The low down on low carb diets

LEAH GROppo, RD, CDE

STANFORD HEALTH CARE ADULT ENDOCRINOLOGY CLINIC
Objectives

By the end of the presentation the learner will be able to:

1. Be able to describe BG rise from each macronutrient

2. Know one lower carbohydrate rich food that can be replaced with a lower carbohydrate food

3. Understand how the different macronutrients affect post prandial blood glucose

4. Understand what you should monitor if you start a low carbohydrate diet
Why did you chose to come to the low carbohydrate talk?

Questions to ask yourself:

Why low carbs?

What is appealing to eating lower carbohydrates?

What are your nutrition goals?

Is your main goal weight loss?
Food philosophy

No one eating style fits everyone

However carbohydrate counting is recommended

Decision fatigue

Where are you going to focus your energy on

Recommend that you talk to your Endocrinologist and CDE team especially on dosing your insulin
Macronutrients

Carbohydrates main macronutrient that is responsible for the majority of the glucose rise elevate post prandial BG 0-2 hours

Fats: elevate post prandial BG >3-5 hrs and longer especially when overnight up to 10 hours (more satiety)

Protein: elevates post prandial BG 3 hrs (more satiety)
Glucose rise from macronutrients

Food conversion to blood glucose

- **Carbohydrates**: 90-100% turns to glucose, peaks in bloodstream in 1-2 hours
- **Proteins**: 50% turns to glucose, peaks in bloodstream in 2-4 hours
- **Fats**: 10% turns to glucose, peaks in the bloodstream in 8-10 hours
Carbohydrate

2 Types: Complex and refined

Aim for Complex digest slower

Complex examples

Beans, lentils, whole grains, corn, quinoa, teff, farro, black bean pasta

Refined

White bread, pasta, white rice, white flour
Net carbs

Net carbs include sugar alcohols and fiber

Calculated by subtracting fiber and sugar alcohols from the total carbohydrate

No legal definition of the net, active, or impact

Food companies creation

FDA only regulates total carbohydrates, dietary fiber and sugar
Sugar alcohols

Examples:
- Sorbitol
- Xylitol
- Mannitol
- Isomalt
- Maltitol
- Lactitol

How to count them?

Count ½ as carbohydrates that will affect your BG
Where are sugar alcohols found?

- Low carbohydrate bars
- Lower carbohydrate ice cream, cookies, candy
- Xylitol is the sugar alcohol
Fiber: black beans

½ a cup of cooked black beans

Total carbohydrates: 21g

Fiber: 6g

21 - 6g = 15g of usable carbohydrate
How to count the carbs?

Use applications on your phone (apps)

USDA nutrient data base

Myfitnesspal

Figwee

Calorieking

Carb counting booklets

Handouts from clinic
Fat

2 Types: Saturated and unsaturated

**Saturated:** solid at room temperature

**Unsaturated fat:** liquid at room temperature

Aim for unsaturated (or liquid at room temperature)

Broken down to triglycerides in the blood

40g or more tends to have a BG rise
Examples of fats

Fat examples:

1oz of cheddar cheese full fat is around 9-10g of fat per oz

In and Out

Double double with onions 41g of fat

French fries 18g of fat

Chocolate shake 29g (15oz)

Vanilla shake 31g (15oz)
Table 1—Summary of systematic review: effects of fat, protein, and GI on acute postprandial glycemia in type 1 diabetes

<table>
<thead>
<tr>
<th>Nutritional factor</th>
<th>Summary of findings</th>
<th>Clinical implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat</td>
<td>• Seven studies (total 103 subjects) (5,7,8,11,15,18,19).</td>
<td>• Increase in dose required for coverage of higher-fat meals needs to be individualized.</td>
</tr>
<tr>
<td></td>
<td>• All studies reported significant differences in glycemia with addition of fat.</td>
<td>• Delicate balance in calculation and timing of insulin action: needs more insulin to prevent late postprandial hyperglycemia; however, if too much insulin upfront, there is a risk for early postprandial hypoglycemia.</td>
</tr>
<tr>
<td></td>
<td>• Fat reduces early glucose response (first 2–3 h) (7,8) and delays peak blood glucose (5,7,15,18) due to delayed gastric emptying.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fat leads to late postprandial (&gt;3 h) hyperglycemia (18,19).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Addition of 35 g fat can increase blood glucose by 2.3 mmol/L (15), and in some individuals, 50 g of fat can increase insulin requirements by twofold (19).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Marked interindividual differences in the glycemic effect of fat.</td>
<td></td>
</tr>
</tbody>
</table>
Protein

Complete protein: all the essential amino acids our bodies need
Examples: meat, fish, dairy, tofu, soy beans, quinoa, amaranth

Complementary protein: vegetarian protein sources like legumes and a grain that when paired have all the essential amino acids our bodies need
Examples: Rice and beans

Think first about carbohydrates
Protein insulin recommendations

<table>
<thead>
<tr>
<th>Protein</th>
<th></th>
<th>Protein-only meals (e.g., ≥230 g lean steak with salad) may require a different insulin dosing strategy than for protein and carbohydrate meals.</th>
</tr>
</thead>
</table>
| • Seven studies (total 125 subjects) (5,8,11,13,15–17).  
• All studies reported significant differences in glycemia with addition of protein.  
• Effect of protein is delayed (effects seen ∼100 min postmeal) (11,13,15,17).  
• Protein has different effects when consumed with and without carbohydrates [e.g., 30 g protein with carbohydrates will affect blood glucose (15,16), whereas at least 75 g protein is needed to see an effect when consumed in isolation (13)]. | 230 g lean steak with salad |
Diet Pendulum swing

1970 low fat craze

Now low carb high fat

Middle: Balanced nutrients
What is considered low carb

Ketogenic: 20-40g of carbs (including carbohydrates from vegetables)

Recommended for Type 1 DM Adult: 100-150g per day

Per the Institute of Medicine's Food and Nutrition Board: 130g of glucose per day for the brain’s fuel

30% total calories from carbohydrates, 40% from protein, 30% from fat

Check ketones if you choose to start a lower carbohydrate diet
Macronutrient calculations from percentages

Calculate total calories

If you want to lose weight subtract 250-500 kcal per day from your recommended amount to maintain weight

Carbohydrate is 4 calories per gram

Protein is 4 calories per gram

Fat is 9 calories per gram

Example: Multiply your total calorie per day goal by .4 to get calories from carbohydrates

Divide by 4 to get grams
What does the research say?

Not much
Small sample sizes
Anecdotal evidence
More research in the adult population
Low carb diet examples

Ketogenic diet: low carb, high fat, moderate protein typically less than 40g of carbs

Paleo diet: protein and produce

Some medically managed weight loss
  ◦ Low carb and low calorie with or without medication

South beach diet: protein and produce
Insulin dosing adjustments

Fat
- For high fat meals (≥ 40 g of fat), as a starting point consider increasing total insulin dose starting with 30-35% increment using combo bolus with 50/50% split over 2 – 2.5 h.
- Review late postprandial glucose: adjust total insulin dose as indicated.
- Review early postprandial glucose: adjust split as indicated (if increased early postprandial → more insulin upfront).
- If on injection therapy: consider additional insulin 1 hour after the meal equivalent to 30-35% of pre-prandial dose or, alternatively, consider pre-prandial injection of regular +/- analog insulin.

Protein
- For protein-only meals containing less than 75 g of protein, insulin may not need to be adjusted.
- For meals containing at least 30 g of CHO and at least 40 g of protein, consider increasing total insulin dose by 15-20%.

High GI
- High GI foods require more insulin upfront, less in late postprandial period to avoid hypoglycemia.
- Consider dosing > 20 min prior to meal or ‘super bolus’ (additional insulin upfront with reduction of basal in late postprandial period).
- Consider use of Afrezza®.

Figure 1—Clinical application of insights about the effects of fat, protein, and GI on postprandial glucose control.
What do we know about low carb diets?

Typically also high in non starchy vegetables

Moderate protein or high protein

Higher fat foods

When one macronutrient is restricted the other two are typically increased
Adults and low carb precautions

Less response to low BG with lower glucagon storage

Carb intake in the low carb group was less than 50g per day for 1 week

Limited glycogen storage from the liver hepatic glycogen

Study reviewed LCD was less than 50 grams per day

Cross over study
Safety

Get ketone testing kit

Use full glucagon injection to treat a severe low BG

Increase carbohydrates before physical activity
Kids and low carb

Balanced meals

Not much research

Focus on fueling activity

Concerns about change in growth

Focus on balanced diet

Encourage whole plant foods like vegetables, fruit and legumes that are higher in fiber and complex carbohydrates (average age in the study as 12.6 years old)

Am J. Clin Nutr 2016; 104:81-7
Where to start…

What kind of person are you?

All in?
Ease in?

1. Identify carbohydrate dense foods in your diet
2. Think about a substitution or replacement
3. Maybe think about 1 meal and making it lower carbohydrate (dinner?)
4. Make a list of the protein, non starchy vegetables and fats that you like to eat

5. Calculate the average of total carbohydrates you consumer per day and think about reducing it by 25% to start or whatever you think is realistic

OR jump right in to 100-130g per day! Your choice
Think about goals

Maybe lower carb snack ideas or no carb snack ideas

Remember not one diet style fits everyone but work to fine out what works for the most important person…YOU
Lower carb ideas

**HIGHER CARB**
- Rice noodles
- Pasta

**LOWER CARB ALTERNATIVE**
- Yam or tofu noodles
- Spaghetti squash
- Zoodles (zucchini noodles)
- Edamame noodles
Lower carb ideas

**HIGHER CARB**

Rice

**LOWER CARB ALTERNATIVES**

Cauliflower rice

Broccoli rice

Miracle rice
## Lower carb ideas

<table>
<thead>
<tr>
<th>HIGHER CARB</th>
<th>LOWER CARB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread</td>
<td>Great low carb bread company</td>
</tr>
<tr>
<td>Buns</td>
<td>Cauliflower bread</td>
</tr>
<tr>
<td></td>
<td>Lettuce as bread</td>
</tr>
<tr>
<td></td>
<td>Oopsie bread (do not recommend per my own taste buds)</td>
</tr>
</tbody>
</table>
Lower carbs potential benefits

Easier to match insulin for

More predictable BG numbers

Less glucose spikes

Potential weight loss

More satiety (potentially)
Lower carbs potential downside

- More work
- More planning
- Less options
- Decision fatigue
- Less glucagon storage
- Decreased diet flexibility
- Potentially more tired
In summary

Think about what your nutrition goals are and how to meet them.

Think about exploring a lower carbohydrate diet if you feel it will benefit your management.

Talk to your own health care team about reducing your carbohydrates.

You can also focus on changing the types of carbohydrates you eat.
Now for a....

Food sample!
References


