110</td>
<td>525 MORE Calories</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>500 Calories</td>
<td>55</td>
<td>220 MORE Calories</td>
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Portion Distortion

What you're served vs. What's one serving

The Portion Size Illusion

Which plate contains the most food?

Think about it before looking at the answer below:

There is exactly the same amount of food on each plate.
Portion Sizes...

- 1 cup of cereal flakes = baseball
- 3 cups popcorn = 3 baseballs
- ½ cup of cooked rice = lightbulb
- ½ cup cooked pasta = lightbulb
- 1 bagel = can of tuna
- 1 pancake = compact disc
- 1 slice of bread = cassette tape
Restaurant Eating Tips!

Avoid

• Large
• Giant
• Grande
• Supreme
• Extra large
• Jumbo
• Double (or triple) -decker
• King-size
• Monster
• All-you-can-eat!
• Anything that comes in a bucket...

Look For

• Junior
• Single
• Petite
• Kiddie
• Regular
• Appetizer(s)
Michael’s Nutrition Tips for Weight Loss

• 4-5 servings/day
  – Fruits
  – Vegetables

• 3 cornerstones of daily nutrition
  – 4,700 mg Potassium
  – 30 g Fiber
  – <12 g Saturated Fat
  – However you get there!