BAKING SODA VS. BAKING POWDER
Submitted by Rita Snyder

BACKGROUND:

It was not until the middle of the 1800’s that people started using chemicals to put air into breads and cakes. Today, instead of yeast, we often use either baking soda or baking powder-sometimes both. It takes much less time to bake with them. Batters, such as those used for pancakes and certain cakes, contain much more liquid than does the bread dough made with yeast. These batters are so thin that slow-acting yeast cannot trap enough air to make bubbles. That’s why we use chemicals.

Baking soda is sodium bicarbonate (NaHCO₃) sometimes called bicarbonate of soda. Some people use it for brushing their teeth, for absorbing refrigerator odors, or as an antacid for ingestion! Baking soda is an alkali (or base), opposite of an acid. When it combines with an acid, it produces carbon dioxide (bubbles).

\[
\text{NaHCO}_3 + \text{CH}_3\text{COOH} \rightarrow \text{NaCH}_3\text{COO}^- + \text{H}_2\text{CO}_3 \rightarrow \text{H}_2\text{O} + \text{CO}_2
\]

Acetic acid (vinegar)  Sodium acetate

Baking powder is a combination of baking soda and an acid. When you add baking powder to water or milk, the alkali and the acid react with one another and produce carbon dioxide bubbles.

ACTIVITIES:

Step 1:  water  baking soda  orange juice or lemonade  (optional other foods, buttermilk, sour cream, yogurt, molasses, apple cider, regular milk)

Measure and record pH of each food being tested including water.

Add 1 teaspoon of baking soda to 100 mL water and 1 teaspoon of baking soda to 100 mL orange juice and to other foods if being used.

Describe what happens in each.

<table>
<thead>
<tr>
<th>Food</th>
<th>pH</th>
<th>Observation</th>
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<tbody>
<tr>
<td>Water</td>
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<td>Orange juice</td>
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<td>Buttermilk</td>
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<td>Sour cream</td>
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<td>Yogurt</td>
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<td>Molasses</td>
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<td>Apple cider</td>
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<td>Regular milk</td>
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When an acid and baking soda are mixed, carbon dioxide (bubbly gas) is formed.

**Step 2:**
- water
- ½ tsp baking soda
- ½ tsp baking powder

Add the baking powder to 50 mL of water. Add the baking soda to 50 mL of water.

Describe what happens. ___________________________________________

**Step 3:**
- sour milk, orange or lemon juice
- ½ tsp baking powder
- ½ tsp baking soda

Add the baking powder to 50 mL of sour milk, orange or lemon juice and baking soda to another 50 mL of the same acidic food.

Explain the results. ___________________________________________

When you add baking powder to an acid, you are tampering with the balance of acid and alkali. When more acid than alkali is present, less carbon dioxide is produced!

Therefore, if you want to bake with sour milk or buttermilk instead of regular milk, you could do it by eliminating the extra acid. You would just replace each teaspoon of baking powder in the recipe with ½ teaspoon of baking soda.

**Questions:**

1. When do you get bubbly action, when you added baking soda to the water or to the orange juice?

2. Which gas was being released in the above question?

3. What is baking powder a combination of?

4. Why is baking soda or powder used instead of yeast in some recipes?

5. What is the purpose of using baking soda or baking powder?