NAJA TRIPUDIANS

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Naja is a reptile found mainly in Asia and Africa. Its common name is cobra. In all there are ten species of cobras, of which seven are found in Africa, two in India and one in the Philippines. Technically, the common cobra is called *Naja naja* or *Naja tripudians.*

One of the characteristic features of the cobra is its well-developed hood, which occasionally bears one or two "spectacle marks." But the hood is formed only when the cobra is irritated or when it is about to strike. At other times, it is difficult to distinguish a cobra from other similar snakes. However, on the underside of the neck of the former there exist two or three series of nearly black belly plates, which serve to identify a dead cobra.

The cobra is a graceful and beautiful reptile when in the hood. Its color is usually ash-gray or black; but, depending upon the color of the environment, sometimes the body of a cobra may be brick-red or green. The hood presents a mixture of several colors with a preponderance of green. These latter colors are not due to some pigments; but to the reflection of the sun's rays in various fluorescent lights from the hood.

The cobra lives almost anywhere; for example, underground, gardens, fields, loose masonries, old cemeteries, living houses, holes of trees, etc. It has a liking for water; and always lives near water. Peculiarly, it also prefers to live close to a human habitation, and thus causes thousands of casualties every year.

The average length of a common cobra is about four feet; but the king cobra, *Naja bungarus,* may grow up to a length of 15 feet or more. The king cobra is found in the mountains. It is regarded as an aggressive snake, attacking a person or an animal with or without any provocation. But the common cobra is a timid snake, attacking usually under a sense of self-defense or under provocation. The common cobra lives mainly on frogs, rats and eggs; but a king cobra lives also on other snakes, including the smaller cobras.

The venom of a cobra is much more poisonous than that of a rattlesnake, 15 milligrams of it being sufficient to kill an adult person. Normally, about 400 miligrams of the venom are secreted by a cobra of an average size at one time. The amount secreted depends upon its size, age and the period following the previous use of the fangs. On the other hand, the seriousness of a bite depends upon the amount of venom injected, the body-weight of the victim and the season of the year. It is more dangerous during the hot days of summer than in winter.

So long as there is no possibility of its contact with an open wound in the skin or in the mucous membranes, like other snake venoms, the cobra venom can be swallowed with impunity. When taken in quantities much larger than a lethal biting-dose, only an unpleasant bitter taste and a dizziness are felt. These disappear, leaving no toxic effects. Because of this, it is possible to suck out the poisoned blood from a snake-bite wound without any danger.

The harmless nature of the ingested snake venom is explained by the destruction of a part of the venom in the stomach. The remaining part is believed to be excreted at a rate faster than its absorption into the system. It is, however, probable that, in Nature's effort to preserve life, the mucous membrane prevents the venom from reaching the blood by throttling the osmotic process through the membrane.

The venom of a cobra is a modified saliva with which it paralyzes its victim before swallowing. The venom helps also in digesting the victim. However, if it can somehow enter into the blood stream in sufficient quantities, the venom could be equally toxic to the cobra itself. But the venom is not a serious blood poison, and it is peculiar that the venom must come into contact with the blood in order to develop a toxic effect.

The cobra venom is a transparent fluid of a faint unpleasant odor. It has an acid reaction, and the specific gravity varies from 1.046 to 1.095. It is either colorless or is slightly yellowish. Dr. Armstrong found 45.76 per cent carbon, 14.30 per cent nitrogen, 6.60 per cent hydrogen, and 2.50 per cent sulphur in a sample of cobra venom. But its exact chemical composition has not been established as yet. It is, however, regarded as an

aqueous solution of a number of proteins. On evaporation, it is transformed into a pulverizable yellow solid, which can be preserved for a long time without an appreciable loss in toxicity.

While the toxicity of the cobra venom is unaffected at temperatures below 100°C, it is destroyed by certain chemicals like the caustic alkalies, silver nitrate, gold chloride, potassium permanganate, etc. When a solution of potassium permanganate is added to the cobra venom, the temperature rises considerably, and the physiological properties of the venom are destroyed. But potassium permanganate is an inefficient chemical to cure a cobra bite, since it can seldom be applied externally in time. Once the venom gets into the blood, the cell constituents absorb the venom tenaciously and irreversibly. To destroy the venom *in situ* by intravenous injections, the concentration of the chemical must be raised to a point where the chemical itself becomes toxic to the system. So far, no reliable chemical or *antivenin* has been found for the treatment of a cobra bite.

The cobra venom is used in the treatment of diseases of a serious nature. In the *Ayurvedic* system of medicine of India, it is long in use as a heart stimulant in cases of cardiac weakness and collapse. In the *allopathic* system of medicine, it has been advocated for use in the diagnosis of cancer by the *Farmachidis* test and in the treatment of poliomyelitis. It is used as an analgesic in incurable cancer and arthritic cases. Although such use fails to provide the desired relief in every case, sometimes a single injection of the venom relieves the pain for about a week or more.

In the *homœopathic* system of medicine, *Naja* has been used for about a century. Clinically, it is indicated in hay-fever with asthmatic breathing, aggravated by lying down or by sleeping. It has also been used in heart affections characterized by palpitations and imminent paralysis. It may be indicated in a disease where the keynote symptoms are a sensation as if the distant organs, like the ovary and the heart, are drawn together; a constrictive feeling in the throat, chest and other organs; weakness in the heart; and aggravation of symptoms on lying on the left side or after sleep. But clinically the success of *Naja* does not compare with that of *Lachesis* (bushmaster) or of

Crotalus (rattlesnake). It is believed that *Naja* has not been fully investigated as yet.

The physiological action of *Naja* differs considerably from that of *Lachesis* and *Crotalus*. *Naja* is predominantly a neurotoxic venom, whereas the other two are predominantly hemolytic. The bite of the bushmaster and of the rattlesnake is accompanied by hemorrhage and edema at the site of the wound; but the cobra bite shows no hemorrhage and, often, no swelling. The latter is also very difficult to detect with the unaided eye.

The toxic symptoms of *Naja* are somewhat similar to the symptoms of curare, the South American arrow poison used by the Indian tribes of the Amazon and Orinoco river valley. There is, however, a considerable resemblance between the action of *Naja* and that of *Gelsemium*.

When a cobra bites a person, there are stinging and burning sensations at the bitten spot, which may be red, swollen and painful. For some time there is no new symptom, and the victim is usually normal. In some cases, however, there may appear convulsions following the bite; but Gharpurey maintains that these convulsions are caused by the fright (*Gelsemium*) rather than by the venom. The period of normal condition varies from a few minutes to about an hour, with about 15 minutes in average cases. This is followed by a feeling of intoxication similar to that of alcoholic intoxication. After the development of this constitutional symptom, other symptoms of a serious nature follow in rapid succession. One of these symptoms is the paralysis of the leg muscles (*Gelsemium*). It is the most prominent of the early symptoms. The victim staggers on walking (*Gelsemium*) and falls down, if unsupported. But the arms seem to retain their use for a much longer time.

With the appearance of the constitutional symptom, the victim feels sleepy (*Gelsemium*), and the symptoms travel *upward* (*Gelsemium*). The eyelids are next paralyzed. They droop down and close the eyes completely (*Gelsemium*). The respiration increases in frequency; but the senses of sight and of hearing seem to be unaffected. Other symptoms appear quickly, but their sequence varies from individual to individual. Usually the tongue and the larynx are the next organs to be paralyzed

(*Gelsemium*). The lower jaw hangs down (*Gelsemium*), and the victim is unable to speak or to swallow because of the paralysis of the muscles of speech and deglutition (*Gelsemium*). However, the most prominent of all symptoms—not observed in *Gelsemium*—is an abundant quantity of frothy and viscid saliva which runs down the lower lip. When the quantity of the injected venom is small, salivation can be the only symptom. Nausea, retching and vomiting are also common; but they are by no means always present. Also, in many cases, the pulse and the body temperature are slightly increased.

The final picture of the symptoms is a general and complete paralysis (*Gelsemium*). The muscles may be subjected to startings and twitchings (*Gelsemium*). The respiration is now labored, but not stertorous. It gradually slows down both in frequency and in excursus until it is insufficient to support the life processes. Until his death, the victim appears to be conscious of the environment and his conditions (*Gelsemium*), although he is unable to express himself.

A cobra bite victim dies of paralysis of the respiratory centers in the medulla. If artificial respiration is resorted to, the heart can circulate the blood for hours even after the rest of the bodily functions have ceased to operate. Without artificial respiration, it is also possible to feel the action of the heart in many cases after the respiration has failed sometime before. This suggests that *Naja* has a primary *elective affinity* for the respiratory organ rather than for the heart. This is also confirmed by the observation that in cases of rapid poisoning with a large amount of the venom, instead of a gradual extinction of the functions, death is caused immediately by the restraint of the respiratory center.

When absorbed into the blood in the usual way, the venom accelerates the heart and reduces the blood pressure, both to a slight extent. However, Gottdenker and Wachstein (*J. Pharmacol.*, 1940, 69, 117) observed a rise in the blood pressure with smaller doses of the venom. Albuminuria has never been observed in any case. The blood of the victim after death is found to be fluid and non-coagulable; but the venom is not a serious blood poison. If a victim can survive the nervous

affections, he recovers naturally to a perfect health without showing any symptom of blood poisoning. Dr. Richards reports the case of one Bamon Das who was bitten by a cobra on the shoulder at 3 A.M. He complained of a feeling of intoxication, and had vomited. Although conscious, he could neither stand nor speak. By 10 A.M. the arm on the affected side became hot, painful and swollen. The eyelids drooped, but the pupils were normal and the irides responded. The sense of hearing was normal; but he could recognize people only by pushing the head backward. The lower jaw dropped, and profuse saliva ran down the lip. His speech was nasal and indistinct. When he attempted to drink water, it ran out of the nostrils. There were difficult respiration; body temperature 100·5°; pulse 96 and full; and occasional retchings. At 2:30 P.M. he passed a large quantity of urine. This was followed by the ability to speak distinctly and a gradual, but perfect, recovery with only a sloughing of the skin and flesh at the location of the wound.

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