

ABSENCE OF SALIVARY TOXIN IN CHHACHHUNDAR THE INDIAN SHREW,
SUNCUS MURINUS

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Summary: Aqueous extract of the submaxillary salivary gland of Indian shrews (*Suncus murinus*) from Delhi and Ranchi was injected intraperitoneally into mice and rats and was found non-toxic. Some less readily available information including medical history of the shrew in ancient India is also presented.

Key words: Indian shrew *Suncus murinus* salivary gland venom

INTRODUCTION

In Bihar there is a popular belief that the shrew bite is poisonous and even fatal to man and animals. In this connection it is interesting to note that bite by only one species of shrew (*Blarina brevicauda*) is known to be poisonous. Indeed, *Blarina brevicauda* and the male duck-billed platypus (*Ornithorhynchus paradoxus*) are the only two mammals which have evolved the mechanism of poisoning their victims; the former in the submaxillary salivary gland and the latter in the spur of the hind leg (9). Therefore, the effect of salivary gland extract of the Indian shrews in mice is reported here. Some less readily available information on shrews is also presented.

History: Rat bite was probably common in ancient India and was considered to be occasionally fatal. This is mentioned in all the three classical Ayurvedic texts of Charaka (about 1000 B.C.), Sushruta (about 500 B.C.) and Wagbhat (about 300 A.D.). Sushruta described the problem in great details including the observation that the bite, the scratch as well as exposure to rats semen, faeces, urine could be poisonous. He classified 18 morphological types of "rats" which included the shrew (chhuchhundar, छुचुन्दर) and, curiously enough, albino rats (महाश्वेत) It was specifically stated that shrew bite could produce thirst, fever, weakness, rigidity of neck, oedema of the back, loss of smell and severe diarrhoea.

Shrew in general: Shrews (Hindi name Chhachhundar, छुचुन्दर) which evolved about two-and-half crore (25 million) years ago belong to the Order *Insectivora* which represents the most primitive placental mammals (7,12). Incidentally all mammals except platypus and echidna are placental. Unlike the higher mammals, shrew has a common urorectal opening called cloaca and a primitively constructed brain (7).

Though not a rodent, it owes the title 'musk rat' to the musk-like odour emitted by odouriferous gland present behind each axilla and because of a slight resemblance to rats. By rendering shrews repulsive to the predators the strong odour possibly helps their survival. During the mating season, the odour increases in males and disappears in females (10). The female has bicornuate uterus with common median uterine segment and ovulates, as in rabbit, ferret and cat only after copulation (16). It is believed to have only one breeding season during the 16 month's life (7).

Shrew is nocturnal in habit and is one of the fiercest animals in existence (3). While being attacked by a diving falcon, a shrew dug its teeth through the falcon's leg bones. The attack frightened the falcon so much that it took refuge in the hedge plants and allowed itself (with the dead shrew firmly clipped on its leg) to get caught by the gardener (Bhide, personal communication, 1).

The shrew is omnivorous but prefers insects, earthworms, snakes, mice, field rats and even other shrews. Like rabbits and guinea-pigs, it usually eats its own faeces (coprophagy; 6); mammalian faeces are generally rich in some nutrients including vitamin B₁₂ though they may contain pathogenic microbes and ova. Its vision is poor but olfaction and taste considerably help in catching its prey (3,5). It is a voracious eater because, for survival it must eat, every day, food amounting to one-and-half times its body weight. Deprivation of food and water for a few hours often proves fatal (7,17) which may explain why 3 shrews caught for this work during early night were found dead in the trap within 18 hrs. In captivity they keep well on liberal feed of groundnuts, biscuits, boiled eggs and ground meat (7).

The adult Indian shrew (*Suncus murinus*) is about 6-9 inches long (including tail). In 20 shrews studied by Gopal Rao and 6 in this work, the weight ranged from 25-82 gm. It has soft fur of pale grey, ashy brown or fawn colour. Long pointed snout, depressed ears, thick, short and rapidly tapering tail and plantigrade gait usually distinguish them from rats with which they are occasionally confused. Detailed anatomy of bones, muscles, eyes and ears of the Indian shrew has been described by Sharma (11).

Incidentally the minute shrew, *Suncus etruscus* is about 1.5 inches long (without its tail), weighs about 2 gm, and is today the smallest living mammal known (12,13).

Although somewhat susceptible to the laboratory infection of plague (8), the shrews are highly resistant to the natural plague and are, therefore, considered unimportant in the spread of its epidemic (18). Probably because of their insect-eating habits and inhibitory effect on rat population, they are regarded as representatives of "Lakshmi" (Goddess of wealth) and if caught, are released by workers in rat eradication programme. This popular belief is vindicated by Plague Commission (quoted by 10) which drew attention to their usefulness in keeping away rats and mice.

When bitten by *Blarina brevicauda*, mice, field rats and invertebrates get incapacitated because of its salivary toxin. Its bite is unlikely to be fatal to man. The toxin is produced in

the submaxillary salivary gland by special granule-filled cells (9). Incidentally in snakes, the venom is secreted by parotid salivary glands. The submaxillary salivary ducts of the shrew open near the base of the lower incisor teeth. The toxin itself is a water-soluble, unstable thermolabile protein which can be extracted from the minced gland. The salivary gland extract produced transient hypotension followed by hypertension and tachycardia in anaesthetized rabbits and cats and contracted isolated ileum and uterus of guinea-pig (4).

MATERIALS AND METHODS

Four shrews (40-53 gm) were trapped on the campus of this Institute and 2 (70-82 gm) on that of Ranchi Veterinary College, Bihar. They were killed by chloroform and weighed. The submaxillary salivary glands were immediately dissected out, weighed (200-318 mg) and homogenized in distilled water in a mortar by using washed, coarse pyrex glass powder. The glass powder settled quickly and the milky suspension was promptly injected intraperitoneally into the test animals.

RESULTS AND DISCUSSION

Five mice received the extract (Delhi shrews) of 0.37—2.4 gm fresh submaxillary gland per kg body weight. They did not show any toxicity and remained healthy for 7 days. In Ranchi 2 domestic black rats were injected under light ether anaesthesia 1.7—2.0 gm fresh submaxillary gland/kg and they suffered no apparent toxicity. On the other hand, Pearson (9) found the extract of the submaxillary salivary gland of the American shrew *Blarina brevicauda* potent. Thus extract of 0.145 gm fresh gland when injected intraperitoneally per kg basis, killed more than half of his mice. The present work, therefore, suggests that the Indian shrew *Suncus murinus*, like all European and most of the American species (9), does not carry any substance in its saliva, which could produce acute toxicity in mice or rats.

It is possible that the folk-lore, (in Bihar) of the poisonous nature of shrew-bite is either unfounded or derived from ancient Ayurvedic tradition or based on occasional cases where secondary microbial infection was responsible for the clinical outcome.

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