CHEMICAL AND BIOLOGICAL CHARACTERIZATION OF VENOM OF THE ANT *SOLENOPSIS XYLONI* McCOOK

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The reaction of human beings to the sting of the indigenous southern fire ant (*Solenopsis xyloni* McCook) is in marked contrast to that produced by the sting of the closely related imported fire ant (*Solenopsis saevissima* [Fr. Smith]). Whereas the sting of *S. saevissima* is characterized by a painful edema and marked necrosis (Caro *et al.* [1957]), we have found that the sting of *S. xyloni* seldom results in more than a mild prurience. These facts strongly indicate that the venoms of these two species of *Solenopsis* differ chemically. The purpose of this present paper is to compare the chemical and biological properties of these *Solenopsis* venoms in order to possibly determine what is responsible for their different dermatological effects.

Materials and Methods

Venom was collected from major or media workers employing a previously described method (Blum *et al.* 1958). The chemical and biological properties of *S. xyloni* venom were studied by procedures described elsewhere (Blum *et al.* 1958; Blum and Callahan 1960). A crystalline derivative of the main component in *S. xyloni* venom was prepared from an ether extract of 450 poison glands dissected from major workers. The derivative was isolated by the method of Blum and Callahan (1960).

The dermatological effects of the sting of *S. xyloni* to human beings were studied by observing reactions at sting sites.

Results and Discussion

The chemical properties of the venom of *S. xyloni* parallel those of the venom of *S. saevissima* in nearly all respects. Like the venom of *S. xyloni,* the venomous secretion of *S. saevissima* consists of an alkaline two-phase system in which the suspended droplets represent the minor phase (Blum *et al.* 1958). The main constituent in the venom of *S. xyloni* is an amine which is chemically comparable to the amine isolated from the venom of *S. saevissima* (Adrouny *et al.* 1959; Blum and Callahan 1960). The infrared spectrum of the venom of *S. saevissima* is virtually superimposable on the spectrum of the venom of *S. xyloni* and it is probable that the amine constituents which these

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spectra represent are very similar. On the other hand, whereas the venom of *S. saevissima* contains two rhodamine-complexing minor components, the venom of *S. xyloni* contains only one.

The chemical similarities of the two venoms are paralled by their biological properties. The venomous principles of *S. xyloni* exhibit the same antimycotic and antibacterial activities as are found in the venom of *S. saevissima* (Blum *et al.* 1958). The pronounced hemolytic effect and insecticidal activity of *S. xyloni* venom compare to these same properties in the venom of *S. saevissima* (Adrouny *et al.* 1959; Blum *et al.* 1958). Thus the venoms of both of these fire ants feature the same broad-spectrum activity against diverse types of cells.

The skin responses of human beings to the stings of these two fire ants are similar only during the first few hours, both being characterized by an immediate flare followed by a wheal. However, whereas the sting of *S. saevissima* is always characterized by an umbilicated pustule at the sting site (Caro *et al.* 1957), we have found that the response to the sting of *S. xyloni* seldom results in more than a mild prurience. In the few cases where minute pustules were observed, they were on individuals who were quite sensitive to the sting of *S. saevissima*. At least three explanations seem possible: (1) minor structural modifications of the necrotoxin in the venom of *S. saevissima* are associated with a large increase in necrotoxicity when compared to its counterpart in the venom of *S. xyloni,* (2) the concentration of the necrotoxin in the venom of *S. saevissima* is greater than its counterpart in the venom of *S. xyloni,* (3) the minor components contribute to the necrotoxic action of the venom. These hypotheses remain to be determined experimentally.

References Cited

Adrouny, G. A., V. J. Derbes, and R. C. Jung.
1959. Isolation of a hemolytic component of fire ant venom. Science **130**:449.

Blum, M. S. and P. S. Callahan.
1960. Chemical and biological properties of the venom of the imported fire ant (*Solenopsis saevissima* var. *richteri Forel*) and the isolation of the insecticidal component. XI Int. Kongr. Ent., Vienna. **3**:290-293.

Blum, M. S., J. R. Walker, P. S. Callahan, and A. F. Novak.
1958. Chemical, insecticidal and antibiotic properties of fire ant venom. Science **128**:306-307.

Caro, M. R., V. J. Derbes, and R. Jung.
1957. Skin responses to the sting of the imported fire ant (*Solenopsis saevissima*). A. M. A. Arch. Dermotol. **75**:475-488.