A laboratory investigation of aggressive behavior in the Mongolian gerbil (*Meriones unguiculatus*)

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Although the Mongolian gerbil *(Meriones unguiculatus)* is noted for its docility and its nonaggressiveness toward littermates and human Es (Thiessen, 1968), it has been purported that the animal will attack viciously conspecifics of litters other than its own. The present paper reports the results of a preliminary laboratory investigation of such intraspecific aggression. The authors have reported in another paper[1] that gerbils both recognize and prefer their own litter environments to others. Would a "familiar" vs an "unfamiliar" discriminative response also occur in the case of aggression; i.e., would gerbils attack nonlittermates more frequently than littermates? Some instances of interspecific aggression (toward albino rats and mice) are also reported.

SUBJECTS AND MAINTENANCE CONDITIONS

The Ss were 12 Mongolian gerbils which comprised three natural litters of four animals each. Litters X and Z each contained one female; all other animals were males. All Ss were between 90 and 120 days old. The animals had been tested previously for preference of the home litter environment; they were otherwise experimentally naive. The litters were housed separately in clear plastic compartments, 15 x 11 x 8 in., with 1/4-in. hardware cloth tops. Wood shavings covered the compartment bottoms. Ad lib food and water conditions were maintained throughout the experiment.

Four male Cheek-Houston albino rats and four male Swiss random-bred albino mice were also used in tests of interspecific aggression. These latter species were housed in individual cages in the department's vivarium and were also maintained on ad lib food and water.

APPARATUS AND PROCEDURE

All Ss were removed from their home litter compartments and were placed in separate wire-bottom cages. Testing began immediately following separation. One S was placed in its home compartment, and its tail was marked for identification. Individually, and in random order, nine gerbils were placed in the compartment along with the home S. Three of these nine test gerbils were littermates of the home S; six were from the two litters other than its own. Testing consisted of placing the test gerbil into the far-right corner of the compartment of the home S and allowing the two animals to remain together for a maximum period of 3 min, or until an attack occurred. The test gerbil was then removed and, after an interval of 2 min, another test animal was introduced. An "attack-time" score (the interval between the placement of a test animal into the compartment and the occurrence of an attack response) was recorded for all encounters. An attack response was taken to be behavior by the Ss which involved acts of physical contact, such as grasping, clawing, or tumbling, coupled with acts of biting. Prior to such attack behavior, the animals were noted to typically sniff the anal-genital region of their conspecific, exhibit piloerection, and assume the stereotyped upright posture that is characteristic of the aggressive response in rodents (Urlich & Craine, 1964). If an attack did not occur within the 3-min period, the test animal was removed and a score of 180 sec was assigned. The encounters were initiated, timed, and terminated by an assistant who was unaware of the litter membership of any of the animals.[2] After all animals had been tested, they were returned to their respective home compartments.

Following the tests of intraspecific aggression, the gerbils were tested for interspecific aggression. Each of the gerbils was presented four rats and four mice, in random order, and under conditions identical to those described above.

A final series of tests involved confrontations of gerbils which were littermates, but which had been separated from one another for 6 weeks. Litter Y originally contained six animals; two had been removed and maintained in their own separate compartment for this period. During this time, this segregated pair had produced its own litter of five pups. A final test of intraspecific aggression involved presenting these two segregated adults, as well as two of their pups, to the other four gerbils of Litter Y. The presentation and scoring procedures were identical to those previously described.

RESULTS

The results of the various aggression tests, in terms of both proportions and latencies of attack, are presented in Table 1. In no case did an aggressive response occur when the "intruder" was a littermate from which the home gerbil had never been separated. On the other hand, the presentation of a nonlittermate resulted in attack in 87% of all cases. Albino rats were attacked even more frequently (94%) and albino mice were attacked on every single presentation.

The latency data are equally consistent. Albino mice were attacked quite rapidly and with very little variability. Attack latencies in the case of nonlittermates and albino rat "intruders" were 10 times as great and were quite variable. Any statistical comparisons of these scores would have been gratuitous.

Not included in Table 1 are the results of the tests in which the "intruders" were littermates which had been separately housed for 6 weeks. These animals were attacked as though they were nonlittermates. The mean attack proportions, based upon one presentation of each adult and one presentation of each of the two pups, for the four home gerbils of Litter Y were 75%, 100%, 100%, and 75%; the attack latency means were 84, 39, 71, and 91 sec, respectively.

DISCUSSION

Littermates (nonseparated) were never attacked, while nonlittermates were almost invariably attacked by the "home gerbils."

Table 1
Latencies and Proportions of Intra- and Interspecific Attack Responses

Litter	Number of Gerbil Tested	Attack Latencies (Seconds)				Attack Proportions (Percent)			
		Littermate	Nonlitter-mate	Rat	Mouse	Litter-mate	Nonlitter-mate	Rat	Mouse
X	1	no attack[a]	71[b]	80[c]	6[c]	0[a]	83[b]	75[c]	100[c]
	2	no attack	14	100	6	0	100	75	100
	3	no attack	4	36	2	0	100	100	100
	4	no attack	4	7	1	0	100	100	100
Y	5	no attack	52	73	5	0	83	75	100
	6	no attack	70	29	4	0	83	100	100
	7	no attack	65	10	4	0	83	100	100
	8	no attack	96	56	6	0	67	100	100
Z	9	no attack	41	36	5	0	83	100	100
	10	no attack	45	14	6	0	83	100	100
	11	no attack	8	46	7	0	100	100	100
	12	no attack	64	46	2	0	83	100	100
Mean		no attack	45	44	4	0	87	94	100

[a]*Mean of three encounters.* [b]*mean of six encounters,* [c]*mean of four encounters*

In those cases in which a nonlittermate was presented and no actual attack occurred, other agonistic behaviors, such as "freezing" and "flight" by "intruders" and piloerection and aggressive posture by "home gerbils," were always observed in such instances. In no case did these behaviors occur during encounters between nonseparated littermates. "Foot-stomping" was occasionally observed when "home gerbils" were presented with nonlittermates. This rather unique behavior does not appear to be a signal toward aggression. In the most aggressive of the animals, the attack response was almost instantaneous. "Foot-stomping" was observed only when the actual attack was not immediate or when no attack response occurred within the 3-min presentation interval. Another observation of interest was that when a submissive posture was assumed by an intruder animal, attack by the home gerbil was allayed. This was especially true in the case where the intruder animal was a mouse. If any sudden movement by an intruder occurred, however, an aggressive posture, generally followed by subsequent attack, was immediately assumed by the home gerbil.

It should also be noted that a 6-week isolation period greatly increased aggressive behavior among littermates. Isolated littermates were not discriminated from nonlittermates in terms of aggressive behavior by home gerbils. This finding suggests the operation of habituation and dishabituation-like processess in the control of aggressive behavior in this species. Thiessen (1968) has pointed to the role of similar processes in explaining the apparent monogamous behavior of gerbils. A possible mechanism underlying the differential aggressive behavior observed in the present study might be attack-inhibiting and attack-exciting properties of familiar and unfamiliar olfactory cues, respectively. Whether or not such cues are as important as they appear to be in the case of mouse-killing behavior in rats (Myer, 1964) remains to be demonstrated.

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NOTES

1. Ginsburg, H. J., & Braud, W. G. Decrement and shock-induced increment in preference of a familiar litter environment in the Mongolian gerbil. In preparation.

2. We are indebted to Miss Diana Rosen for her assistance during this phase of the experiment.

Comparison of taste aversion with various delays and Cyclophosphamide dose levels*

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A drug-induced sickness was paired with flavored water to induce a taste-aversion response in rats. Three Cyclophosphamide dosage levels and three time-delay intervals were used. Three pairings of the drug and flavored water were followed by three presentations of the flavored water alone. The drug-dose level, the time delay between drinking and injection, and the number of trials effected the acquisition and extinction portions of the learning curve. The rate of acquisition of the response was related to both the Drug-Dose Level by Trials interaction and the Time Interval by Trials interaction, while the rate of extinction was related only to the Drug-Dose Level by Trials interaction.

The acquisition of a response has been regarded as theoretically and practically limited by the amount of delay between the conditioned stimulus and the unconditioned stimulus or between the response and the reinforcer. Barnett (1963) described a "new object reaction" in wild rats, where avoidance to unfamiliar foods or familiar foods in a new place is observed (neophobia) and noted that this reaction was not observed in laboratory rats. When rats eat poisoned foods, the survivors quickly learn to avoid these foods on subsequent encounters. The interval between eating and sickness from poisoned food would suggest that the contiguity principle is not inviolate. Delay of punishment of up to 75 min after drinking flavored water has produced a drinking aversion (Garcia, Ervin, & Koelling, 1966), and delay of positive reinforcement up to 30 min has produced an increase in drinking flavored water (Garcia, Ervin, Yorke, & Koelling, 1967). Garcia, Ervin, & Koelling (1967) varied the amount of an illness-producing drug injected 5 min after drinking flavored water and found that the taste-aversion acquisition curve was related to the magnitude of the dose. In a set of experiments, Revusky (1968) also found that various delays (up to 6.5 h) and varying amounts of punishment (x-irradiation) produced differential aversions to drinking sucrose-flavored

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