Discovery of Peptide-Based Antitoxins against Neurotoxins from Green and Black Mamba (Dendroaspis Family)

Globally, more than 5.5 million people are bitten by venomous snakes every year, leading to an estimated 125,000 deaths and 3 times as many amputations. The problem is most prevalent in Sub-Saharan Africa where affordability of antivenom is low, resulting in only 2% of snakebite victims receiving treatment. Since the introduction of antivenoms in the 1890's, only modest advances in antivenom technology and production have been made. Current antivenoms are, therefore, still being produced by immunisation of large ruminants, typically horses, with snake venoms and subsequently bleeding them to collect blood comprising venom-specific antibodies [4]. The incompatibility of these antivenoms with the human immune system can lead to serious adverse effects. A novel approach is needed in order to introduce safer, cheaper and more efficacious antivenoms that are compatible with the human immune system to the market.

Figure 2: Phage display is a screening technique whereby peptides are displayed on the surface of bacteriophages, some of which bind with high affinity to snake toxins that are attached to plate wells. We attempt to discover cross-reactive, peptide-based antitoxins against the structurally similar dendrotoxins α-dendrotoxin (α-Dtx, UniProtKB:00980), isolated from Dendroaspis angusticeps (Green mamba), and dendrotoxin I (Dtx I, UniProtKB:00979) from Dendroaspis polyplepis (Black mamba) by phage display [5,6]. Cross-reactive antitoxins with the ability to neutralise several toxins are of interest to antivenom development, since only a few cross-reactive antitoxins would be needed to neutralise a complete snake venom.

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State: Published
Organisations: Department of Systems Biology, Center for Biological Sequence Analysis, Network Engineering of Eukaryotic Cell Factories, Technical University of Denmark, University of Copenhagen
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Number of pages: 1
Publication date: 2014
Peer-reviewed: Yes
Event: Poster session presented at GRØN DYST, Lyngby Campus, Denmark.
Electronic versions:
Discovery_of_Peptide_Based_Antitoxins_against_Neurotoxins_from_Green_and_Black_Mamba_Dendroaspis_Family_.pdf
Research output: Research - peer-review - Poster – Annual report year: 2014