Novel Toxins from a Rare Snake

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When most people think of venomous snakes, they only think of harmful effects or deadly, slithering animals such as the cobra. In reality, snake venom research has helped humanity in countless ways—and the potential for more is huge. Pharmaceutical drugs and research tools for understanding human physiology have been developed based on the outcomes of snake venom research.

The venoms of some potentially harmful species of snakes have been examined for decades now, and some of their specific components have been thoroughly analyzed. However, there are many species of snakes in which the understanding of their venom is either rudimentary or completely unknown. This is likely because many species of snakes do not come into contact with or cause harm to humans. Some of these venoms may hold the vast treasures of unique toxins.

As an example of such possibilities, researchers in the Department of Biological Sciences at the National University of Singapore have recently examined the venom of a rare species of elapid (related to cobras and kraits) snake from Australia. The White-lipped Snake (*Drysdalia coronoides*) has not been documented to have ever envenomated a human, although it is related to many potentially harmful Australian snakes.

Recently-graduated Ph.D. student Dr. Shifali Chatrath, working under the supervision of Prof. R. Manjunatha Kini and Prof. Prakash P. Kumar, along with collaborators in the department and abroad, used two complementary approaches to characterize venom composition. The venom and venom gland tissue from a specimen captured in Australia were used to examine both the proteomics (the types of proteins) and transcriptomics (the genes potentially producing these proteins) of *D. coronoides*. This dual approach was necessary to determine the full range of components in the venom and led to a wider range of discovered proteins.

The venom was found to contain proteins from eight different snake venom protein families, indicating a diverse array of potential physiological actions in the snake's prey. Seven of these families such as three-finger toxins, serine protease inhibitors, cysteine-rich secretory proteins, phospholipases A_2, nerve growth factors, metalloproteinases, and vespryns, are well-documented in snake venoms. The eight family of phospholipase B (PLB) has not previously seen in snake venoms. In addition, we also identified three unique toxins in the family of three-finger toxins. This diversity gives only a small glimpse into the wide range of compounds yet to be discovered in nature. This research adds to our growing knowledge of snake venom toxins and highlights the need for further research into this fascinating field.

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