Sweet Indigestion:
A Directed Case Study on Carbohydrates

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Part I—Of Cows and Carbs

"What's so funny?" Gwen asked as she slid next to her friends Sara and Emily at the library.

"Read this," Sara said. "I'm thinking about getting my dad vaccinated."

> S Y D N E Y, Australia, June 7 — Australian farmers are signing up their sheep and cattle in droves to take part in a vaccine program aimed at reducing harmful methane gas emissions from their animals and help take the heat off global warming.
>
> Methane is a greenhouse gas more potent than carbon dioxide and farm animals produce a lot of it.
>
> Australian scientists said today early results show they may be able to reduce methane emissions per animal by about 20 percent a year, or the equivalent of 300,000 tons of carbon dioxide a year if they can vaccinate three million animals. The methane vaccine discourages Methanogenic archae, organisms which inhabit the animal's digestive system and which produce methane by breaking down feed.
>
> *Reuters 2001*

Gwen laughed, "Your dad? What about your dog? He's got the real problem. But seriously, is farting a major cause of global warming?"

"Well, not all of it, but greenhouse gases could be reduced if people stopped eating meat. Cows actually produce the vast majority of methane released in the U.S." Emily replied.

"300,000 tons of CO2 in Australia alone," Gwen said. "I wonder how much people produce?"

"When I visited Space Camp we learned about how the astronauts deal with noxious fumes," Sara said. "The average astronaut expels about a half liter of gas a day from bacterial break down of undigested carbohydrates in the large intestine. Maybe we all should be vaccinated. You both have been dieting, I bet you think you're eating a lot less carbohydrates than before. You could be our first test subjects."

"But what are carbohydrates exactly?" Emily asked looking at Gwen. "And which are undigested?"

Here's a list of what the girls had eaten so far:

- *For breakfast*—Cheerios with oat bran, a tall Latte with skim milk, and a PowerBar®.
- *For lunch*—Coke and a salad with lettuce, cabbage, tomato, shredded carrot, green peas, kidney beans, and tuna fish.

Questions

1. Underline all foods containing carbohydrates.
2. Come up with a rule to help you identify foods containing carbohydrates.
3. How are carbohydrates made normally (i.e., what organism makes them)?
4. Which ingredient would cause gas? Why are some foods digestible and others aren't?

Part II—Label Analysis

The girls checked out a nutrition textbook and learned that almost all of the foods they were eating contained carbohydrates. But how much gas is produced in your intestine depends on the type of bacteria you are harboring and whether or not you eat the following carbohydrates that aren't well digested.

Gwen's list of carbohydrates that aren't well digested:

- Simple sugars:
  - Dried beans, peas, and lentils containing the tri- and quatro-saccharides Raffinose and Stachyose
  - Lactose
  - Fructose
  - Sorbitol, found in fruit but also an artificial sweetener
- Starches
- Insoluble fiber

Analyze the PowerBar® food label below and then answer the questions that follow.

INGREDIENTS: HIGH FRUCTOSE CORN SYRUP WITH GRAPE AND PEAR JUICE CONCENTRATE, OAT BRAN, MALTODEXTRIN, MILK PROTEIN ISOLATE, RICE CRISPS (MILLED RICE, RICE BRAN), PEANUT BUTTER (ROASTED PEANUTS, SALT), BROWN RICE, GLYCERIN

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THE ORIGINAL PERFORMANCE ENERGY BAR™

Nutrition Facts

Serving size 1 bar

Calories 240
Calories from Fat 30

*Percent Daily Values (DV) are based on a 2,000 calorie diet

Amount/Serving	% DV	Amount/Serving	% DV
Total Fat 3.5g	**5%**	**Total Carb 45g**	**15%**
Saturated Fat 0.5g	**3%**	Dietary Fiber 3g	**12%**
Cholesterol 0mg	**0%**	Sugars 14g	
Sodium 120mg	**5%**	Other Carb 28g	
Potassium 130mg	**4%**	**Protein** 10g	**20%**

Questions

1. What percentage of the carbohydrates in the bar is simple sugar?
2. Can the girls omit all carbohydrates that are not well digested (like those in Gwen's list) from their diet? What are these carbohydrates used for?
3. What are the differences between simple sugars, starches, and fiber?
4. Use this PowerBar label to find all the ingredients that are carbohydrates of the following classes:
   - Simple sugars
   - Complex carbohydrates like starches
   - Complex carbohydrates that contain fiber
   - Carbohydrates that would produce gas according to the list