

PHYSICS AND THE PUYALLUP FAIR

Chapter 2: Food at the Fair

Guest Scientist Column:

The Science Behind the Scone

Written by
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One of the main characteristics of the Fisher® Fair Scone is the fluffy texture

that perfectly supports the accompanying whipped butter and raspberry jam. So what's responsible for the texture? A key contributor to the texture lies in the leavening ingredients. Leavening is a process by which ingredients cause rising or fermentation in a food product. The Fisher Fair Scone uses three leavening components: sodium bicarbonate (also known as baking soda), monocalcium phosphate (MCP) and sodium aluminum phosphate (SAP).

Sodium bicarbonate is an alkali or basic ingredient, which means that its pH value is greater than 7 (neutral). MCP and SAP are both acids and have a pH value less than 7. These three ingredients happily coexist together in dry form, but when you add water and heat from the oven, these ingredients react with each other, yielding primarily carbon dioxide (CO₂) gas. This CO₂ exerts outward pressure on the scone's structure, causing it to rise in the oven, which results in the light, fluffy texture that people love.

Here's what the chemical reaction looks like:

$\text{HX (an acidic salt, such as MCP) + NaHCO}_3 \text{ (baking soda)} \rightarrow \text{NaX (a neutral salt) + H}_2\text{O + CO}_2$

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What is a Food Scientist?

Food scientists develop and test the food that we purchase in grocery stores, restaurants or even at the Puyallup Fair. They make sure our food is safe and yummy!



Photo credit: Philip Quigley



CALORIES  ENERGY

Burning Calories

Have you ever seen the word "calorie" on a food label and wondered what it was? A calorie is a unit of energy. Specifically, it is the amount of energy it takes to raise the temperature of 1 gram of water 1 degree Celsius. It can apply to anything containing energy, from food to electricity. The calories in the food we eat fuel our bodies to perform basic functions, including breathing and moving. When you play basketball, ride your bike or walk around the Puyallup Fair, you are burning calories.



Photo credit: Patrick Hagerty

Interview with: Fisher Scones CEO Michael Maher

How long have you been with Fisher Scones? What positions have you held with Fisher Scones?

34 years. I started when I was 15 years old, working in the scones wagon at the Portland Rose Festival. In 1985 I became General Manager, vice president in 1990, president & COO in 1999, and president & CEO in 2006.

At what point did the company begin selling scones at the Puyallup Fair?

In 1915 William Paulhamus, president and general manager of the Puyallup Fair, brought the scones to the Fair after tasting them at the Panama Pacific Exposition in San Francisco. He recommended they be served with jam made from Puyallup Valley raspberries. They're still served in the very same corner booth under the grandstand where they started.

Have the scones changed over the years?

In the 1920s lard was removed and in the 1960s raisins were removed.

About how many scones are sold each day at the Puyallup Fair? How many have been sold at the Puyallup Fair to date?

65,000/day. This summer we will reach 100,000,000 scones sold to date.

How many pounds of jam are used at the Puyallup Fair each year?

During the 17-day Puyallup Fair, Conifer expects to make 1.1 million scones, and plans to use at least 75 tons of flour, 12 tons of butter and 40 tons of raspberry jam.



Mix It Up!

A mixture is a combination of two or more substances that are held together by physical forces. In a mixture, the individual parts (molecules) do not change their chemical composition.

An example of a mixture is salt water. To learn more about mixtures, try to make salt water at home or in your classroom. Be sure to follow safety procedures and have an adult supervise you when you try this!

1. You'll need three tablespoons of salt, a stirrer, a hot pot (or a burner at home), gloves or a mitt to protect you from the heat, and a beaker or pot large enough to fit two cups of cold water.
2. Mix the water and salt together in the beaker and observe what happens. Continue to mix the two as you heat the substance on the hot pot. Be very careful! Describe what you see.

Time to Think!

Did the salt dissolve more easily in cold water or warm water?

If you continued to boil the substance for a while, what would happen to the water?

What would happen to the salt?

Explain why salt water is a mixture.

What Would That Raspberry Jam Weigh on the Moon?

Weight is the force of an object due to gravity. Unlike mass (which is the measure of the amount of matter in an object), weight can change due to variations in gravity. Weight is calculated by multiplying mass by the acceleration of gravity ($w=mg$).

Over 40 tons of raspberry jam are spread on the scones each year at the Puyallup Fair. Convert this to pounds. Next, determine what the weight of that jam would be if it were on the moon. (Hint: You will need to know both the Earth's and the moon's gravity to solve this problem. See the teacher's guide for more information.)