13. Using a new transfer pipette, add a single drop of the povidone iodine solution on each sample's test site.
14. Look to see if the samples change to dark blue/black. Record a "+" if carbohydrates were present and a "-" if no carbohydrates were observed.

	Flour	Cheddar Cheese	Unknown
Fat Test			
Carbohydrate Test			

EXTENSION ACTIVITY

Test foods at home to see if they contain fats and/or complex carbohydrates! If your food is solid, grind it and combine with water to test.

LEARNING UNDEFEATED

Macromolecule Test

ANYWHERELABS

STEM LEARNING FOR GRADES 6-12

Want a video of this experiment? Snap a pic of the QR code to visit the At-Home Science app.

Show off your success!

Tag us on Instagram @LearningUNDFTD with a selfie of your experiment.

Macromolecules are molecules made of many subunits called monomers. The major macromolecules in biology are proteins, fats, nucleic acids, and carbohydrates. Macromolecules make up everything inside your body. Your hair is made of keratin, a tough **protein, which is made of amino acid monomers**. All of your cells are enclosed in a cell membrane made of phospholipids, a type of **fat composed of fatty acid and glycerol monomers**. All of the instructions that determine how you look and function are determined by the chromosomes in your cells. These are large bundles and strands of **nucleic acids which are made of nucleotide monomers**. Lastly, all cells use sugars, or carbohydrates, to make the energy that keeps your body moving. Carbohydrates are composed of **monosaccharide and disaccharide monomers**.

To keep growing and moving, we need to consume these macromolecules. We can find information about these macromolecules on every box of food by looking at the Nutrition Facts.

In today's activity you are going to conduct tests to determine if an unknown substance contains starch, a complex carbohydrate, or fat. To test for complex carbohydrates, we will use an iodine solution. When this brown solution comes in contact with starch, it binds and changes to a dark blue, almost black color. To test for fats, we will use a piece of brown kraft paper. When fats and oils come in contact with this paper they

spread out as they dry, leaving a visible ring of where it was, while non fatty substances don't change the paper.

Our controls for this experiment are flour and white cheddar cheese powder. By looking at the nutrition facts below, can you determine which substance is a control for fats and which substance is a control for carbohydrates?

FLOUR

Nutrition Facts

Serving size	1 cup (125g)
Amount Per Serving	
Calories	**460**
	% Daily Value*
Total Fat 1g	**1%**
Saturated Fat 0.2g	**1%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 0mg	**0%**
Total Carbohydrate 95g	**35%**
Dietary Fiber 3g	**11%**
Total Sugars 0g	
Includes 0g Added Sugars	**0%**
Protein 13g	**26%**

Not a significant source of vitamin D, calcium, iron, and potassium

*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.

WHITE CHEDDAR CHEESE POWDER

Nutrition Facts

Serving size	5 tsp (20g)
Amount Per Serving	
Calories	**100**
	% Daily Value*
Total Fat 6g	**8%**
Saturated Fat 2g	**10%**
Trans Fat 0g	
Cholesterol 5mg	**2%**
Sodium 630mg	**27%**
Total Carbohydrate 9g	**3%**
Dietary Fiber 0g	**0%**
Total Sugars 2g	
Includes 0g Added Sugars	**0%**
Protein 2g	**4%**

Not a significant source of vitamin D, calcium, iron, and potassium

*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.

MATERIALS

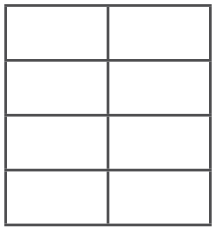
From the Macromolecule Test bag	From Home
• White cheddar cheese powder • Flour • Unidentified powder • Cotton swabs • Brown kraft paper • 5mL tubes • Transfer pipettes • Povidone iodine	• Cup of water • Non-paper plate

PREPARING SOLUTIONS

1. Gather all supplies listed on the "Macromolecule Test" bag.
2. Label the three 5mL tubes: one "Cheese", one "Flour", and one "Unknown".
3. Fill your three tubes with 4 mL of water using a transfer pipette. Be sure the bottom of the meniscus hits the appropriate graduation on the side of the tube (4mL).
4. Add approximately ¼ tablespoon of the food sample to the appropriate test tube. Cap the tubes and shake to mix.

LIPID TEST PROTOCOL

5. Draw a table on your brown kraft paper to create eight boxes like this:



6. Label three boxes for your three samples.
7. Use a cotton swab to dunk into your white cheddar cheese sample. Then spread the liquid in its labeled box on the brown paper.
8. Dunk and spread the white cheddar cheese sample two additional times onto the same space of the labeled box.
9. Repeat steps 7 and 8 for your two remaining samples.
10. Set a timer and leave to dry for approximately 30 minutes.
11. Look at the samples for the distinct fat ring. Record a "+" if fats were observed and a "-" if no fats were observed in the table below.

CARBOHYDRATE TEST PROTOCOL

12. Use your transfer pipette to create a test site for each sample by placing five drops of a sample into a single spot on your plate. Create one test site for each sample and be sure to label or remember which sample is in each test site. Be sure that the drops of the different samples won't combine.

    a. Rinse your pipette with water in between samples to reduce chances of contamination.