Short communication

Nephrotoxicity of hump-nosed pit viper (Hypnale hypnale) venom in mice is preventable by the paraspecific Hemato polyvalent antivenom (HPA)

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ABSTRACT

Mice experimentally envenomed with Hypnale hypnale venom (1× and 1.5× LD50) developed acute kidney injury (AKI) principally characterized by raised blood urea and creatinine. Prolonged blood clotting time and hemorrhage in lungs implied bleeding tendency. Pallor noted in most renal cortices was suggestive of renal ischemia secondary to consumptive coagulopathy. Intravenous infusion of Hemato polyvalent antivenom following experimental envenoming effectively prevented death and AKI in all mice, supporting its potential therapeutic use in envenoming cases.

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Bites by hump-nosed pit vipers (Hypnale hypnale) have been identified as a leading and potentially fatal cause of snake envenomation in Sri Lanka as well as southwestern region of India (Kerala) (Ariaratnam et al., 2008; Joseph et al., 2007). The majority (90%) of envenomed patients suffered from local tissue damages, e.g., hemorrhagic blistering and extensive tissue necrosis, while approximately 40% of them developed concurrent systemic syndrome characterized by hemostatic derangement. Acute kidney injury (AKI), a severe systemic complication associated with the bite, was responsible for most deaths with an overall fatality rate of 1.8%, even though it occurred infrequently (10% of total bite cases, n = 302) (de Silva et al., 1994; Ariaratnam et al., 2008). The mechanism of kidney injury by H. hypnale venom was postulated to be a complication of consumptive coagulopathy secondary to the venom’s procoagulant and fibrinolytic actions (Kanjanabuch and Sitprija, 2008), and the venom at a sublethal dose (1/3 intramuscular LD50) did not appear to induce direct kidney damage in a rat model (Tan et al., 2011b). Nevertheless, in view of the venom’s prominent proteolytic and cytotoxic activities (Tan et al., 2011b; Maduwage et al., 2011), a direct tissue-damaging effect on the kidney or indirect immunological responses induced by the venom at higher doses cannot be completely ruled out.

Although antivenom is the definite treatment for snakebite envenoming (Chippaux and Goyffon, 1998), there are currently no effective antivenoms clinically available to treat H. hypnale envenoming. A paraspecific antivenom (Hemato polyvalent antivenom, HPA, raised against venoms of Thai Calloselasma rhodostoma, Cryptelytrops albolarbis and Daboia siamensis), previously shown effective to neutralize the venom’s hemotoxic, necrotic and lethal effects in mice (Tan et al., 2011a), is nonetheless a potential therapeutic treatment for the endemic medical urgency.