Accepted Manuscript

Title: Synergistic Strategies of Predominant Toxins in Snake Venoms

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 PII:
 S0378-4274(18)30041-9

 DOI:
 https://doi.org/10.1016/j.toxlet.2018.02.004

 Reference:
 TOXLET 10092

To appear in: *Toxicology Letters*

 Received date:
 3-12-2017

 Revised date:
 17-1-2018

 Accepted date:
 3-2-2018



Please cite this article as: Xiong, Shengwei, Huang, Chunhong, Synergistic Strategies of Predominant Toxins in Snake Venoms.Toxicology Letters https://doi.org/10.1016/j.toxlet.2018.02.004

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Synergistic Strategies of Predominant Toxins in Snake Venoms

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Highlights:

- SvPLA₂s, 3FTxs, SVMPs and SVSPs are the predominant toxins in snake venoms;
- The predominant toxins play essential roles in synergistic processes.
- The synergistic mechanisms can be generalized under the effect of amplification and chaperoning.

Abstract

Synergism is a significant phenomenon present in snake venoms that may be an evolving strategy to potentiate toxicities. Synergism exists between different toxins or toxin complexes in various snake venoms, with phospholipaseA₂s (PLA₂s) (toxins or subunits) the main enablers. The predominant toxins, snake venom PLA₂s, metalloproteases (SVMPs), serine proteases (SVSPs) and three-finger toxins (3FTxs), play essential roles in synergistic processes. The hypothetical mechanisms of synergistic effect can be generalized under the effects of amplification and chaperoning. The Toxicity Score is among the few quantitative methods to assess synergism. Selection of toxins involved in synergistically enhanced toxicity as the targets are important for development of novel antivenoms or inhibitors.

Keywords: Synergism; predominant toxins; synergistic mechanisms; antivenom development;

1.Introduction

Snake venoms are dangerous cocktails consisting of bioactive molecules that immobilize and digest prey, and act as a defense against competitors and natural predators [1]. Historically, snake venom research has involved a reductionist approach. This has been a necessity because isolation and characterization of individual toxins has been the only feasible option to clarify the mechanism underlying the complex pathological state induced by snake venoms. There has been a tendency to ignore the fact that snake venoms are integrated multicomponent systems [2, 3]. A largely neglected aspect in the characterization of venom toxicity profiles is the evaluation of potential synergisms that may exist between their various components. When the joint effect is greater than the sum of their individual potencies, the combination is described as synergistic[4, 5]. This potentially allows snake venoms to reach a significant efficiency with only a trace amount of venom. Some literature reports have described synergism amongst the toxin constituents of snake venoms. For instance, none of the fractions of *Dendroaspis angusticeps* venom were lethal to mice

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