

Find the Gluten!



Common Core:

CCSS.ELA-Literacy.SL.5.1

Next Generation Science Standards:

Matter and Its Interactions: 5-PS1-1; 5-PS1-2; 5-PS1-3; 5-PS1-4



Materials Needed:

- Any combination of the following flours:
 - ⇒ Whole wheat flour
 - ⇒ Bread flour
 - ⇒ All-purpose flour
 - ⇒ Pastry flour
 - ⇒ Gluten flour
 - ⇒ Instant flour
- Water (1/2 to 3/4 cup for each flour you'll be using)
- Bowls (one for each flour you'll be using)



Directions:

1. Into separate bowls, measure out 1 cup of each of your flours. If your bowls look different, remember which one contains which type of flour. If not, label them.
2. Slowly add about 1/2 to 3/4 cup water to the flour in each bowl, and knead each mixture until it forms a soft, rubbery ball of dough. Let the dough balls sit for about 10 minutes.
3. In the sink, run cold water over one of the dough balls. Be careful not to let the dough disintegrate; try cupping your hands around the ball and squeezing gently to remove the starch. With low-gluten cake or pastry flours, you may want to put the dough in cheesecloth in order to hold it together.
4. You'll notice the water turning milky as it washes away the starch in the dough. Keep pouring out the cloudy water that collects in the bottom of the bowl. Slowly, your dough ball will become a gummy, slimy network of gluten strands.
5. When the water no longer becomes milky, you know there's no more starch in the dough, leaving nearly pure gluten. Notice how much smaller and stretchier your ball has become.
6. Repeat steps 3 to 5 for each of your flour types. How does the texture of each one differ as you wash away the starch? Does it take the same amount of time for each one? Are the gluten balls all the same size, or are some larger than others?



Lesson Extender:

Try baking your gluten balls in the oven for about 15-30 minutes at 450° F. When you take them out of the oven, you'll notice they've puffed up and hardened, which is exactly what happens to the gluten in a loaf of bread as it bakes. Add flavoring and try it! You can add soy sauce, ginger, garlic, and seaweed. The finished product, known as seitan, is a great source of texture and protein.

Discussion:

When you knead dough, you help two proteins in wheat flour, gliadin and glutenin, form gluten. But flour also contains many other components: starch, lipids, sugars, and enzymes that contribute to the consistency and nutritional value of bread. When you run water over dough in this activity, you wash away most of these other substances, isolating the gluten in the dough. In the oven, the steam produced as the the gluten heads up expands the ball. Finally, the gluten hardens, and you have a finished gluten ball. Why is gluten so important? Without it, there would be nothing to hold the gas that makes bread rise. Think of gluten as the rubber of a balloon: The stronger it is, the more gas it can hold. But stronger isn't always better. For many baked goods, like pastries and pie crusts, it's important to avoid gluten development. That's why different flours contain different amounts of protein, depending on how they are meant to be used. A high-protein flour will make a dough with strong gluten, good for hearty yeast breads. Pastry chefs, on the other hand, prefer low-protein flours that yield delicate, tender doughs.

Adapted from: The Accidental Scientist: Science of Cooking

<http://www.exploratorium.edu>

