

Hot Peppers and Capsaicin

Introduction

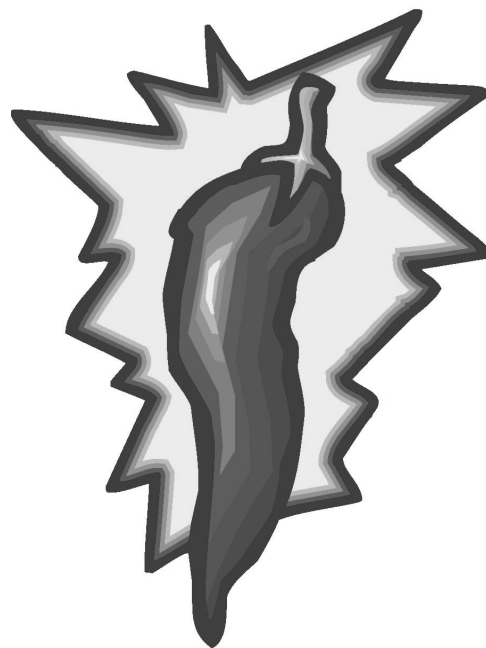
Almost all of the “heat” in hot peppers comes from large molecules called *capsaicin*. Capsaicin is a member of the vanilloid family, which includes the distinctly flavored chemicals found in vanilla, cloves, ginger and garlic. However, due to their large size, capsaicin molecules are odorless, do not evaporate easily, and do not dissolve in water.

Capsaicin has the ability to open a door in cell membranes that allows calcium ions to flood into the cell. This triggers a pain signal that is similar to when cells are exposed to heat, so the burning feeling from eating a hot pepper is a very real sensation! If people eat enough spicy, capsaicin-rich foods, they can build up a tolerance to the heat as well as a sort of mild addiction to the endorphin rush caused by the pain.

Because capsaicin does not dissolve in water, any water-based beverage will not be effective in reducing the pain caused by capsaicin. Milk, however, contains casein, a fat-loving protein that surrounds the offending molecules and washes them away in a similar manner to soap washing away grease. Sugar water, which was used by Scoville himself establishing his heat scale, can also have a cooling effect.

Materials

cups	peppers, various
milk (2%)	pipettes
paper plates	sugar water



Procedure

1. Prepare several samples of hot peppers by slicing them into thin rings or chopping them up in a food processor.
2. Obtain a cup of milk. Take a small sip to cleanse your palette.
3. Obtain a cup of sugar water and a pipette.
4. Select a pepper to sample. Record its name in the Data Table. **CAUTION: DO NOT TOUCH YOUR EYES AFTER HANDLING PEPPER SAMPLES.**
5. Eat the pepper sample, chewing it up completely to release the capsaicin. You may swallow it or spit it out into the trash.
6. Squirt a pipette full of sugar water into your mouth and swish it around to try to decrease the heat effect. Keep using pipettes of sugar water until the heat is tolerable. Record the number of pipettes of sugar water you used.
7. Rank the pepper’s spiciness from 1 (“Not Spicy”) to 10 (“Extremely Spicy”). Record this ranking in the Data Table.
8. Drink a small amount of milk and swirl it around in your mouth to cleanse your palette. Depending on the spiciness of the sample, you may want to do this several times, but be careful not to drink large quantities of milk at once because it could make you sick!
9. After you have completed the lab, wash your hands thoroughly and dispose of any uneaten peppers and used paper plates in the trash.
10. Compare your rankings of the peppers you tasted with the chart of pepper “hotness” provided by your teacher.

Data

Pepper Name	# of Pipettes	Ranking	Scoville Heat Units

Questions

1. How did your spiciness rankings compare to the pipettes of sugar water you used?

2. Why is milk effective at decreasing the hot effect of peppers, but cold water isn't?

3. Why do you think the use of concentrated capsaicin in pepper spray is effective?

4. Countries with hot climates often have spicy peppers in their local food. Why do you think this is?

5. List one way you could change this lab and describe how your results might be different.
