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A biochemical and pharmacological characterization of phospholipase a 2 and metalloproteinase fractions from eastern russell's viper (Daboia siamensis) venom: Two major components associated with acute kidney injury

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Abstract

Author keywords

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Abstract

Acute kidney injury (AKI) following Eastern Russell's viper (Daboia siamensis) envenoming is a significant symptom in systemically envenomed victims. A number of venom components have been identified as causing the nephrotoxicity which leads to AKI. However, the precise mechanism of nephrotoxicity caused by these toxins is still unclear. In the present study, we purified two proteins from D. siamensis venom, namely $RvPLA_2$ and RvMP. Protein identification using LCMS/MS con-firmed the identity of $RvPLA_2$ to be snake venom phospholipase A_2 ($SVPLA_2$) from Thai D. siamensis venom, whereas RvMP exhibited the presence of a factor X activator with two subunits. In vitro and in vivo pharmacological studies demonstrated myotoxicity and histopathological changes of kidney, heart, and spleen. $RvPLA_2$ (3–10 µg/mL) caused inhibition of direct twitches of the chick biventer cervicis muscle preparation. After administration of $RvPLA_2$ or RvMP (300 µg/kg, i.p.) for 24 h, diffuse glomerular congestion and tubular injury with minor loss of brush border were detected in envenomed mice. $RvPLA_2$ and RvMP (300 µg/kg; i.p.) also induced congestion and tissue inflammation of heart muscle as well as diffuse congestion of mouse spleen. This study showed the significant roles of PLA_2 and SVMP in snake bite envenoming caused by Thai D. siamensis and their similarities with observed clinical manifestations in envenomed victims. This study also indicated that there is a need to reevaluate the current treatment strategies for Thai D. siamensis envenoming, given the potential for irreversible nephrotoxicity. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.

Author keywords

Kidney; Myotoxicity; Nephrotoxicity; Phospholipase A_2; Russell's viper; Venom

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