

Materials needed:

- Miracle Berry (freeze dried)
- Lemon or Lime fruits
- Optional: a wide variety of sour foods and also sweet, salty, and umami
- pH paper

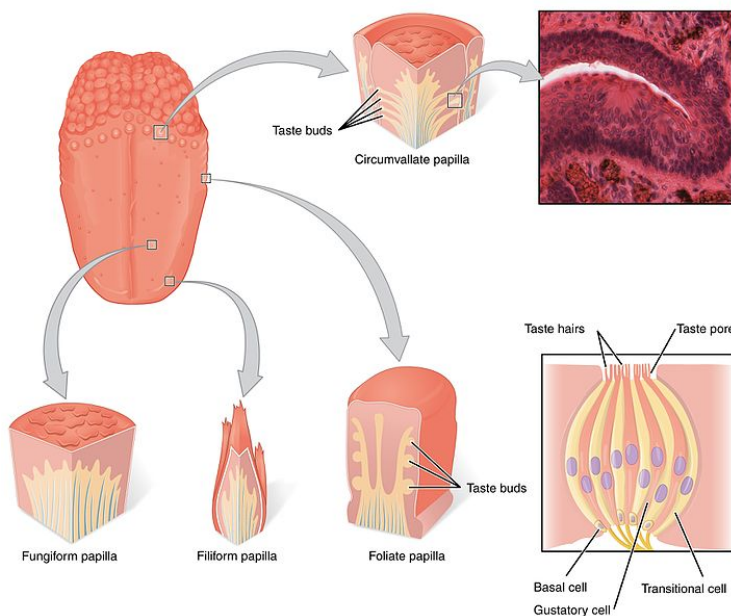


CC-BY-SA-3.0 MiracleFruitFarm

1. Look at your tongue in the mirror.

Do you see little bumps? They are called papillae (say: puh-PILL-ee). Inside the sensory papillae are many taste buds. Each taste bud has up to 100 sensory cells that end in microscopic “taste hairs” arranged around a central pore. The sensory cells are tuned to detect different types of chemicals important to our survival. They send signals to your brain for sweet, salty, sour, bitter, and savory (umami) flavors.

In this experiment you will use a natural fruit called the Miracle Berry to trick your taste buds!

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2. Collect a variety of foods for your taste experiment, especially sour foods! Lemon is a great food to try. Other ideas are sour cream, vinegar, unsweetened yogurt, dill pickles, or fresh grapefruit.

3. Chew one miracle berry for 2 minutes. Swish the fruit pulp around in your mouth and smooch it against your tongue. The proteins in the berry need to contact your taste buds thoroughly to have an effect!



4.

After chewing the miracle berry do your taste experiment right away. The effects will wear off in an hour or so.

Try the lemon and other foods. How do they taste now? Which flavors have changed, and how?

Some people find the results yummy, others think they are gross. What do you think?

5.

pH paper changes color when it comes in contact with an acid or base. It's fun to use!

Test your foods and drinks – which is the most acidic? Are the most acidic foods the ones that tasted sweetest?

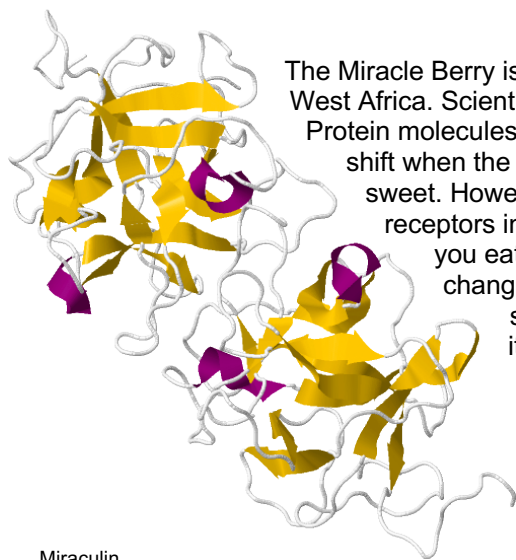


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pH 0.0 - 13.0
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Lot 210620 Exp Apr 15, 2023

0 1 2 3 4 5 6
7 8 9 10 11 12 13

Use the color guide for your pH paper. The pH scale runs from 0 to 14. Seven is neutral. Any number six or under is an acid. The lower the number, the more acidic the substance is!

Tips and Tricks: Be careful not to consume too much acidic food or drink at one time. Even if it tastes good, it could make you feel sick.

The Amazing Science behind the taste sensation

Miraculin
Molecular
structure

By Jmol, Public Domain, Wikipedia

The Miracle Berry is the fruit of a shrub *Synsepalum dulcificum*, native to tropical West Africa. Scientists isolated the active protein in the fruit and named it *miraculin*. Protein molecules have unique three-dimensional shapes. Some proteins shape-shift when the pH of their environment changes. The Miracle Berry itself is not sweet. However, molecules of miraculin temporarily bind to the sweet taste receptors in your tongue. At normal pH the miraculin has no effect. When you eat an acidic food the drop in pH causes the miraculin molecule to change shape, activating the receptor and sending a “sweet” taste signal to the brain. The “sweet” signal is so strong that apparently it overwhelms the “sour” signal, tricking your senses!

Do you like spicy food? Do you know anyone who likes to eat incredibly hot peppers? Chili peppers taste spicy because of the chemical compound called *capsaicin*. Capsaicin works on receptors that send information about temperature to the brain. Like the Miracle Berry it tricks your senses. It sends two messages – warmth and intensity, which combined together are interpreted by the brain as a BURNING sensation, even though there is *no* actual harm or temperature change! It feels real, and your body’s response to this perceived threat can cause uncomfortable side-effects.

All animals have the ability to sense chemicals in their environment but there are interesting differences. Mammals like us can taste capsaicin in chilli peppers but birds cannot – they can eat as many chili peppers as they want! Butterflies have taste sensors on their feet. Cats have lost the ability to taste sweet foods. Some fish, such as catfish, have taste receptors located all over their body!

How is this useful?

Chemical compounds like *miraculin* could help provide safer sweets for people with diabetes. It might also lead to solutions for people with diminished sense of taste, including astronauts living in zero gravity, people who’ve been through certain cancer treatments, and anyone over age 50.

Plants are a treasure trove for scientists and doctors searching for new and better medicine. This is one reason why we must protect the earth’s biodiversity. Drugs to help high blood pressure, irregular heartbeats, diabetes, parasite infections, and much more have been found in plants. There is still much more to discover! You could become an ethnobotanist and study traditional uses of plants, or a biochemist, or a food scientist, or a medical doctor, and help with this quest!

We have a sense of taste and smell not just for our enjoyment, but for important survival reasons. Bitter foods can be a sign that toxins are present. Salt is essential for nerve and muscle function. Likewise, sweet foods can provide good energy sources. Our biological systems evolved to detect salt, sweet, and fatty foods, and cause us to enjoy and crave them. Now that these substances are more readily available it’s easy to eat more of them than is good for you.

The pH scale is used for everything from gardening, caring for animals in an aquarium, diagnosing illnesses, testing for pollution, and measuring water health. It’s useful to know!