

Deadly snake bites: Potential antivenom discovered

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Credit: Anton Willemann.

Amputations, deformed bones and disfigured skin. At worst, death. These are the potential consequences of a venomous snake bite.

For millions of people living in low-income countries deadly [snake](#) bites are an everyday occurrence, and the nearest health clinic or hospital can easily be hundreds of kilometers away. Add to this that the roads are

often impassable, in these parts of the world, many do not own a vehicle, and the price of [antivenom](#) can be several hundred dollars (a fieldworker makes \$1-2/day). Therefore, the World Health Organization, WHO, has classified antivenoms for venomous snake bites as an official shortage.

A [project](#) headed by Associate Professor and Project Manager Brian Lohse, Department of Drug Design and Pharmacology at the University of Copenhagen, have set out to try and change that. Brian Lohse and collaborators have just published a study proving that the concept behind their alternative antivenom strategy appears to work on e.g. Cobra venom. Furthermore, through Serpentides, a UCPH start up company, Brian Lohse and COPA have filed a national patent on a peptide which binds and neutralizes a particular type of toxin found in the venom of 75 per cent of all venomous snakes.

"We have been working on an alternative type of antivenom that is much cheaper than traditional, antibody-based antivenom. If it becomes a future product, it will fit in your pocket, and it can be used by anyone, anywhere. The idea is that it can be injected using an automatic injection unit, precisely like the ones used by diabetes patients, that is, directly into the muscle or fold of the skin at the site of the bite," Brian Lohse explains.

WHO estimates that more than 400,000 people each year suffer from serious consequences of a snake bite and 140,000 die. Among other things, this is due to the fact that antivenom is expensive and hard to gain access to for the people who need it.

Today, the only treatment available for snake bites is antibody-based antivenom, and it saves many lives each year. But the antibodies today, are produced in [live animals](#), horses for example, and this process can take up to 18 months. And as it requires several hundred venomous snakes and several hundred horses to produce enough antibodies to be

able to support the demands in a region, it is a slow and cost-intensive process. On top of this, it is hazardous for the animal keepers, who often are bitten themselves.

Once the antibody-based antivenom has been produced, it must be injected into the veins of the person who has been envenomed. This requires healthcare training, and when the nearest clinic is located far away from the place of the bite, things are likely to end in disaster, Brian Lohse explains.

"A lot of people die before they reach a place for treatment, because the snake venom is free to spread in the body for several hours or even days. Add to this the many potential side effects of the treatment and the fact that high-quality products with hardly any side effects can cost up to 2,000 dollars per dose. This creates a destructive market of poor quality counterfeits, sold as cheap antivenom medicines. These poor-quality products can cause an allergic shock that may kill the patient," he explains.

Traditional antivenom treatment is further limited by the fact that antivenom for an Indian Cobra, for instance, not necessarily work on its African Cobra-cousin. Unlike antibodies for antivenom, the Serpentides version only takes one day to synthesize and can be produced in a standard chemistry laboratory.

"Right now we are testing the stability of the active substances in our antivenom, and the tests are showing good results. Stability is important if we want people to be able to carry the product in their pocket, but also if we want to avoid the need for cooling," Brian Lohse explains.

"The fact that our potential antivenom can be used right away (in the jungle or bush) buys the patient life-saving time. When you are dealing with snake venom it is important to prevent the venom from spreading

further. Therefore, the faster you are able to neutralize it, the better are the patient's chances of survival and minimizing sequelae. nevertheless, a snake bite is a serious matter, and the patient should always go to the nearest hospital, even after having used our future Serpentes antivenom, whose main objective is to limit the spread of venom in the muscles into the veins," he says.

Brian Lohse says that he and his colleagues from the Faculty of Health and Medical Sciences (the Olsen Lab and the Pless Lab) together with a team from the Technical University of Denmark (the Dufva Lab) and collaborators from the University of Münster (the Kümmel Lab) just completed a so-called proof of concept in vitro study, which showed that these peptides can inhibit cobra venom, which is a quick-acting neurotoxin.

"Publications and patents are the easy part; we got that in the bag. Now comes the real challenges," says Brian Lohse.

More information: Timothy Lynagh et al, Peptide Inhibitors of the α -Cobratoxin–Nicotinic Acetylcholine Receptor Interaction, *Journal of Medicinal Chemistry* (2020). [DOI: 10.1021/acs.jmedchem.0c01202](https://doi.org/10.1021/acs.jmedchem.0c01202)

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