

# FOOD SCIENCE!

## WEEK 2 | PART 1 | STARCH

### SUMMARY

- ✓ Today we learn about the properties of starch.
- ✓ We will see how starch granules unfold when heated and absorb water.
- ✓ We will use starch to thicken a sauce, which is good for chicken or vegetable stir fry.

### EXPERIMENT ~ OOBLECK AND THICKENING A SAUCE

#### MATERIALS LIST

- Cornstarch
- Sugar
- Rice Vinegar
- Soy Sauce
- Garlic (or frozen garlic cubes)
- Sesame oil

#### Optional:

- Sesame seeds
- Stir fry chicken and/or vegetables (like broccoli, string beans, zucchini, etc.) to pour the sauce over.

#### INSTRUCTIONS ~ OOBLECK

- 1. Warning!** This experiment needs to be heated on a stove. Be sure to get help from an adult.
- 2. Prepare:** Gather the supplies listed in the materials list. Setup somewhere that is safe for your computer. You may want to put down plastic or paper to catch any mess.
- 3. To make oobleck,** mix 1 part water to 2 parts cornstarch. You can use 1 cup cornstarch and  $\frac{1}{2}$  cup water, or  $\frac{1}{2}$  cup cornstarch and  $\frac{1}{4}$  cup water. It depends how much you want to make.
- 4. Slowly stir** cool water into the cornstarch, until it is the consistency of thick yogurt.
- 5. You now have made oobleck!** (You can add food coloring if you want.)

6. Hit the surface with your fingers, or a potato masher. What happens?
7. Slowly lower your fingers into the surface. Notice a difference?
8. Scoop some up and quickly squish it or roll it into a ball in your hands.
9. Stop rolling it, and watch it melt away.
10. Optional: Heat the oobleck with some extra water to see how it gels. You can use the thermometer to see how hot it is when this happens.

## INSTRUCTIONS~SAUCE

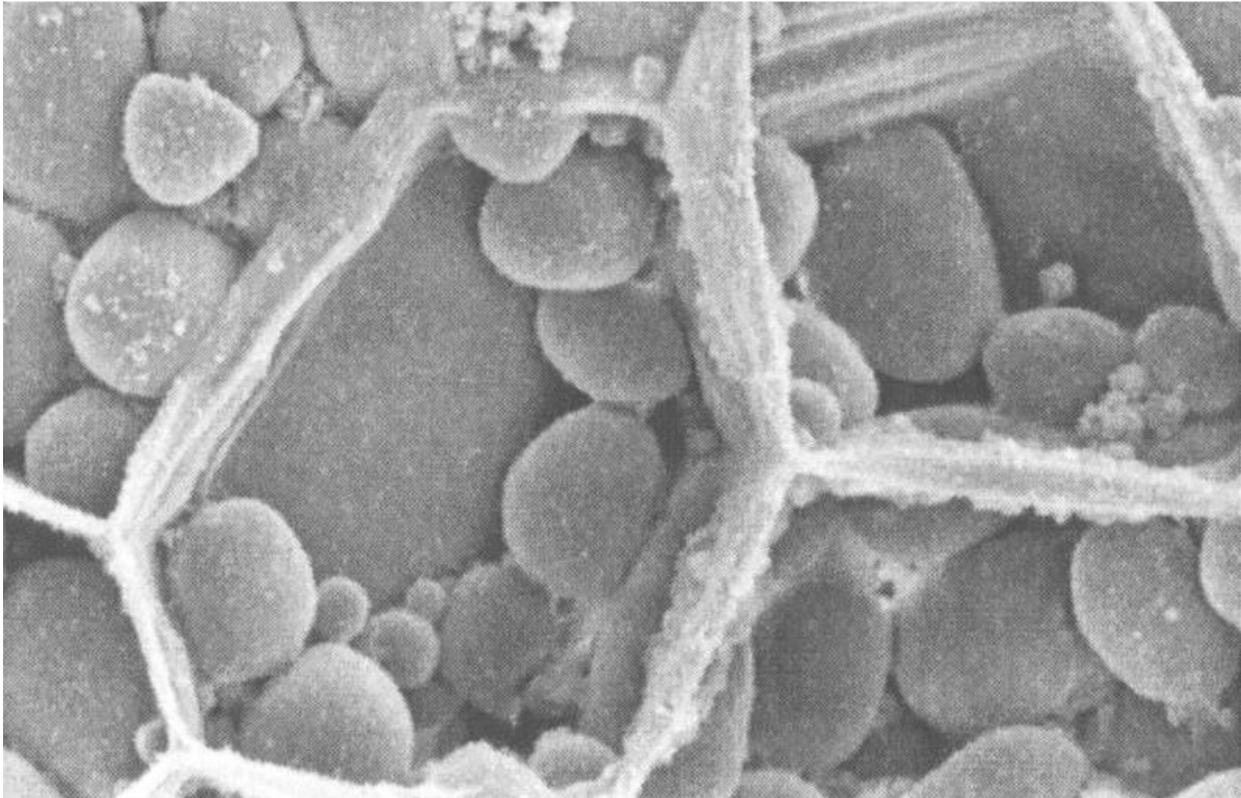
1. **Warning!** This experiment needs to be heated on a stove. Be sure to get help from an adult.
2. Prepare: Gather the supplies listed in the materials list. Setup somewhere that is safe for your computer. You may want to put down plastic or paper to catch any mess.
3. Add 1 cup sugar to a pot or sauce pan.
4. Add ½ cup rice vinegar.
5. Add 6 Tablespoons of soy sauce.
6. Add 6 cloves of crushed garlic (or 6 frozen garlic cubes).
7. Add 2 Tablespoons of sesame oil.
8. Put the pot on the stove, and heat over a medium-high heat, until simmering.
9. While the sauce heats, make your cornstarch slurry.
10. Add 2 Tablespoons cornstarch to a small bowl.
11. Add 6 Tablespoons of cold water, and mix until fully dissolved.
12. Bring the sauce back to a simmer. As it heats up the white cornstarch will turn clear, and it the sauce will thicken.
13. Stir a little, but not too much. When the sauce is thick, turn of the heat.
14. Optional: Pour over chicken and or vegetable stir fry.
15. Optional: Top with sesame seeds.

## EXPLANATION

Starch is the most common form of carbohydrates in food. All plants make simple sugars (glucose) from carbon dioxide and water using photosynthesis. Sugar is like a chemical battery, which holds energy from the sun for later use. To store the sugar, cells make long chains of

these molecules of starch, which are curled into small grains. This makes starch a good way to store a lot of energy in a small space.

Plants make two kinds of starch chains. One is long and straight, called *amylose*. The other has lots of branches, like a tree, and is called *amylopectin*. It fits these together in twisting packets that form little balls, or grains, of starch. Here is a picture of potato cells with starch granules inside.



## HEATING STARCH

When starch granules are heated in water, they absorb water and swell up like a balloon. Eventually, they burst open and get all tangled together, becoming a thick gel. This is called *gelatinization*. Each starch will gel at a different temperature, which is one reason why some foods get stickier than others when cooked.

Cornstarch starts to swell at 60°C / 140°F and burst at around 95°C / 203°F.

Here is a picture of starch granules being heated under a microscope.

