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Snake Venom : A Concise Knowledge

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ABSTRACT

There are more than 3,000 species of snakes on the planet and they're found everywhere except in Antarctica, Iceland, Ireland, Greenland, and New Zealand. About 600 species are venomous, and only about 200 seven percent are able to kill or significantly wound a human. Of the terrestrial venomous snakes, four species are widespread on the Indian mainland – also known as the "big four." They include spectacled cobra (*Naja naja*), common krait (*Bungarus caeruleus*), Russell's viper (*Daboia russelii*), and saw-scaled viper *(Echis carinatus*). Snake venom is a highly toxic saliva containing zootoxins that facilitates in the immobilization and digestion of prey. This also provides defense against threats. Snake venom is injected by unique fangs during a bite, whereas some species are also able to spit venom. simplified historical overview is that viper venoms are predominately hemorrhagic and elapid venoms neurotoxic. While this simplification holds for many species there are a number of examples of vipers causing neurotoxicity and elapids causing bleeding disturbances.

Key words: *Snake venom, snake bite, viper venom*

INTRODUCTION

Snakes are cylindrical, long, limbless and cold-blooded reptiles. Among 216 species of snakes, 52 are poisonous. It is very important to differentiate poisonous and non-poisonous snakes for many aspects such as : to be cautious against snake bite, to identify the snake in case of snake bite, to diagnose, prognoses and treat the snake bite cases. Most of the people die due to fear of snake bite rather than poison of snake. Therefore, assuring the patient before treating also plays an important role in the snake bite management.[1]

50% of venomous snake bites are dry bite. There are 5 types poisonous snakes, namely Colubridae (oviparous), Elapidae (land snakes), Hydrophidae (sea snake), Crotalidae and Viperidae (viviparous).[2]

Identification of poisonous and non-poisonous snakes plays an important role in clinical life. Sea snakes have compressed and flat tail, were as cylindrical and non-compressed tail indicates venomous or non-venomous. Small belly scales that do not cover the entire breadth of belly is non venomous. Small head scales indicate viper. Were as large shield like head scales could be venoms / non venomous.

Identification of snake based on bite mark and symptoms also plays an important role while treating the patient. Venomous snake bite is identified with two flang marks, were as all the flang marks are present in non-venomous.[3]

SNAKE VENOM

Snake venoms typically consists of mixture of 20 to more than 100 components, of which the majority (>90%) are peptides and proteins, with the dominant bio activities including neuro toxicity, haemo toxicity and cytotoxicity, depending on the snake species. Venom composition varies widely between species and even within the same species. Other factor such as environmental condition, age, sex or type of prey available can also affect venom composition.

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The venom gland represents a modified salivary gland of venomous snakes for producing and storing venom toxins. Venom glands are situated in the temporal region behind the eye. The duct with an accessory gland, muscles for squeezing the venom, and fangs for the delivery the toxic venom. The primary function venom is to immobilize the prey and also aid in the pre digestion of prey.[4] The proteroglyph venom delivery system is found in Indian cobra and the Indian common krait, while solenoglyth system occurs in Indian Russell's viper and Indian saw scale viper.

The venomous gland that secrets zootoxins are a modification of parotid salivary gland found in other vertebrates and are usually located on each side of head at below and behind the eye and enclosed in muscular sheath. Venom is stored in large glands called alveoli before it is conveyed by a duct to the base of tubular fangs through which its ejected.

Snake toxins vary greatly in their function. The two broad classifications of toxins found in snake venoms are neurotoxins and hemotoxins. Cobra and krait venom are neurotoxin whereas Russell's viper, saw scaled viper venom are hemotoxin.[5]

Snake venom toxicity is assessed by a toxicological test called Median Lethal Dose (LD_{50}), which determines the concentration of a toxin required to kill half the members of the tested population.

Mechanism of effect of neurotoxic poison in the body is rather diverse and complex. It takes about 10 minutes for the venom to affect the nervous system. Most neurotoxic are too large to cross the blood-brain barrier, and so they usually exert their effect on peripheral nervous system rather than directly on brain and nervous system. Venom targets on acetylcholinesterase. It over stimulates the post synaptic neuron and causes tetany. Dendrotoxins target K+ channels and does not let the action potential to get completed. Therefore, message transfer is mis interrupted and causes paralysis of nerves. Alpha-neurotoxins target acetylcholine receptors and causes paralysis of nerves.[6]

Hemotoxic venom causes hemolysis, induce excess blood, coagulation, result in vast internal bleeding, finally death.

Cytotoxic venom hydrolyses phospholipids, several physiological systems get affected, membrane losses its integrity and leads to rupturing of cell membrane.[7]

Discussion

Identification of snake based on bite mark, and signs and symptoms are very significant in the treatment of snake bite. Prognosis of snake bite and treatment is based on strength of the patient, age of the patient and associated symptoms. Knowing the type of venom before treating the patient is very important. Pathophysiology of neurotoxic and hemotoxic helps a practitioner to know the signs and symptoms and treat accordingly.[8] Usage of monovalent or polyvalent ASV and treatment for associated symptoms needs a deeper knowledge on snake venom.

Conclusion

The compounds of snake venom, especially complex mixture of proteins and polypeptides and enzymes are responsible for important but non-lethal biological effects. Some of the proteins in snake venom have very specific effects on various biological functions including blood co-coagulation, blood pressure regulation and transmission of nerve impulses. These venoms have been studied and developed for the use as pharmacological or diagnostic tool and even drugs.

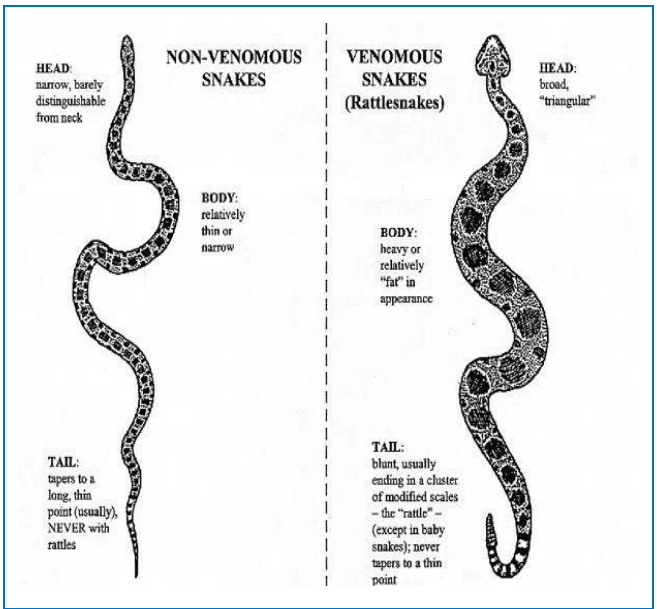

Fig. 1: Difference between venomous and non-venomous snake

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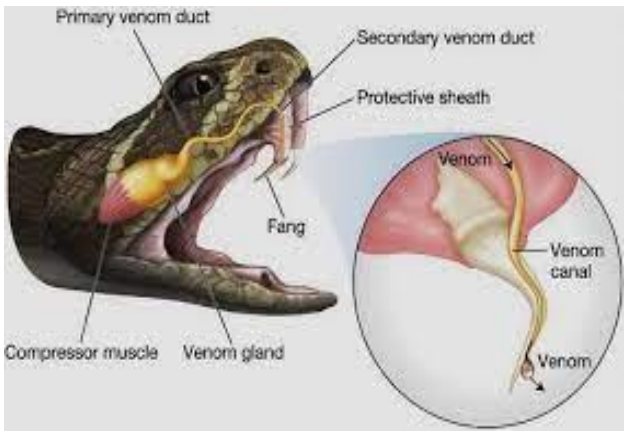

Fig. 2: Venom Apparatus

Fig. 3: Snake Venom

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