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THE INHERITANCE OF SHYNESS IN DOGS*

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In evaluating the results from experiments on animal behavior, it is particularly important to study the psychological characteristics of the experimental animals in order to determine whether they constitute a representative sample of the species as a whole. This is particularly important in the case of laboratory animals which are obtained from the city pound or bought cheaply because of some outstanding imperfection and which are therefore utilized in animal experiments because of their unsuitability for anything else.

In a previous experiment (1) on approach and withdrawal behavior in a group of 300 dogs, studied at the Cornell University Experimental Morphology Station,[1] it was discovered that about 25 per cent of the animals showed varying degrees of unfriendliness which was not modified by attempts at taming carried out over a 30-day experimental period. These animals showed a persistent fear response which was interpreted as being hereditary, since it was observed soon after birth before opportunity for learning and also because it was not modified by a variety of incentives to be friendly.

Since publication of the original data, information has become available concerning the breed and genetic relationships of the animals studied in the experiment. The experimental animals consisted of (*a*) a group of pure-bred dogs purchased from various sources for the purpose of establishing groups representative of the various morphological types, and (*b*) groups of hybrid animals obtained by crossing various morphological types among the pure-bred dogs. The classification of breeds studied in this experiment is presented in Table 1.

The original experimental group consisted of 181 dogs, but three animals died and are not included in the final report. Eighty-two or 46 per cent of the 178 experimental animals showed consistent withdrawal behavior which

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TABLE 1

SHOWING THE BREED AND HYBRID TYPE OF 181 ANIMALS INVESTIGATED IN AN EXPERIMENT ON SHYNESS IN DOGS AT THE CORNELL UNIVERSITY EXPERIMENTAL MORPHOLOGY STATION

Pure bred types		Hybrid types	
Bassett Hound	4 animals	Bassett-Shepherd	15 animals
Bloodhound	2	Bassett-E. Bull	19
Boston Bull	2	Bassett-Dachshund	15
English Bull	3	Bassett-Salouki	11
Cocker Spaniel	3	Dachshund-Brussels	7
Dachshund	5	Dachshund-B. Bull	11
Great Dane	1	Dachshund-Peke	2
Labrador Husky	1	Dachshund-Cocker	11
Pekinese	4	Gt. Dane-St. Bernard	17
Pomeranian	4	Gt. Dane-Bloodhound	1
St. Bernard	1	Labrador-Chow	3
Salouki	2	G. Shepherd-E. Bull	1
English Setter	2	Salouki-Peke	2
German Shepherd	7	Pomeranian-Peke	3
		Bull Terrier-Bassett	3
		Salouki-Bassett × Salouki f_1	6
		Peke-Pomeranian × Peke f_1	3
		Bassett-Bassett × Shepherd f_1	1
		E. Bull-E. Bull × Shepherd f_1	8
		E. Bull-E. Bull × Shepherd f_1	2

was unmodified by incentives to taming. Of the 82 shy animals, genetic analysis revealed that 43 or 52 per cent were descendants of a single Bassett bitch named Paula who was extremely shy and known as a bad "fear-biter." In spite of her extremely fearful and generally undesirable social behavior, this animal was extensively crossbred with other morphological types because of her great fecundity.

An analysis of the genetic records indicates that this Bassett bitch was successively mated with a Salouki, a Dachshund, an English bull, and a German Shepherd. In each case the male animals were considered to be normal friendly dogs who had never shown excessive shyness or withdrawal behavior. The offspring of these various matings are graphically tabulated in Figure 1 together with notations from the experimental records indicating whether each animal was rated as being friendly or shy. In several instances siblings in the second generation were mated, and in two instances the f_2 animals were mated with unrelated animals of the same breed. It is unfortunate that all members of the various litters could not be included in the chart, but they had been disposed of before the experiment began.

The original litter obtained by crossing the shy Bassett bitch with a

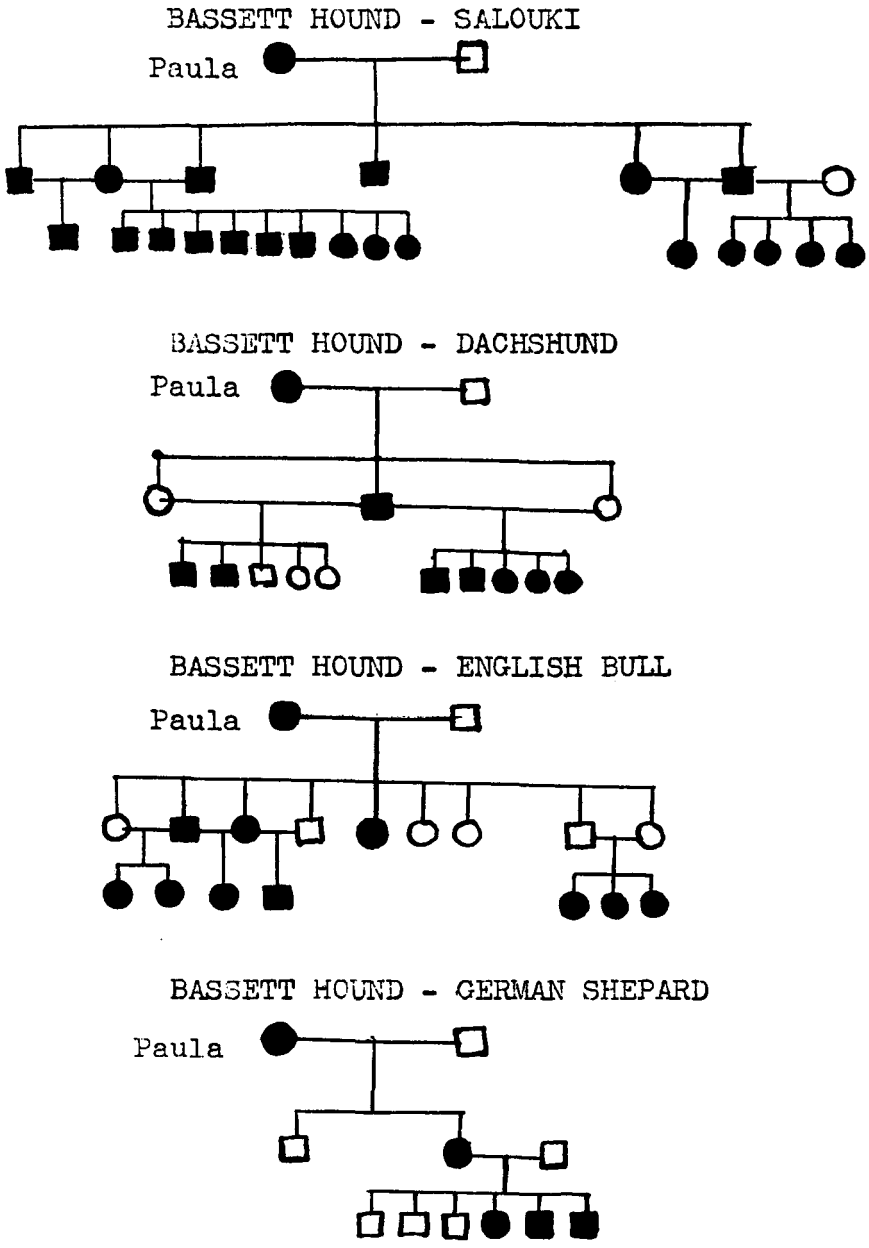

FIGURE 1

SHOWING THE FAMILY TREES RESULTING FROM SUCCESSIVE MATINGS OF A SHY, FEAR-BITING BASSETT HOUND (PAULA) WITH NORMAL MALES OF FOUR DIFFERENT PURE-BRED TYPES

(Shy animals are represented in black symbols and friendly animals with white symbols.)

friendly Salouki yielded six pups all of whom became exceedingly shy dogs. Three matings of shy f_1 animals produced 11 pups all of whom were shy. Another mating of a shy f_1 male with a friendly female Salouki produced a litter of four all of whom were shy. All of the Bassett-Salouki hybrid animals were exceedingly shy, unfriendly, and generally unsatisfactory as pets.

The litter resulting from the Bassett-Dachshund mating contained two friendly females and one shy male. This male was mated with each of the friendly females and 7 out of the 10 pups from the two litters were shy unfriendly dogs.

The mating between Paula and a friendly male English Bull resulted in a litter containing two shy females and one shy male out of nine pups. Two matings between shy and friendly f_1 animals resulted in three shy pups. One mating between the shy brother and sister produced an unfriendly pup, while another mating between two friendly dogs resulted in three shy pups. The original litter from the Bassett-German Shepherd mating contained one shy female and two friendly males. One mating between the shy female and one of her friendly brothers resulted in a litter of six pups three of whom were shy animals.

Discussion

It is now apparent that the high percentage (46 per cent) of shy unfriendly animals encountered in the experimental group of 178 dogs was directly caused by the use of a shy fear-biter (Paula) as one of the principal breeding animals from which the various hybrid strains forming the colony were obtained. Fifty-nine descendants of the shy Bassett hound (Paula) were traced and studied and 43 were shy unfriendly animals while 16 were friendly and good-tempered. Although shy animals were encountered in other pure and hybrid types, in no other instance was there such striking evidence of the hereditary transmission of a psychological trait. One of the pure-bred Dachshunds was an extremely shy animal and this trait appeared in seven descendants but not in such an impressive degree.

It is fortunate that this experimental group of animals was originally bred for the study of the inheritance of morphological characteristics rather than for purely psychological studies. While the presence of an abnormally high percentage of shy animals probably had no appreciable effect on the morphological investigations, this atypical sampling might introduce an important error in studies of physiological traits. It seems important to emphasize that great care should be taken in the selection of brood animals from which the experimental groups are derived.

Unfortunately it is not possible to reach definite conclusions concerning the inheritance of shyness in dogs from this study, because of the fact that complete records were not available concerning all the members of the various litters. Some members of the litters were assigned to other experiments or had been disposed of before the experiment began so that it was not possible to include all the members of all the litters in the study. No attempt has been made therefore to analyze the data quantitatively. The incidence of such a high percentage of shy unfriendly animals among the descendants of Paula suggests that the trait is a dominant characteristic. Under normal biological conditions, the extremely shy animal or fear-biter does not survive as effectively as the more friendly animal and this is a possible explanation why such animals do not exist in larger proportion in a normal canine population.

Summary

Analysis of the genetic data concerning an experimental group of 178 dogs, used in a study of approach and withdrawal behavior, reveals that a sampling error was responsible for the abnormally high percentage of shy animals reported in the experiment. Of 82 shy animals, 43 or 52 per cent were descendants of an exceedingly shy Bassett hound who was known as a fear-biter. Fifty-nine descendants of this shy dog were traced and 43 or 73 per cent were also shy unfriendly animals. It is suggested that this excessive shyness is caused by the inheritance of a dominant characteristic and is therefore unsusceptible to modification through learning and training.

Reference

1. Thorne, F. C. Approach and withdrawal behavior in dogs. *J. Genet. Psychol.*, 1940, **56**, 265-272.

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