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Apitoxin poison of honey bees (Hymenoptera: Apidae).

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Potential competing interests: No potential competing interests to declare.

The bee is a peaceful animal, but when it feels threatened it can attack. When stinging an invader, the bee deposits the stinger into a venom sac called apitoxin. This poison has a chemical component and a biological component. Venom is produced by a gland (acid or poison gland) and stored in the venom sac or reservoir. The venom gland is in the posterior region of the abdomen, between the rectum and the ovaries (Figure 1) [1-8].

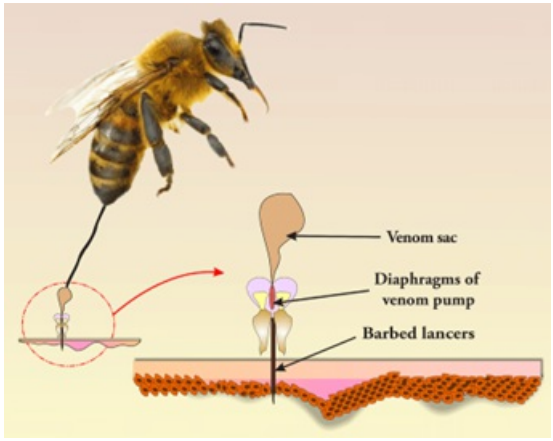

Figure 1. The unique structure of the venom delivery apparatus in honeybees makes it possible to deliver the venom even after the apparatus is being pulled out of the abdomen.

Source: https://www.researchgate.net/figure/Unique-structure-of-the-venom-delivery-apparatus-in-honeybee-makes-it-possible-to-deliver_fig1_312574312.

Histologically it is a thin excretory tubule of variable length, which can be bifurcated in the distal region and the proximal region, it presents a sac-shaped dilation called a reservoir. It is from the ages of 10 and 15 days that the acid glands of workers become more developed. This level of development drops a little in workers aged 25 and 30 days, as the peak of production needs to happen when the bee is in the guardian phase (Figure 2) [1-8].

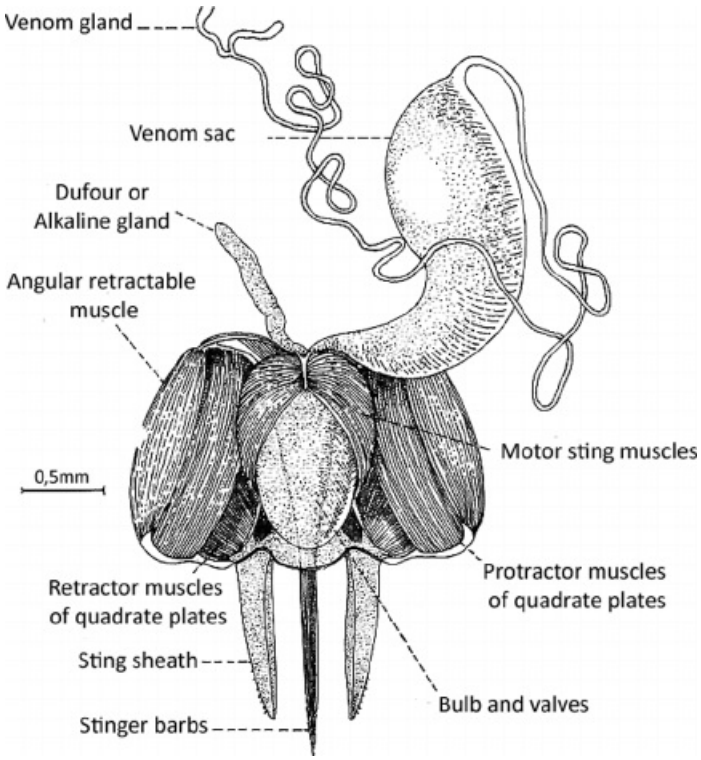

Figure 2. AHB stinger apparatus and venom gland.

Source: https://www.researchgate.net/figure/AHB-stinger-apparatus-and-venom-gland_fig4_221687351.

The venom is made up of neuromuscular blocking agents and has a powerful hemolytic action, in addition to antiarrhythmic properties. The biological component, which is based on enzymes, apitoxin, which consists of a complex mixture of nitrogenous compounds, consisting of most of the carbohydrates and lipids protein, melittin and a smaller fraction of apamins, adolapine, phospholipase A2, hyaluronidase, and peptides also has a positive factor from a health point of view. for humans, as it can be used to treat arthritis, rheumatic pain, and other circulation problems [1-8].

Apitoxin is a poison produced by the *Apis mellifera* L., 1758 (Hymenoptera: Apidae) species to protect the colony from attacks by invaders and predators Communication between bees through alarm pheromones produced by cells in the venom gland (isopentylacetate) and mandibular glands (2-heptanone) of workers. Apitoxin substances such as militin are the main component and the main pain-producing substance of bee venom. Melittin is a basic peptide composed of 26 amino acids and Apamine is a globular peptide neurotoxin of 18 amino acids found in apitoxin. Dry bee venom consists of 2-3% apamin. Apamin is an 18-amino acid globular peptide neurotoxin found in apitoxin. Dry bee venom consists of 2-3% apamin. Apamin selectively blocks SK channels, a type of Ca^{2+}-activated K^+ channel expressed in the central nervous system [1-8].

Its production as a medicine is done through electrical extraction, in which a collector of glass plates with electrical stimulators is inserted into the hive, so, when they receive a shock, the bees sting the plate, depositing a quantity of apitoxin in it. This technique has the advantage of not killing the bees in addition to extracting large quantities of apitoxin with greater purity. Beekeeping products have numerous pharmacological properties. The poison product is apitoxin. Most are done sublingually, subcutaneously with needles, injections, or even bee stings directly into the skin. The

pharmaceutical applications are vast, with treatments such as anti-inflammatory, analgesic, antitumor, healing, and neuroprotective uses for diseases such as multiple sclerosis, Alzheimer's, Parkinson's, and rheumatoid arthritis [1-8].

Apitoxin also accelerates the decrease in cholesterol content in the blood, providing a tonic effect on the heart muscle and lowering blood pressure. It is good for both strengthening the body and relieving pain. Apitoxin improves and stabilizes blood pressure, increases physical strength and well-being, reduces pain and inflammation, has an antioxidant effect, reactivates the immune system, and even helps transform acute conditions, facilitating the cure of inflammatory conditions. Apitoxin extraction activity can provide an excellent source of additional income for the beekeeper. Bee poison is, however, a product that is difficult to commercialize, as, unlike other bee products, apitoxin must be sold in compounding pharmacies and chemical processing industries, due to their toxic action (Figure 3) [1-8].

Figure 3. Bee venom powder.

Source: https://www.sciencedirect.com/topics/chemistry/bee-venom.

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