Scientists invent animal-free testing of lethal neurotoxins

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A temple pit viper from Gombak Valley, Malaysia. Credit: Scientistchic

Animal testing will no longer be required to assess a group of deadly neurotoxins, thanks to University of Queensland-led research.

Associate Professor Bryan Fry, of UQ's Venom Evolution Lab, said a new technique could replace conventional methods of testing paralytic neurotoxins, which previously required euthanasia of test subjects.

"The old method, while extremely efficient, is limited in that it's slow and requires the euthanisation of animals in order to obtain the necessary

tissue," Dr. Fry said.

"Our new method uses optical probes dipped into a solution containing the venoms and we measure the binding to these probes—the critical factor—by analysing changes in the light reflected back.

"It's going to reduce the numbers of animals used for research testing, but it also has significant biomedical implications."

Testing and trialling paralytic neurotoxins is not only critical for research into anti-venoms, but also for the treatment of a wide array of diseases and conditions.

"The team can now—without the use of animal subjects—screen venoms for non-target activities that may be relevant for drug design and development, helping treat all types of ailments," Dr. Fry said.

"For example, we've showed that temple pit viper venom has an unusual cross-reactivity for the human alpha-5 receptor, which is a major target for conditions including colitis and smoking.

"Who knows what other potential treatments the world's venoms could lead to—we're excited to find out."

The technology relies on the development of synthetic peptides that correspond to nerve receptors, which tell our muscles to contract.

"Neurotoxins, found in the venom of many types of snakes, cause paralysis by attaching to nerve receptors in our muscles, preventing the normal chemical binding process that naturally occurs in our bodies when we want to move," Dr. Fry said.

"This is what stops a mouse fleeing from a snake after it has been bitten.

"Since venoms bind to the synthetic peptides more vigorously than they do to human nerves, we're also investigating a new treatment of snakebite, using these peptides as 'decoys'.

"The venom would bind to them instead of their original nervous system target in the human body.

"Many species of deadly snake lack an effective anti-venom, so these sorts of applications may help meet this critical need.

"This underscores the flexibility of this novel technique and why we're so excited about this breakthrough."

The research has been published in *Toxins*.

More information: Christina N. Zdenek et al. A Taxon-Specific and High-Throughput Method for Measuring Ligand Binding to Nicotinic Acetylcholine Receptors, *Toxins* (2019). DOI: 10.3390/toxins11100600

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