

Easily administered nasal spray offers hope for millions of snakebite victims

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A group of scientists led by researchers from the California Academy of Sciences and Trinity College Dublin have taken a promising step towards the development of a universal antidote for snakebite. Their research may lead the way to providing a fast, accessible and easy way to administer treatment and increase survival rates in victims of venomous snakebites.

The scientific team, led by Dr Matthew Lewin, Director of the Center for Exploration and Travel Health at the Academy and Dr Stephen P. Samuel, a Visiting Research Fellow in the Nanomedicine and Molecular Imaging Group in the School of Medicine, Trinity, examined the use of a nasally administered common hospital drug, neostigmine, on mice injected with high doses of Indian cobra venom. Mice injected with otherwise fatal doses of venom outlived those that didn't receive the treatment and in many cases survived after being treated with the antiparalytic agent, neostigmine. The results of the research were recently published in the *Journal of Tropical Medicine*.

Almost 5 million people are bitten by snakes each year with between 94,000 to 125,000 deaths occurring as a result. Global fatalities are up to 30 times that of land mines and in India alone snakes kill approximately a third as many people as AIDS and severely injure many more. Traditionally, the international treatment for neurotoxic snakebites is with antivenom, administered in a hospital via injection, and/or the WHO recommended neostigmine, also administered via injection. However, the vast majority of snakebites occur in impoverished, rural



populations with limited access to medical treatment and it has been estimated that more than 75 percent of snakebite victims who die do so before they ever reach the hospital, predominantly because there is no easy way to treat them in the field.

For those who do manage to receive successful treatment, studies have shown that the costs of hospital treatment can cause economic ruin for the individual and their family with many patients reporting taking loans, removing their children from school and incurring up to 12 years income worth of debt.

Speaking about the significance of these findings, in particular for those most affected by snakebites, Dr Samuel said: "Our approach towards developing a point-of-care treatment will give victims much needed time to reach the hospital, while reducing cost of treatment. This would make a profound difference in the health of millions. In the future, patients from impoverished areas should not have to take loans, sell their valuables or deny education to their children for want of better treatment as recently described by Dr Sakthivel Vaiyapuri of Reading University."

Dr Vaiyapuri, one of the world's expert on viper venoms is also an author on the paper and did the epidemiological groundwork proving the depth of the problem.

Dr Samuel continued: "This is the first promising step towards development of a universal antidote for snake bites. We urge global health leaders to accelerate the development of affordable, innovative treatments for snakebite."

Closer to home, various scientific papers have reported on the newly recognised, developing presence of neurotoxic venom from adders in the UK and Balkan vipers in Europe. Within the UK and Europe one of the traditional treatments is antivenom, however, the study's researchers



commented that although they are seeking a universal antidote, the nasal inhaler treatment could be appropriate for trials in cases such as those occurring in Europe where vipers are native. A study published in the *BMJ* also noted the existence of large numbers of dangerous snakes in the UK and Ireland which are kept as pets and which occasionally result in people getting bitten. Because of the wide variety of exotic pets kept, quickly identifying the animal and the correct antivenom can be a challenge.

In 2011, Dr Lewin started exploring the idea of a quick and easy to administer treatment which could shorten time to treatment and save lives. Together with Dr Samuel and their colleagues, they began investigating a neostigmine <u>nasal spray</u> which had been used, experimentally, decades ago for an uncommon neuromuscular disease. They first tested its potential efficacy against the paralysing effects of neurotoxic snakebites through an experiment with a healthy human volunteer who was paralysed, while awake, using a toxin that mimics the effects of the venom of cobras and other snakes that disable their victims by paralysis. The experimental paralysis progressed from eye muscle weakness to respiratory distress in the same order typically seen in snakebite victims. The team then administered the nasal spray and within 20 minutes the patient had recovered.

Dr Samuel, along with Dr C. Soundara Raj, and colleagues at TCR Multispeciality Hospital in Krishnagiri, Tamil Nadu, India, also tested the nasal spray treatment on a snakebite victim in a hospital in India. After receiving 30 vials of antivenom, the standard treatment for venomous snakebites, the female patient remained weak and suffered from facial paralysis. Within 30 minutes of <u>treatment</u> with the antiparalytic nasal spray, the patient's facial paralysis was reversed. Two weeks after being treated, the patient reported having returned to her daily activities.



Dr Lewin, Director of the Center for Exploration and Travel Health at the Academy said: "Ninety-eight percent of snakebite victims live in poverty, which is perhaps why funding and innovation are lacking. The bottom line is that no one should die from a snake bite in the twenty-first century, and we're optimistic about this promising step."

More information: The paper is available online: <u>www.hindawi.com/journals/jtm/2014/131835/</u>

Provided by Trinity College Dublin

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