One step closer to cheaper antivenom

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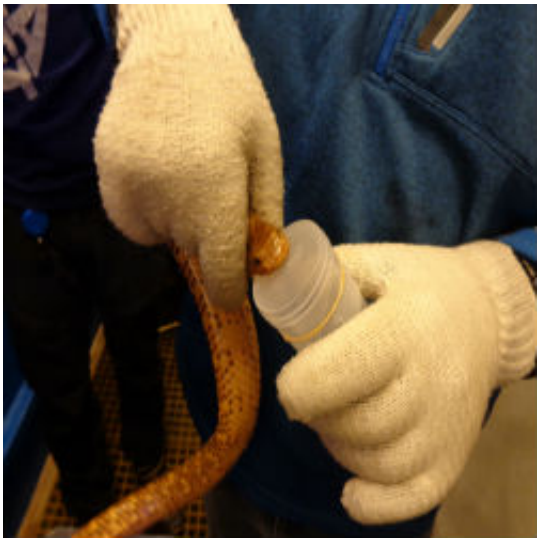

Researchers involved in an international collaboration across six institutions, including the University of Copenhagen and the National Aquarium of Denmark (Den Blå Planet), have successfully identified the exact composition of sea snake venom, which makes the future development of synthetic antivenoms more realistic. Currently, sea snake anitvenom costs nearly $2000, yet these new findings could result in a future production of synthetic antivenoms for as little as $10-100.

Venomous snakebites represent a major health concern in many tropical and subtropical countries with more than 10 million registered bites each year. In Sub-Saharan Africa alone, an estimated one million snakebites

occur annually and about half of them need treatment, many result in amputations and a significant amount result in deaths. Yet in rich, developed countries little attention is paid to victims of snakebites. It is ironic that the snake is the worldwide symbol of medicine, while the world appears to have all but forgotten about snakebites.

"People in poor countries, including fishermen at work and children playing in the ocean, are bitten, but they can't afford the antivenom and so they die. They die because it is extremely expensive, not because they cannot be saved. If we could design and synthesize simple antivenoms, producing them would be inexpensive and thus millions of lives could be saved," says Associate Professor Brian Lohse from Department of Drug Design and Pharmacology, University of Copenhagen.

Research results are published in the journal *Toxicon*.

Sea snake venom

By dissecting the venom, scientists were able to identify the individual components in the lethal cocktail of the Olive Sea Snake. Compared to other venomous snakes like the Mamba and Cobra, the Olive Sea Snake venom is remarkably simple.

"This indicates that we could actually develop a synthetic antivenom that might also be used against other sea snake venoms, because of overlapping toxins and the close homology across species. Furthermore, such antivenom would be shelf-stable and would eliminate the cold-chain (constant refrigeration), which is a highly negative factor in terms of storing current antivenoms," says Professor Lohse.

Dissecting raw sea snake venom here in the Northern Hemisphere is unique and only possible because the researchers had access to live sea snakes at Den Blå Planet and were assisted by one of the world's leading

sea snake experts, Arne Redsted Rasmussen. The talented PhD student Andreas H. Laustsen, from Professor Lohse's lab in Costa Rica, tested each component, in mice, to identify the medically most relevant target. This is a relatively new field, not least because of the development of proteomics and venomics, and lead by experts at the famous snake institute, Clodomiro Picado, in Costa Rica. Presently, there are only very few studies on sea snakes as most of the research dates back to the 1970s when there was no sophisticated precision equipment.

Antivenoms

Antivenoms are still produced by traditional animal immunization procedures, which has a number of drawbacks, such as allergic reactions, which in the worst instances end in death. Yet technological advances within biopharmaceuticals and medicinal chemistry could pave the way for rational drug design approaches to snake toxins. This could eliminate the use of animals and bring forward more effective therapies for snakebite envenoming.

"We are determined to continue this international research collaboration whereby we avoid using animals (e.g. horses) in the production of antivenom. We wish to make clean antivenoms by using state-of-the-art biotechnology, hopefully making synthetic antivenom available to all one day," Lohse concludes.

More information: www.ncbi.nlm.nih.gov/pubmed/26169672

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