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Heat and sting

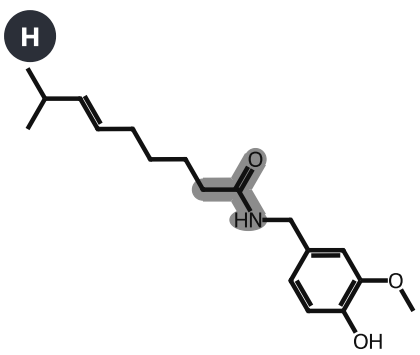
Six kitchen molecules that burn, sting and make you cry.

1 Heat and sting · 2 Aroma · 3 Taste and tricks

The grey glow marks the working part of each molecule.

Chem2Cure
Institute for Chemical Research and Therapeutics

H



$C_{18}H_{27}NO_3$ · 305.4 g/mol

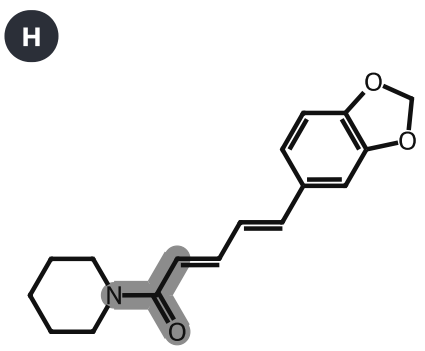
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Chilli

Capsaicin · Group: amide

The burn. It switches on the nerve that senses heat, so the mouth feels on fire. Milk helps more than water.

H



$C_{17}H_{19}NO_3$ · 285.3 g/mol

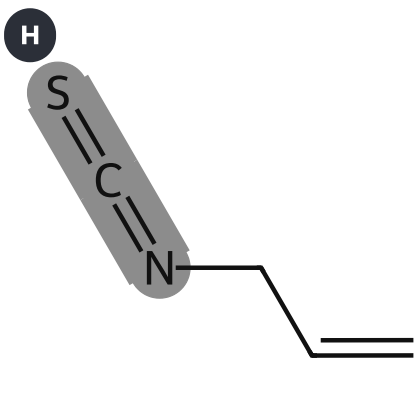
গোলমরিচ

Black pepper

Piperine · Group: amide

The bite of black pepper. Like capsaicin, it also sets off the nerve that senses heat.

H



C_4H_5NS · 99.2 g/mol

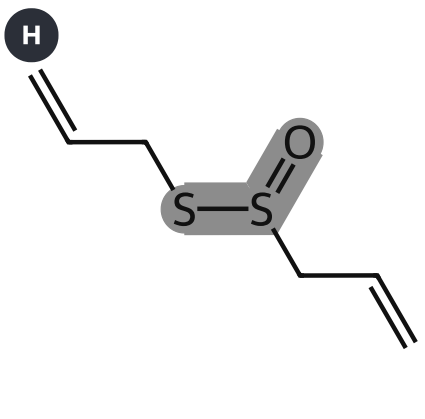
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Mustard

Allyl isothiocyanate · Group: isothiocyanate

The sharp sting in the nose. It forms only when crushed seeds meet water, so shorshe paste is made fresh.

H



$C_6H_{10}OS_2$ · 162.3 g/mol

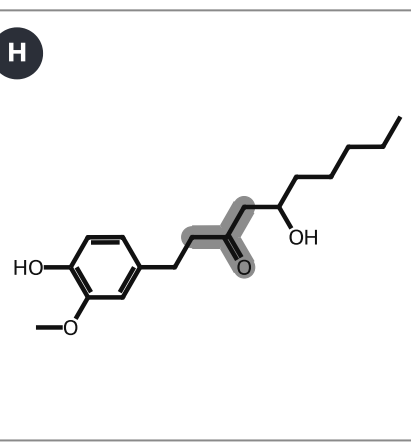
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Garlic

Allicin · Group: thiosulfinate

Made only when garlic is crushed, as two separate parts of the clove meet. Its smell fades as it breaks down.

H



$C_{17}H_{26}O_4$ · 294.4 g/mol

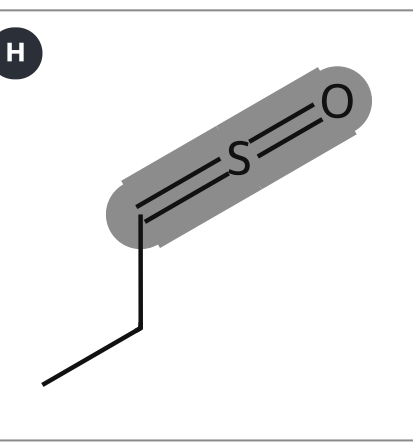
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Ginger

6-Gingerol · Group: ketone

The warm bite of fresh ginger. Cooking turns some of it into a milder molecule, zingerone.

H



C_3H_6OS · 90.1 g/mol

পেঁয়াজ

Onion

Propanethial S-oxide · Group: sulfine

The tear-maker. Cutting an onion releases this gas, and your eyes make tears to wash it away.

GOOD TO KNOW

The heat sensors

Chilli and black pepper switch on TRPV1, a sensor in your nerves that detects heat. Mustard and garlic switch on TRPA1, a sensor for irritants. The 2021 Nobel Prize in Physiology or Medicine honoured the discovery of the body's temperature and touch sensors, and David Julius found TRPV1 using capsaicin.

GOOD TO KNOW

Cool the burn

Capsaicin dissolves in fat, not in water, so a drink of water just spreads it around. Milk and yoghurt work better: the fat dissolves it, and casein, a milk protein, grabs hold of it.

TRY IT AT HOME

Two experiments for the kitchen table.

Mustard, dry and wet
Crush a few dry mustard seeds and smell them: mild. Add a drop of water and crush again. The sting appears, because allyl isothiocyanate forms only when water is there.

Garlic, whole and crushed
Smell a whole garlic clove, then crush it and smell again. Crushing starts the reaction that makes allicin.

Ask an adult first. Never taste an experiment.

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