Cross neutralisation of Southeast Asian cobra and krait venoms by Indian polyvalent antivenoms

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ABSTRACT

Cross neutralisation of venoms by antivenom raised against closely-related species has been well documented. The spectrum of parascpecific protection of antivenom raised against Asiatic Naja and Bungarus (krait) venoms, however, has not been fully investigated. In this study, we examined the cross neutralisation of venoms from common Southeast Asian cobras and kraits by two widely used polyvalent antivenoms produced in India: Vins polyvalent antivenom (VPAV) and Bharat polyvalent antivenom (BPAV), using both in vitro and in vivo mouse protection assays. BPAV was only moderately effective against venoms of N. kaouthia (Thailand) and N. sumatrana, and either very weakly effective or totally ineffective against the other cobra and krait venoms. VPAV, on the other hand, neutralised effectively all the Southeast Asian Naja venoms tested, as well as N. naja, B. candidus and Ophiophagus hannah venoms, but the potency ranges from effective to weakly effective. In an in vivo rodent model, VPAV also neutralised the lethality of venoms from Asiatic Naja and B. candidus. In anaesthetised rat studies, both antivenoms effectively protected against the N. kaouthia venom-induced cardio-respiratory depressant and neuromuscular blocking effects. Overall, our results suggest that VPAV could be used as alternative antivenom for the treatment of elapid envenomation in Southeast Asian regions including Malaysia, Thailand and certain regions of Indonesia.

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1. Introduction

Snake envenomations have been a serious yet often overlooked public health threat especially in tropical and subtropical countries, including Southeast Asia. 1,2 The medically important venomous land snakes in Southeast Asia include snakes from the Elapidae and Crotalidae families. Among the elapids, there are only 11 species that are considered as medically important, represented by the Asiatic cobras (including Naja kaouthia, N. sumatrana, N. siamensis, N. sputatrix, N. philippinensis and N. atra), the king cobra (Ophiophagus hannah) and the kraits (Bungarus candidus, B. fasciatus, B. flaviceps and B. multicinctus). 2

Antivenom is the only proven effective treatment for snake envenomation. 4 Many nations in Southeast Asia (with the possible exception of Thailand) however, either do not produce or do not have the supply of monovalent antivenoms against all the medically important venomous snakes found in the country. It will not be economically practical for each nation in Southeast Asia to produce its own monospecific antivenoms against all the relevant medically important venomous snakes. Furthermore, differential diagnosis of biting species is often impractical in Southeast Asia because of cost, and therefore polyvalent antivenoms are preferred over monovalent antivenoms in snakebite treatment. In view of this, the Global Snakebite Initiative (2011) has recently proposed the development