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Scientists provide new mechanism to help develop anti-venom therapy for snake bite

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Developing strategies for topical application of antivenom or small molecule inhibitors may be a more effective alternative: Study

Scientists at the Institute of Advanced Study in Science and Technology (IASST), Guwahati, an autonomous institute of the Department of Science and Technology, in collaboration with Shemyakin-Ovchinnikov Institute of Bioorganic Chemistry, Russian Academy of Sciences, Moscow, and Amrita Vishwa Vidyapeetham, Kochi, have comprehensively discussed and traced the mechanisms of the toxic action of cobra venom, paving a path towards developing strategies for application of antivenom or small molecule inhibitors, which can help mitigate the local toxic effects of cobra venom retained at the bite site.

Snakebite envenoming is a potentially life-threatening disease caused by toxins in the bite of a venomous snake. Available data show 4.5–5.4 million people get bitten by snakes annually. Of this, 1.8–2.7 million develop clinical illness and 81000 to 138000 die from complications.

Proteomic studies from several other laboratories have demonstrated that cobra venoms are predominated by the non-enzymatic three-finger toxin family, constituting about 60-75% of the total venom. Cytotoxins (CTXs), an essential class of the non-enzymatic three-finger toxin family, are ubiquitously present in cobra venoms. These low-molecular-mass toxins, contributing to about 40 to 60% of the cobra venom proteome, play a significant role in cobra venom-induced toxicity, more prominently in dermonecrosis (local effects).

Being low-molecular-mass toxins, cobra venom CTXs induce low immune responses during the traditional production of antivenoms. Therefore, commercial antivenoms lack sufficient antibodies to neutralize these cobra venom toxins. "Due to this sub-optimal performance of commercial antivenoms against cobra venom CTXs, in-patient hospital management of local effects prevalent in cobra-envenomation is challenging and still a grave concern that requires immediate attention", said the researchers.

The researchers believe that the recent advances in molecular biology and protein engineering can significantly facilitate the solution to this problem and aid in creating highly immunogenic toxins/toxin fragments for antivenom production.