Vicious Venoms—Wasp Stings

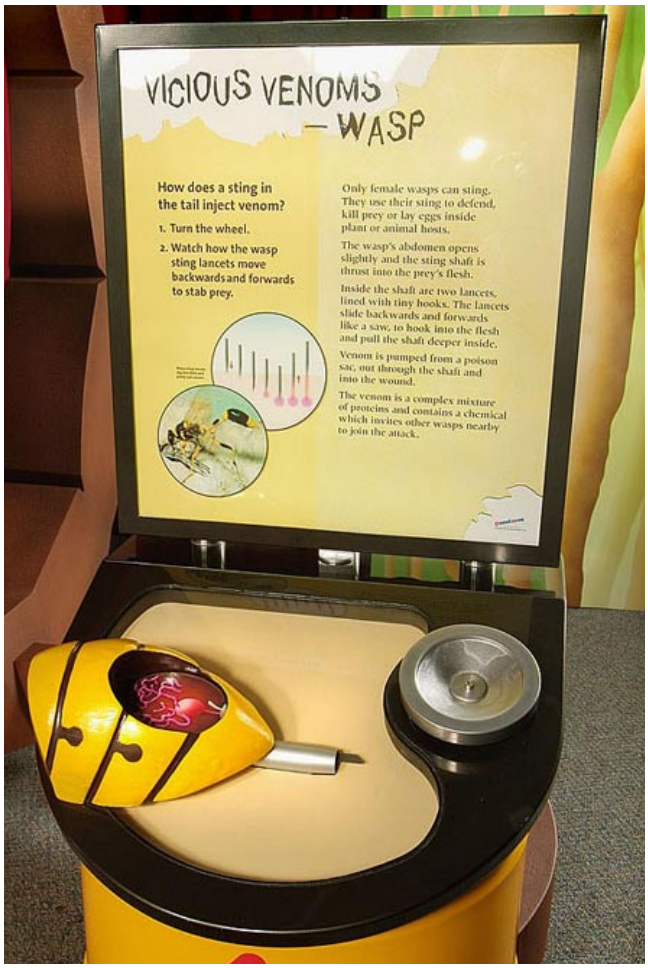

Exhibit message

The wasp sting is a hollow shaft (stylet) with two hooked lancets inside. The lancets move in and out of the shaft and hook into prey's flesh, pulling the sting further into the flesh and pumping out venom.

Quick fact

Bees and some wasps use their sting to defend themselves against predators.

Bee sting lancets are larger than wasp sting lancets. When a bee stings a human, its sting anchors into human flesh more firmly than the flesh of other animals. When the bee tries to fly away, its sting apparatus including its poison sac are ripped from its abdomen and the bee eventually dies.

Graphic panel text

Only female wasps can sting. They use their sting to defend, kill prey or lay eggs inside plant or animal hosts.

The wasp's abdomen opens slightly and the sting shaft is thrust into the prey's flesh.

Inside the shaft are two lancets, lined with tiny hooks. The lancets slide backwards and forwards like a saw, to hook into the flesh and pull the shaft deeper inside.

Venom is pumped from a poison sac, out through the shaft and into the wound.

The venom is a complex mixture of proteins and contains a chemical which invites other wasps nearby to join the attack.

Want to know more about wasp stings?

Most wasps are solitary and are harmless to humans (unless you have a specific allergy to wasp venom). Social wasps living in groups tend to sting in defence of their nests. Wasps that use their sting to kill or paralyse insect prey are called vespid wasps.

Wasps hold onto their victims tightly with their legs and push their sting into the victim's flesh.

Some female wasps sting and disable an insect so it is paralysed. The female wasp then lays her eggs inside the paralysed host. When the wasp eggs inside the host hatch, the wasp larvae use the host's body as a food source as they develop. These parasitic wasps have inspired dozens of science fiction and horror movies!

Other vespid wasps sting and kill prey, then carry the prey back to the wasp's nest. Their stings are specialised, so they are able to carry prey in mid-air.

The wasp's sting contains a hollow shaft or stylet. The stylet surrounds two lancets that have barbed hooks along the outside edges. The lancets slide backwards and forwards out the end of the stylet and into their victim's flesh.

The shape of a wasp's stylet and the size and number of barbs along its lancets depends on the type of prey that the wasp hunts.

Type of prey	Shape of wasp sting stylet
Flies quickly and has hardened skin	Extremely curved
Moves and flies a little slowly or doesn't fly	Slightly curved
Slow moving caterpillars and spiders	Straight or only slightly curved
Adults or larvae of other soft-bodied prey	Spines on the tips of the lancets help to impale and carry the prey mid-flight.

Wasp venom contains proteins that cause pain by directly stimulating nerves or releasing compounds from the victim's cells.

Extra for experts

Wasps belong to the order *Hymenoptera* (meaning skin wings). Stinging wasps belong to the families *Vespidae* and *Sphecidae*.

Once a wasp stings a human, the skin goes red and swollen due to:

1. water collecting in tissue (oedema) and
2. blood capillaries allowing blood cells to escape and enter surrounding tissue (erythema).

Wasp venom contains enzymes and peptides. The enzymes in wasp venom that cause great pain in humans are the enzymes phospholipases, hyaluronidases and cholinesterases.

The venom also causes allergic reactions, and histamine, serotonin, acetylcholine and kinin contribute to the pain of a sting in humans.

Even closely related wasps can have very different sting apparatus, due to the type of prey they hunt.

Some types of digger wasps (*Sphecini*) have an elongated sting apparatus with a narrow and slightly curved stylet. This shape may be better adapted for stinging their fast-moving prey *Orthoptera* (grasshoppers, locusts, crickets).

Other digger wasp stings (*Ammophilini*) have straight stylets and lancets lined with spines along its tip. These stings are better suited for slow moving prey such as caterpillars, which also have softer flesh than prey such as grasshoppers.

Other wasps (such as the genus *Oxybelus*) seem to have thorny projections on their stylets. These projections impale and hold paralysed prey on the wasp's sting as they fly back to their nest.

The wasp's sting lancets are attached to plates inside the wasp's abdomen. Muscles rock these quadrate and oblong plates backwards and forwards so the attached lancets are thrust in and out through the stylet.

These contracting muscles also cause venom to be pumped from the poison sac as the lancets dig through flesh.

Further information

Microscopy UK article on wasp sting
http://www.microscopy-uk.org.uk/mag/articles/waspstng.html

Manaaki Whenua Landcare Research Wasp Sting
http://www.landcareresearch.co.nz/research/biosecurity/stowaways/sting.asp

Venoms Striking Beauties.
California Academy of Sciences
http://www.calacademy.org/exhibits/venoms/

Sting Morphology and Frequency of Sting Autotomy Among Medically Important Vespids (Hymenoptera: Vespidae) and the Honey Bee (Hymenoptera: Apidae). 1992. *Journal of Medical Entomology.* Mulfinger, L. Yunginger, J. Styer, W. Guralnick, M. Lintner, T. Vol 29 (2): 325–28.

Bites and Stings of Medically Important Venomous Arthropods. Richard S. Vetter and P. Kirk Visscher. July 1998. Extract from *International Journal of Dermatology.* http://spiders.ucr.edu/dermatol.html

Morphology and adaptive value of the sting apparatus of digger wasps. Radovic, I T. *Acta entomologica Jugoslavica.* 1985. Vol 21 (1–2).

The structure of the honeybee's sting
http://website.lineone.net/~dave.cushman/stingstructure.html

Urban Entomology
http://www.insects.ucr.edu/ebeling/ebel9-2.html#the%20stinger%20of%20the%20wasp