

Topic: Biting mechanism in Snakes.

B.Sc Part-I, Zoology (Hons. and Sub), Paper-II (Group A), Lecture No. 7

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Biting mechanism in Snakes:

Poison Apparatus

All the poisonous snakes have poison apparatus in their heads, which is not found in non-poisonous snakes. This apparatus includes (i) a pair of poison glands, (ii) their ducts, (iii) fangs and (iv) muscles.

- i. **Poison glands.** In poisonous snakes, two sac-like poison glands are situated one on either side of the upper jaw, below the eyes and somewhat behind them. These are possibly the modified superior labial glands or parotid glands. Each poison gland is sac-like and provided with a narrow duct at its anterior end. The poison gland is held in position by ligaments. An anterior ligament attaches the anterior end of the gland to the maxilla. A posterior ligament extends between the gland and the quadrate. Each gland is thickly encapsulated with fibrous connective tissue and mostly covered by a fan-shaped constrictor muscle, often referred to as temporal. Its stretching during biting squeezes poison from gland into its duct.
- ii. **Poison ducts.** A narrow poison duct leads anteriorly from each poison gland to the base of a poison fang to enter its groove or canal.

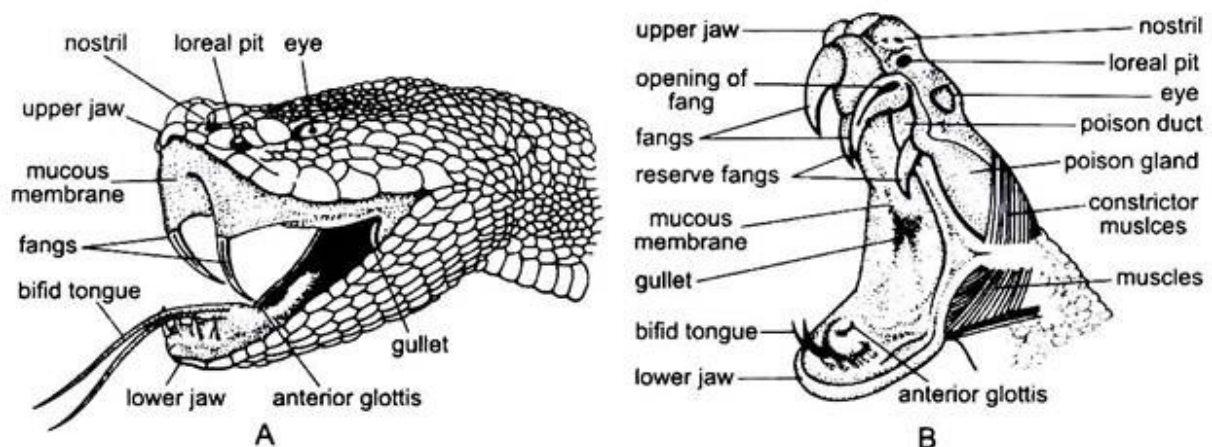


Fig. 1. Pit viper. **A**-Head of *Lachesis muta* (undissected); **B**-Head of rattle snake, *Crotalus*, dissected to show poison apparatus.

iii. **Fangs.** The fangs are certain specialized teeth attached to maxillary bones. They are long, curved, sharp, pointed and hook like, being extremely hard and calcified with a superficial enamel layer. They serve as hypodermic needles for injecting poison into the body of victim. When a functional fang is lost or damaged, it is replaced by one of the reserved fangs. On the basis of structure and position fangs can be classified into 3 types:

a) **Solenoglyphous.** In vipers and rattle snakes, a large functional fang occurs on the front of each maxilla. Its base is covered on all sides by a sheath containing a few reserve and developing fangs. The fangs are movable and turned inside to lie close to the roof of mouth when it is closed. A hollow poison canal, lined with enamel runs through the fang opening at the tip (Fig. 2).

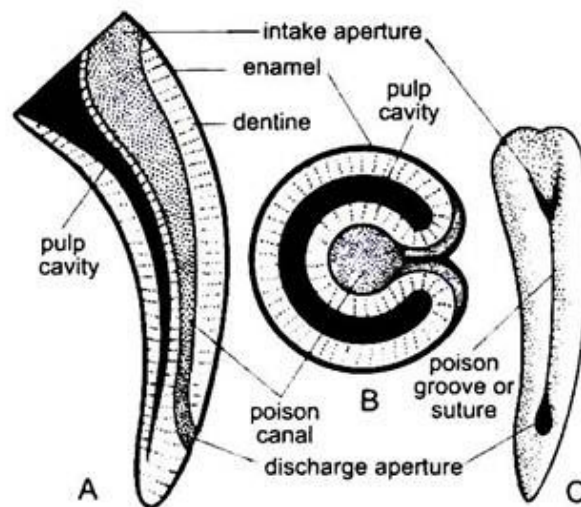


Fig. 2. Fangs. A. Solenoglyphous fang in L.S. B. Solenoglyphous fang in T.S. C. Entire grooved fang.

- b) **Proteroglyphous.** In cobras, kraits, coral snakes and sea snakes, fangs are small, at the front of maxillae and permanently erect. Each fang is groove is grooved all along in anterior face.
- c) **Opisthoglyphous.** In some poisonous snakes, in family Colubridae, fangs are small, lie at the back of maxillae and each grooved along its posterior border.

Muscles associated with snake biting mechanism:

The poison apparatus is associated with specialized bands of three types of muscles viz. i. digastrics ii. Sphenopterygoid iii, anterior and posterior temporalis.

- i. **Digastric muscle** – Attached to the squamosal of the skull at one end and articular of the lower jaw at the other end. It helps in opening jaws.
- ii. **Sphenopterygoid** – attached anteriorly to the spheroidal region and posteriorly to the dorsal surface of the pterygoid. It assists in pulling the pterygoid forward.
- iii. **Anterior and posterior temporalis** – attached to the side walls of the cranium and the lower jaw. They help in closing the lower jaw.

Biting Mechanism:

The skull and jaw bones of poisonous snakes are very flexible. They are loosely or movably articulated thus allowing a considerable degree of adjustment during the act of swallowing or striking. In cobras, the fangs are permanently erect. But in vipers, the large fangs lie against the roof of mouth when closed. Therefore, mechanism for biting serves two main purposes: (i) erection of fangs and (ii) injection of poison into the victim's body (Fig. 2).

When a viper wants to strike, a series of movements occur in a chain. Contraction of digastrics muscles lowers the mandible so that mouth opens and lower end of quadrate thrusts forward. This in turn, pushes forward the pterygoid. This is also aided by the contraction of spheno-ptyergoid muscles. The forward pull of pterygoid in turn pushes the transverse or ectopterygoid upwards. This causes, the maxilla bearing fangs to rotate through 90° at the hinge joint with lacrymal. As a result, the fangs become vertically erect and in the most effective position to strike. A simultaneous stretching of constrictor muscles around the poison gland, forces its poison through poison duct into the canal or groove of fang to be injected into the victim. When mouth is closed by the contraction of temporal muscles, the above movements are reversed. The fangs embed in the prey which is drawn into the mouth. At the same time the vertical fangs rotate to become horizontal.

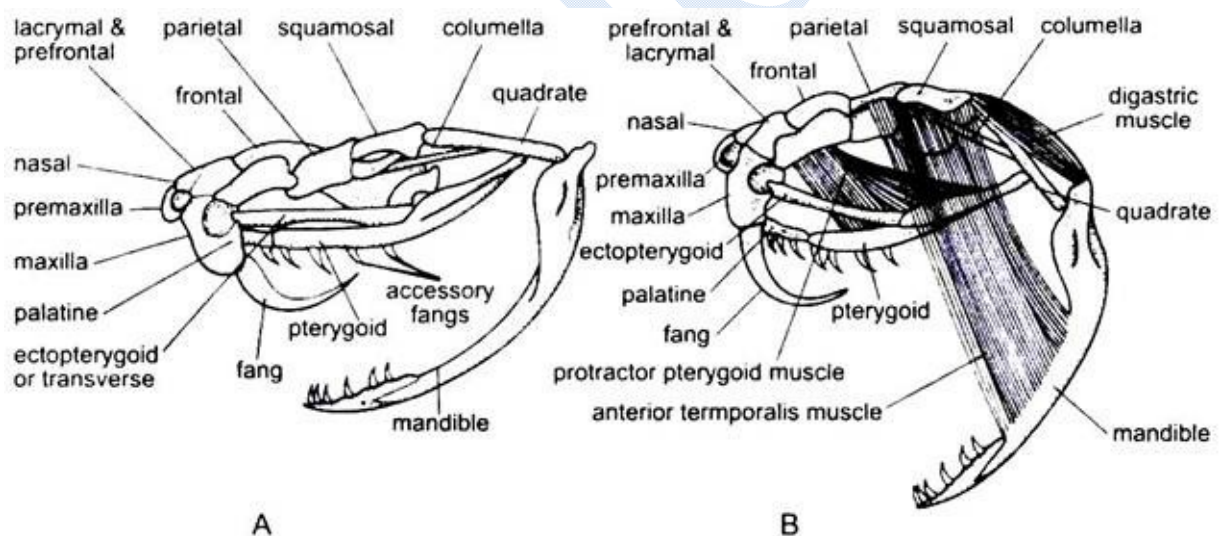


Fig. 3. Skull of a viper showing biting mechanism. **A**-Mouth closed at rest; **B**-Mouth opened when striking the prey.

Reference: Modern Textbook of Zoology Vertebrates by R. L. Kotpal