Table 2. Reactions of aqueous solutions of amino acids in dihydroxyacetone.

Arginine	Immediate yellow; dark brown in 30 min
Glycine	Yellow after 60 min; dark brown in 6 hr
Histidine	Yellow after 60 min; brown in 12 hr
Lysine	Yellow after 60 min
Tryptophane	Yellow after 12 hr
Threonine	Yellow after 12 hr
Alanine	Faint yellow after 12 hr
Valine	No color change
Leucine	No color change
Phenylalanine	No color change

some cases no color change was evident. Additional ninhydrin-positive aniline-phthalate–positive substances were formed in small amounts.

Epidermal proteins have a very high content of basic amino acids, arginine, lysine, and histidine (*3*). Amino acids in sweat (determined by microbiological assay), listed in order of decreasing concentration, are arginine, histidine, threonine, valine, leucine, isoleucine, lysine, phenylalanine, and tryptophane (*4*). Dreizen and associates reported melanoidin formation between degradation products of glucose (dihydroxyacetone and glyceraldehyde) and the organic fraction of tooth structure (*5*). Interaction between amino acids and sugars has been shown to be the cause of browning that occurs in storage of dried foods (*6*). Richards was able to isolate the enolic form of N-(carboxymethyl)-amino-1-deoxyfructose as an intermediate in the browning reaction between glycine and *d*-glucose (*7*). Our data suggest that reactions similar in nature occur between dihydroxyacetone and amino acids. The reaction proceeds more rapidly with the highly reactive dihydroxyacetone.

The presence of arginine and other basic amino acids in skin proteins in relatively high concentration has led to the interesting application of this browning reaction between dihydroxyacetone and skin proteins in cosmetic lotions (*8*).

EVA WITTGENSTEIN
HELEN K. BERRY
Children's Hospital Research Foundation, Cincinnati, Ohio

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Chromatographic Comparison of Scorpion Venoms

Abstract. The venom of seven species of scorpions was subjected to two-dimensional chromatographic analysis. Six major components were defined and tentatively correlated with the physiological activity of the venoms.

The venom of *Centruroides sculpturatus* Ewing and *Centruroides gertschi* Stahnke has the distinction of exhibiting a severe neurotoxic effect, while that of other scorpions of the Southwest produces little or no systemic effects. These two species also differ in this respect from other species of United States centruroidian scorpions, even though some of the other species morphologically resemble them closely (*1*). *Centruroides sculpturatus* and *C. gertschi* venom also has the distinction of being lethal to man in quantities injected during the process of a single sting.

In cases of moderate to severe venenation, *C. sculpturatus* and *C. gertschi* venom will cause severe drooling, so that the patient loses large quantities of fluids, and characteristic convulsions.

Normally the venom of *Vejovis spinigerus* (Wood) and *Hadrurus arizonensis* (Ewing) apparently produces only a local reaction in the form of a swelling and sometimes ecchymosis at the site of the sting. In severe cases of venenation by these species, reactions of a systemic effect were experienced. This led Palmer (*2*) to investigate the effects of these venoms in larger doses than are injected during the natural stinging process. Among other things, he found that *Vejovis spinigerus* venom in a lethal dose would produce only slight salivation but severe convulsions, while *Hadrurus arizonensis* venom produced severe drooling without convulsions.

The present work is an attempt to characterize chromatographically the proteinaceous components of the venom of seven of these species. The venom from each was collected, lyophilized, weighed, and reconstituted with sterile water to give the concentrations, in milligrams per milliliter, shown in Table 1.

Two - dimensional chromatograms were run on Whatman No. 1 paper squares at 6°C (43°F) with two parts of *N*-propyl alcohol to one part of 1-percent ammonium hydroxide as the first solvent and one part of 1-percent phenol to one part of 1-percent ammonium hydroxide as the second solvent. Two drops from a tuberculin syringe were used as inoculum for all runs.

The ninhydrin-positive pattern was revealed by spraying the strips with 0.2-percent ninhydrin solution in 95-percent ethanol to which 5-percent 2,4,6-collidine was added just before use (*3*).

Table 1. R_F values for seven species of scorpions.

Concn. (mg/ml)	R_F*	R_F†	Component group
	Hadrurus hirsutus (Wood)		
11.5	0.27	0.94	*D*
	.42	.96	*C*
	.65	.90	*B*
	.88	.85	*A*
	Hadrurus arizonensis (Ewing)		
9.9	.46	.96	*C*
	.70	.84	*B*
	.86	.96	*A*
	Centruroides sculpturatus Ewing		
4.63	.12	.97	*E*
	.16	.58	*F*
	.85	.91	*A*
	Centruroides gertschi Stahnke		
0.72	.12	.91	*E*
	.85	.83	*A*
	Centruroides pantheriensis Stahnke		
6.0	.84	.79	*A*
	Centruroides vittatus (Say)		
5.8	.82	.71	*A*
	Vejovis spinigerus (Wood)		
5.6	.90	.71	*A*

* In *N*-propyl alcohol and NH_4OH.
† In phenol and NH_4OH.

The R_F values obtained for the seven species are given in Table 1. Figure 1 shows the distribution pattern of the venom for these seven species. It is apparent that the venom components fall into six areas as designated in Fig. 1.

While some uniformity of venom components is to be expected, the variation in the effect of the sting of differ-

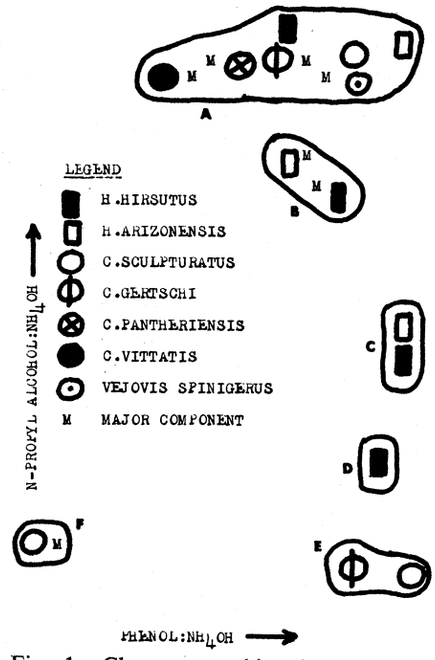

Fig. 1. Chromatographic distribution of scorpion venom into groups. See Table 1 for R_F values.

ent species of scorpions would suggest a similar variation in the constitution of their venom. In this work, such uniformity is found in the area designated as *A* (Fig. 1). Since the chromatograms for all species showed a trailing effect in the *N*-propyl alcohol solution, this was not recorded except for the *Hadrurus* genus, where trailing in the phenol solution definitely indicated unique components. Group *E* was not included in trailing of species other than those designated.

The uniqueness of group *F* in *Centruroides sculpturatus* is significant with regard to the physiological effect of this venom. Group *E*, occurring only in this species and *C. gertschi*, is also significant.

This work would further suggest that the convulsion factor is in group *A*, since it appears as the major component in *C. gertschi* and *Vejovis spinigerus*, while the major component of the *Hadrurus* genus is in group *B*, which could be the salivation factor.

The possibility of synergistic action of these components should not be overlooked. Consequently, small amounts of groups *B*, *C*, and *D* (evidenced by trailing on the chromatograms) in conjunction with component *E* or *F*, or both, could account for this reaction with the venom of *Centruroides sculpturatus* and *C. gertschi*.

Further isolation and purification of these components should establish this relationship.

ROY M. JOHNSON
HERBERT L. STAHNKE
Poisonous Animal Research Laboratory, Arizona State University, Tempe

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Feeding in Conflict Situations and Following Thwarting

Abstract. It is possible to quantify many different aspects of feeding behavior. In order to specify and differentiate the effects of deprivation levels, conflict, and thwarting, one cannot use only a single measure of this behavior pattern.

Several studies have shown that the concept of drive as an energizer of all behavior that leads to the consummatory response is inadequate to describe the changes in a behavior pattern that accompany a high score in consummatory activities (*1*). Further, Miller (*2*) has reported two conditions that increase the amount of food intake while exerting differential effects on a number of other presumptive measures of strength of hunger. These findings are disturbing, as various investigators who have described the effects of frustration (*3*) and conflict (*4*) as increasing drive strength have estimated the strength of drive by measuring a few, often a different few, of the many quantifiable aspects of a behavior pattern. The present report questions the description of such effects in terms of a unitary intervening variable.

Table 1. Feeding behavior: (*A*) following 1, 2, and 3 days deprivation ($N=9$); (*B*) in successive 15-minute periods of the feeding session, 2 days deprived ($N=9$); (*C*) in conflict sessions with high, medium, and low shock ($N=12$); (*D*) following thwarting ($N=6$). Significant differences: Italic type indicates that the difference between vertically adjacent pairs of numbers is statistically significant. In *A* and *C*, the pairs of asterisks indicate that the difference between the pairs of numbers not vertically adjacent are statistically significant. In *C*, bold-face type indicates that the differences between normal controls and all shock intensity tests considered together are statistically significant.

	Completed	Initiated	Initiated / Completed	Duration completed (0.01 min)	Total time feeding (min)
A. Days deprived					
1	*132*	612	*4.39*	3.8*	21.8
2	*196*	717	*3.52*	*3.3*	21.2
3	*252*	778	*2.87*	*2.8**	21.7
B. Successive 15 min of feeding session					
1st	*63*	*172*	*2.75*	*2.6*	*4.3*
2nd	*54*	*193*	*3.46*	*3.2*	*5.7*
3rd	*43*	182	*3.98*	*3.7*	5.8
4th	*36*	169	*4.50*	4.0	5.6
C. Conflict: normal control; high, medium, low shock					
N	**196**	**756**	**3.83**	**3.3**	**22.8**
High	*125**	*551*	3.27	2.8	13.7*
Md.	*155*	*580*	3.64	3.0	17.5
Low	197*	646	3.36	2.9	19.4*
D. Thwarted and normal control; 1, 2, 3 days deprived					
1, N	155	*536*	*3.12*	4.0	21.3
1, T	180	*686*	*3.44*	4.0	25.8
2, N	191	*557*	2.74	4.0	22.2
2, T	209	*701*	2.98	3.7	25.2
3, N	*223*	577	*2.50*	3.5	*19.3*
3, T	*164*	671	*3.60*	3.9	*25.4*

Three-spined sticklebacks (*Gasterosteus aculeatus*, L.) were maintained in aquaria divided by a partition into a food area and a living area. A portion of the partition was removed to permit 1 hour of access to the food at 1-, 2-, or 3-day intervals. For the thwarted feeding sessions the food was covered by a transparent plate for ½ to 2 hours. After intervals ranging from 3 minutes to 4 hours, access to the food area with the plate removed was allowed. In conflict sessions, the fish received electric shock at varying intensities (42 volts, 84 ma; 66 volts, 112 ma; 108 volts, 210 ma) through a pair of electrodes immersed in the water. The first two entries into the food area or the 10th and 20th grasp at food were the occasions for administering shock.

Tubifex worms were scattered in the food area. Samples taken from the tanks indicated that there were over 30 times as many worms present as the fish would remove in the feeding session. To test whether a change in the behavior of the prey would make them less available to their predators, the feeding responses of the fish were imitated by poising over the prey and touching them with the end of a broad pencil at a rate corresponding to that of the feeding stickleback. There were no significant changes in the reaction of the prey to the repetition of this stimulation.

Sticklebacks feeding on their ground-living prey swim near the floor of the tank and occasionally tilt their bodies to remain poised over the worms which are half-embedded in the sand. The eye movements during fixation on the prey are quite distinctive. Fixations may be followed by grasping the prey, scored as *completed feeding responses*. Each fixation, whether it led to the grasp or not, was scored as an *initiated feeding response*. Behavior such as attacks, returns to the living area, swimming up and down the walls of the food area, and so forth, has been grouped together as a bout of *nonfeeding behavior*. Such activities would appear in the absence of food and their frequency and duration could be changed by varying conditions other than deprivation. Then, *total time spent feeding* measures the predominance of feeding behavior in the 1-hour session, while the *ratio of initiations to completions* measures the predominance of one element in the feeding behavior pattern. In a bout of feeding, it is possible that few completions are performed because the *duration* of feeding responses is very long.

Behavior was recorded on a machine that moved a strip of paper at the rate of 5.6 cm/min (*5*). The frequency,