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Factor X activating *Atractaspis* snake venoms and the relative coagulotoxicity neutralising efficacy of African antivenoms

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Highlights

- Atractaspis venoms were shown to have potent procoagulant effects
- Antivenom efficacy was shown to be poor for all available African antivenoms.

Abstract

Atractaspis snake species are enigmatic in their natural history, and venom effects are correspondingly poorly described. Bite reports are scarce but bites have been described as causing severe hypertension, profound local tissue damage leading to amputation, and deaths are on record. Clinical descriptions have largely concentrated upon tissue effects, and research efforts have focused upon the blood-pressure affecting sarafotoxins. However, coagulation disturbances suggestive of procoagulant functions have been reported in some clinical cases, yet this aspect has been uninvestigated. We used a suite of assays to investigate the coagulotoxic effects of venoms from six different *Atractaspis* specimens from central Africa. The procoagulant function of factor X activation was revealed, as was the pseudo-procoagulant function of direct cleavage of fibrinogen into weak clots. The relative neutralization efficacy of South African Antivenom Producer's antivenoms on *Atractaspis* venoms were boomslang>>>polyvalent>saw-scaled viper. While the boomslang antivenom was the most effective on *Atractaspis* venoms, the ability to neutralize the most potent *Atractaspis* species in this study was up to 4-6 times less effective than boomslang antivenom neutralizes boomslang venom. Therefore, while these results suggest cross-reactivity of boomslang antivenom with the unexpectedly potent coagulotoxic effects of *Atractaspis* venoms, a considerable amount of this rare antivenom may be needed. This report thus reveals potent venom actions upon blood coagulation that may lead to severe clinical effects with limited management strategies.

Keywords: venom; antivenom; coagulopathy; thrombin; fibrinogen; snake.