What's Eating You? The South African Fattail Scorpion (*Parabuthus transvaalicus*)

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Parabuthus transvaalicus is one of the most dangerous scorpions in the world. It is found in southern Africa, including South Africa, Botswana, Mozambique, and Zimbabwe, where it favors hot dry deserts and scrublands. It also can be found in semiarid regions. The species commonly hides in burrows or under stones or logs. Despite its limited geographic distribution, the scorpion is of worldwide significance because it has been found in pet collections in the United States and Europe. Needless to say, because this is a highly toxic species, I do not recommend it as a pet.

P transvaalicus is one of the largest members of the family Buthidae and can attain lengths of 15 cm. Adults are dark blackish brown, with reddish-brown pincers (Figure). Its small slender pedipals (pincers) and legs are somewhat lighter in color. Although the tail (telson) is thick and square, it has no subacular tooth (unlike *Centruroides* scorpions).

Other related dangerous scorpions in this region of the world include *Parabuthus granulatus, Parabuthus capensis, Parabuthus mossambicensis, Parabuthus kalaharicus, Parabuthus schlechteri,* and *Parabuthus villosus.* All of the *Parabuthus* scorpions should be regarded as potentially lethal. *P granulatus* is one of the scorpions more frequently implicated in envenomation,[1] probably because of its habit of actively foraging; most other scorpions lie in wait in a sedentary ambush strategy.

Parabuthus transvaalicus.

In Zimbabwe, where *P transvaalicus* stings are most common, an epidemiologic study showed that only about 10% of the stings resulted in severe scorpionism, and 63% of the stings resulted only in intense pain.[2] About 27% of the stings resulted in minor systemic complaints including hypersalivation, sweating, and subjective neurological symptoms. The patients with severe scorpionism demonstrated neuromuscular symptoms and cardiac involvement. Parasympathetic nervous system involvement was a prominent feature.[2] This differs from buthid envenomation in other parts of the world, where clinical evidence of circulating catecholamines is a prominent feature (sympathetic storm). The fatality rate related to *P transvaalicus* scorpionism was 0.3%. Deaths occurred in children younger than 10 years and adults older than 50 years, and the clinical course was prolonged

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compared with other scorpion syndromes.[2] Severe envenomation from *P transvaalicus* is generally the result of a deep sting, but anecdotal reports suggest that this species also is capable of squirting venom up to 1 m.

In a study of 42 cases of serious scorpion envenomation in South Africa, 4 had a fatal outcome.[1] As in Zimbabwe, most envenomations in the southern hemisphere occurred during the summer months, peaking in January and February. About 75% of the stings occurred at night, usually on the foot because of open footwear. Intense local burning pain was the most prominent symptom. Systemic symptoms and signs typically developed within 4 hours of the sting. Characteristic symptoms included generalized paresthesia, hyperesthesia, muscle pain, and cramps. Blood pressure and temperature typically were elevated, and the tendon reflexes were increased. Voluntary motor function often was impaired. A considerable number of patients had respiratory dysfunction, which tended to be more serious in children. Children also exhibited extreme restlessness, with excessive neuromuscular activity. Other striking features were dysphagia, dysarthria, and sialorrhoea. Varying degrees of loss of pharyngeal reflexes were noted. Because *P granulatus* was implicated as the most important venomous species in the Western Cape region and the commercial antivenin is produced from the venom of *P transvaalicus,* it is suggested that polyvalent antivenin including more specific *P granulatus* antibodies may be of benefit.[1]

Crude diluted venom from both *P transvaalicus* and *P granulatus* have a profound influence on the contractility of isolated cardiomyocytes in vitro. This effect can be minimized by preabsorption with commercial antiserum.[3] *P transvaalicus* venom is a complex mixture of salts, peptides, and proteins. The scorpion secretes a small quantity of transparent prevenom when initially stimulated. As secretion continues, a cloudy white and dense venom is subsequently released. The prevenom contains a combination of high K^+ salt and several peptides including some that block rectifying K^+ channels. Together, these components elicit significant pain and toxicity by inducing massive local depolarization.[4]

The results of gel filtration chromatography of the venoms of *P transvaalicus, P granulatus,* and *P villosus* have shown common components among the 3 venoms that inhibit potassium channels and alter sodium channel gating.[5] Three homologous acidic peptides have been isolated from the venom of *P transvaalicus, P granulatus,* and *P villosus.* They are structurally related and belong to subfamily 11 of short-chain α-K^+–blocking peptides.[6] These toxins differ from other alpha-K^+ toxins because of the absence of the critical lysine 27 and their total overall negative charge. Parabutoxin 1 weakly blocks several Kv1-type channels.[7] Parabutoxin 3, another of the short-chain alpha-K^+ neurotoxins from *P transvaalicus,* is a 37-residue polypeptide cross-linked by 3 disulphide bridges. Like other toxins in the group, the affinity for Kv1 channels is weak to moderate, but a single amino acid substitution near the lysine 26 residue creates a toxin with a 100-fold greater affinity for Kv1.1 channels.[8] In addition to blocking K^+ channels, *Parabuthus* toxins also target voltage-gated $Ca2^+$ and Na^+ channels.[9,10]

Treatment of envenomation includes the use of antivenin, as well as supportive measures and symptomatic relief. Antivenin improves measured outcomes, most notably the length of hospital stay.[2]

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