

## Cheap Nasal Spray May Save Snakebite Victims

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*AsianScientist (Jul 21, 2014)* - By Célio Yano - Snakebites are a highly neglected health problem despite causing up to 84,000 deaths a year globally—but a novel, nasal spray-based approach may help reduce the toll, according to researchers.

Currently, snakebites are treated using antivenoms designed to treat the most common deadly snakebites, which are often expensive and not always effective if not given quickly after a bite. In addition, they do not work against the bites of all venomous snake species—something that may be hard to overcome because of the different ways snakes produce venom.

But a new approach to treating snakebites in the field soon after they occur has been tested in laboratory, and its creators believe it holds hope.

A team of researchers, led by Matthew Lewin, from the California Academy of Sciences, United States, and Stephen Samuel, from Trinity College Dublin in Ireland, says a simple nasal spray containing a substance called neostigmine can reduce snakebite fatalities.

“It would be one ingredient primarily directed against rapid onset paralysis—one of the causes of fast death following snakebite,” Lewin tells SciDev.Net. “It is inexpensive and available everywhere in the world.”

If combined with atropine, a substance that is absorbed through the nose, neostigmine would have few ill effects, according to Lewin.

The team tested the nasal spray on mice injected with fatal doses of venom from the Indian cobra. Mice treated with the spray outlived those that were not given it and, in many cases, survived, according to a study they published in the *Journal of Tropical Medicine*.

Traditional snakebite treatments are injected, but this may happen too late for most victims.

More than three-quarters of snakebite victims who die in India, the country with the highest number of venomous bites and deaths, do so before they ever reach the hospital, according to the Million Death Study, one of the largest databases of premature mortality in the world. Many of them die from respiratory failure, after being paralysed by neurotoxins.

Despite some five million people being bitten by snakes every year, public health bodies generally ignore the issue, Lewin says.

“It’s ironic that virtually every medical organisation has a snake on its flag or badge, but no

ability to treat it in the field,” he says.

Sakthivel Vaiyapuri, one of the authors of the study from the University of Reading, United Kingdom, recently did a separate survey on snakebite victims in Tamil Nadu, India.

“It mainly affects poor farmers living in remote rural villages,” Vaiyapuri says.

According to the WHO, which only recognised snakebites as a neglected tropical condition in 2009, the problem is greatest in South Asia, South-East Asia and Sub-Saharan Africa.

### **Antivenom alternative**

The nasally administrated drug is an alternative to antivenoms, Lewin says. He argues that, besides being expensive, antivenoms can vary in effectiveness depending on factors including the snake’s diet, the time of year and the geographic location.

Furthermore, a paper published in the *Proceedings of the National Academy of Sciences* last month reports that it may be harder than originally thought to develop an antivenom that works against many snakebites.

“We discovered that the genetics of the animals can be very similar, yet their venoms very different,” the lead author, Nicholas Casewell, from Liverpool School of Tropical Medicine, United Kingdom, tells SciDev.Net.

Using six related snakes—the Saharan horned viper, the puff adder and four species of saw-scaled vipers—Casewell and colleagues discovered that various genetic regulatory processes act at different stages of toxin production.

“These processes result in major differences in toxin composition, and these different toxins cause different pathologies or levels of toxicity when they are injected, and they also undermine antivenom treatment,” says Casewell.

According to Casewell, there are about 500 species of dangerous, venomous snakes worldwide.

### **Fast treatment**

“Antivenom is necessary, but not sufficient to manage this problem,” Lewin says. “Its limitations are fairly well known at this point and we need a better bridge to survival.”

The nasal spray could be a cheap, fast and easy method to treat the paralysis caused by snakebites, he adds.

In 2013, to see if neostigmine could be absorbed through the human nose, Lewin tried the spray on himself, after being infused with a drug to induce awake paralysis in a manner similar to cobra venom. He made a completely recovery in a little over two hours, as described in *Clinical Case Reports*. Clinical trials of the spray are now planned in India.

Developing inexpensive, heat-stable and easy-to-administer antiparalytics could facilitate early treatment of snakebite and save lives, Lewin and his colleagues argue in the paper.

“Doing so would make a profound difference in the health of millions,” Lewin says.

For Casewell, the new approach looks promising.

“Any treatment that provides the patient with more time before symptoms occur, would be beneficial,” he says. “However, it remains to be seen how many different species this would be useful for.”

The articles can be found at:

[Lewin et al. \(2014\) Early Treatment with Intranasal Neostigmine Reduces Mortality in a Mouse Model of \*Naja naja\* \(Indian Cobra\) Envenomation.](#)

[Casewell et al. \(2014\) Medically Important Differences in Snake Venom Composition are Dictated by Distinct Postgenomic Mechanisms.](#)

[Lewin et al. \(2014\) Reversal of Experimental Paralysis in a Human by Intranasal Neostigmine Aerosol Suggests a Novel Approach to the Early Treatment of Neurotoxic Envenomation.](#)

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