Back to results | 1 of 1

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In Vitro neurotoxicity and myotoxicity of Malaysian Naja sumatrana and Naja kaouthia venoms : Neutralization by monovalent and Neuro Polyvalent Antivenoms from Thailand

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Metrics

Abstract

Naja sumatrana and Naja kaouthia are medically important elapids species found in Southeast Asia. Snake bite envenoming caused by these species may lead to morbidity or mortality if not treated with the appropriate antivenom. In this study, the in vitro neurotoxic and myotoxic effects N. sumatrana and N. kaouthia venoms from Malaysian specimens were assessed and compared. In addition, the neutralizing capability of Cobra Antivenom (CAV), King Cobra Antivenom (KCAV) and Neuro Polyvalent Antivenom (NPAV) from Thailand were compared. Both venoms produced concentration-dependent neurotoxic and myotoxic effects in the chick biventer cervicis nerve-muscle preparation. Based on the time to cause 90% inhibition of twitches (i.e. t90) N. kaouthia venom displayed more potent neurotoxic and myotoxic effects than N. sumatrana venom . All three of the antivenoms significantly attenuated venom-induced twitch reduction of indirectly stimulated tissues when added prior to venom . When added after N. sumatrana venom , at the t90 time point, CAV and NPAV partially restored the twitch height but has no significant effect on the reduction in twitch height caused by N. kaouthia venom . The addition of KCAV, at the t90 time point, did not reverse the attenuation of indirectly stimulated twitches caused by either venom . In addition, none of the antivenoms, when added prior to venom , prevented attenuation of directly stimulated twitches. Differences in the capability of antivenoms, especially NPAV and CAV, to reverse neurotoxicity and myotoxicity indicate that there is a need to isolate and characterize neurotoxins and myotoxins from Malaysian N. kaouthia and N. sumatrana venoms to improve neutralization capability of the antivenoms.

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