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Scientists from India, US design synthetic human antibody to neutralise deadly snakebite toxin

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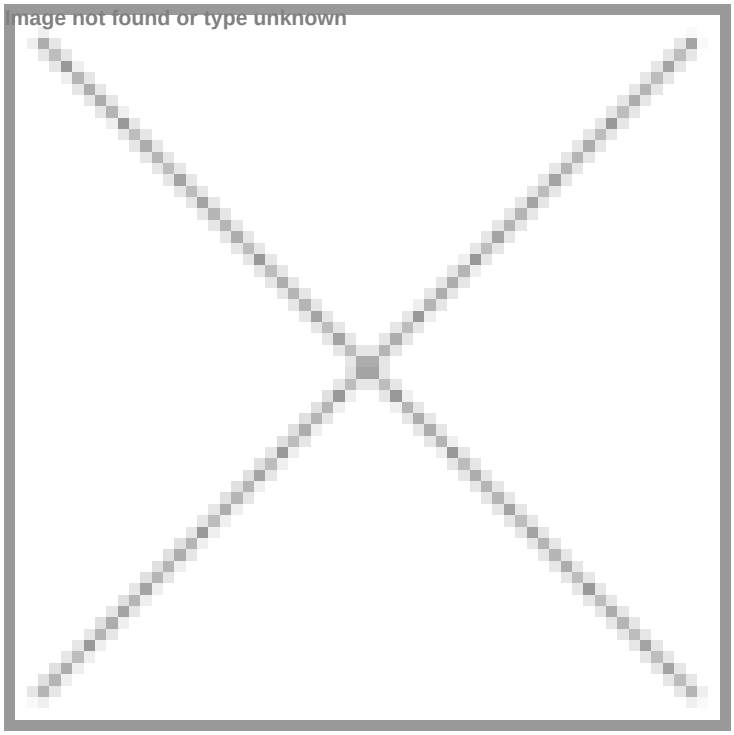

Scientists at the Scripps Research Institute (in the US) and the Evolutionary Venomics Lab (EVL) at the Centre for Ecological Sciences (CES), Indian Institute of Science (IISc), Bengaluru have developed a synthetic human antibody that can neutralise a potent neurotoxin produced by the Elapidae family of highly toxic snakes, which includes the cobra, king cobra, krait and black mamba.

The team adapted an approach used earlier to screen for antibodies against HIV and COVID-19 in order to synthesise the new venom-neutralising antibody.

The researchers say that this development takes us one step closer to a universal antibody solution that can offer broad protection against a variety of snake venoms. Snakebites cause thousands of deaths every year, especially in India and sub-Saharan Africa.

The antibody developed by the team targets a conserved region found in the core of a major toxin called the three-finger toxin (3FTx) in the elapid venom. Although different species of elapids produce different 3FTxs, a handful of regions in the protein are similar. The team zeroed in on one such conserved region, a disulphide core.

They designed a large library of artificial antibodies from humans, which were displayed on yeast cell surfaces. They then tested the antibodies' ability to bind to 3FTxs from various elapid snakes around the world. After repeated screening, they narrowed down their choices to one antibody that could bind strongly to various 3FTxs. Among the 149 variants of 3FTxs in public repositories, this antibody could bind to 99.

The researchers used human-derived cell lines to produce the antibody, bypassing the need to inject the venom first into animals like horses.

"At this stage, a clinician cannot rely on this single antibody for treatment as this is only effective against certain elapid snakes. We are in the process of discovering additional antibodies against other snake venom toxin targets. A universal antivenom in future would consist of a couple of such synthetic antibodies that would hopefully neutralise venoms of most snakes in various parts of the world. A universal product, or at least a cocktail of antibodies that work pan-India, could then be taken to human clinical trials", said the researchers.