

Why do hot peppers make you cry?

The chemistry behind the tears

Capsaicin

Capsaicin ($C_{18}H_{27}NO_3$) is the chemical that makes hot peppers spicy. However, those peppers aren't actually hot, temperature-wise — we just perceive the spiciness as heat.

When we eat hot peppers, the capsaicin binds to pain receptors in our mouths called TRPV1. These receptors respond to things with the potential to damage our tissues, including heat, acidity, and bitter compounds. Capsaicin fits into these receptors, which send a signal from our mouths to our brain that we are eating something we shouldn't be.

TRPV1 receptors

What does the brain make of all this? The message relayed from TRPV1 receptors in the mouth is perceived as heat, making our noses run and eyes water. This is the body's way of letting us know to stop eating and drink something cold to halt the pain.

Sweet relief

Water might seem like a good way to quench the fire in our mouths, but it actually makes things worse. Capsaicin is nonpolar, so it doesn't dissolve in polar molecules like water. Instead of washing away the capsaicin, water spreads it around your mouth, intensifying the pain.

Bread and dairy foods have plenty of nonpolar molecules- like caesein and milk fat in dairy- that dissolve capsaicin and can even pull it off the TRPV1 receptors in your mouth. Colorless, odorless substance, capsaicin is most heavily concentrated around the tissues that connect the seed to the plant.

* How did the Reactions team fare in a hot pepper tasting?

Sources:

<https://www.acs.org/content/acs/en/education/resources/highschool/chemmatters/past-issues/archive-2013-2014/peppers.html>

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<https://www.nature.com/articles/39807#B5>

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