

2.2: Reading Nutrition Labels Handout

The cells of animals, plants, and decomposers are all made mostly of:

- Water, and
- Large organic molecules: Fats, proteins, and carbohydrates

Here's how to use nutrition labels to find out about different kinds of cells. We'll use carrots as an example.

Calories measure the amount of energy in the bonds of the carrot's organic materials.

Carrots

Nutrition Facts	
Serving size	(100g)
Amount Per Serving	
Calories	40
	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
<i>Trans Fat</i> 0g	
Cholesterol 0mg	0%
Sodium 70mg	3%
Total Carbohydrate 10g	4%
Dietary Fiber 3g	11%
Total Sugars 5g	
Includes 0g Added Sugars	0%
Protein 1g	2%
Vitamin D 0mcg	0%
Calcium 52mg	4%
Iron 0.36mg	2%
Potassium 0mg	0%
Vitamin A	330%
Vitamin C	10%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Since the serving size is 100 g, 1 g = 1%.

This part of the label tells us that carrots are 0% fat.

Carbohydrates include:

- Dietary Fiber, like cellulose: 3%
- Starch (not listed): (10%-5%-3%) = 2%
- Sugars like glucose: 5% of the carrot.

Cholesterol, sodium (in salt), vitamins, and minerals all add up to less than 1% of the carrot.

About 1% of the carrot is protein.

What does the nutrition label tell you about what cells are made of?

Here are some things you can learn by reading the nutrition label carefully:

What are the main organic molecules in cells?

Large organic molecules, including carbohydrates, proteins, and fats, do all the work of cells. These organic materials are made mostly of carbon, hydrogen, and oxygen atoms and have high-energy bonds.

- *Carbohydrates* include:
 - Sugars such as glucose that all cells use as a source of energy. Sugars are small organic molecules (5 or 6 carbon atoms, plus hydrogen and oxygen atoms).
 - Starches are large organic molecules (hundreds or thousands of carbon atoms plus hydrogen and oxygen atoms). Most plants store food in starch molecules.
 - Fiber such as cellulose molecules (thousands of carbon atoms, plus hydrogen and oxygen atoms). Fiber molecules make up the cell walls of plant cells, making stems stiff and wood hard.
- *Proteins* are large organic molecules (usually hundreds of carbon atoms, plus hydrogen, oxygen, nitrogen, and other atoms) found in every cell. They do much of the cell's work, such as movement of materials and making new molecules.
- *Fats* are large organic molecules (usually 50-100 carbon atoms, plus hydrogen and oxygen atoms) found in every cell. They are essential molecules in the membrane that encloses every cell, and some animals and plants use fats to store energy; they have lots of C-C and C-H bonds.

So this is what the nutrition label tells us about carrots:

- Fat: 0 g or 0% of the mass
- Carbohydrates (sugar, starch, fiber): 10 g or 10% of the mass
- Protein: 1 g or 1% of the mass

What about other molecules: cholesterol, vitamins, and minerals?

Look at the label carefully. It also includes other materials that cells need in small amounts (less than 1% of the cell's mass) to do their work. These include vitamins (vitamin A and vitamin C), cholesterol, and minerals (sodium and iron).

What about water?

All plant and animal bodies and most foods are made mostly of organic materials and water. You can figure out how much water is in a food by subtracting the mass of the organic materials from the total mass of the food (100 g for this label).

If you add up all the materials on the carrot label, here is what you get:

- Fat: 0 g or 0% of the mass
- Cholesterol, sodium, vitamins, and minerals: less than 1 g or 1% of the mass
- Carbohydrates (sugar, starch, fiber): 10 g or 10% of the mass
 - 5 g of fiber
 - 3 g of sugar
 - 2 g ($10 - 5 - 3 = 2$) of starch
- Protein: 1 g or 1% of the mass
- **Total for all organic materials and minerals: about 12 g or 12% of the mass**
- **This means that the other 88% of the mass of the carrot is WATER!**

What about chemical energy?

Scientists use "calories" to measure how much chemical energy is found in the C-C and C-H bonds of cells' organic molecules. The label shows that there are 40 calories of chemical energy in every 100 grams of carrots.

Digging deeper

- Would you like to find nutrition information for any food? Here's one way to do it. You can find nutrition information for all kinds of foods at the USDA Food-a-pedia website: <https://www.supertracker.usda.gov/foodapedia.aspx>. You need to (a) type in your food, (b) choose your specific food from the menu, and (c) choose the "Nutrient Info" tab on the label that pops up. You can also choose the amount of food.
- Would you like more information about how to read the details of food labels? The US government Food and Drug Administration (FDA) has a step-by-step process for learning about foods from food labels. Go to <https://www.fda.gov/food/ingredientspackaginglabeling/labelingnutrition/ucm274593.htm>.