11350

Change of the Age of Puberty in Albino Rats by Selective Mating.*

CALVIN P. STONE AND R. G. BARKER.

From the Department of Psychology, Stanford University.

During 3 decades, ending about 1922, the reported age of puberty in albino rats shifted downward approximately 20 to 30 days. This change has been ascribed in part to improved diets and husbandry, in part to the use of criteria based on estrus and copulation, rather than on fecundation, and in part to other still unrecognized causes. Among the latter, selective breeding has long been suspected of playing an influential rôle in view of the fact that animal breeders are not able to separate accurately the genetically late pubescent animals from those actually retarded because of illness, malnutrition, over crowding, or other adventitious circumstances contributing to what they consider undesirable breeding stock. A confusion of this kind would, in time, reduce the proportion of genetically late maturing animals in the breeding colony and thus tend to lower the mean ages of puberty in representative animals from the colony. To throw some light on the readiness with which selective breeding might affect mean age of pubescence, the present experiment was undertaken.

In starting the experiment, 25 pairs of albino rats, descendants of the inbred Slonaker colony and originating approximately 35 years ago from Wistar stock, 6 months of age and known to be fertile were mated and allowed to produce one litter each; from these the parent generation was selected. Although we realized that a still larger number of pairs was desirable in order to provide a goodly number of extreme cases, facilities at our disposal at that time prevented our exceeding the number specified above. Nothing was known concerning the ages of pubescence of these 25 pairs.

From the 25 litters 62 males and 82 females were reared. So far as possible living conditions for all of the litters were kept similar and a regular routine of feeding, handling, and examining the young was adopted so as to minimize variables in this sphere of influence. All of this generation and those which followed were fed the Steenbock mixture, supplemented with lettuce once a week. The ages of pubescence of the females were determined from vaginal

* This study was financially supported by a grant from the Committee for Research on Sex Problems, National Research Council.

smears; those of the males by direct tests for copulation. The mean age of first estrus for the 82 females was 51.1 days; the mean age at first copulation by the males was 58.3 days. The extremely early and extremely late cases were used as the parental generation.

The sire used from the parental generation representing the early strain copulated at the age of 44 days, and the 11 dams of the early strain were first in estrus at ages ranging from 35 to 43 days (mean, 40.0 days). For the late strain there were 2 sires, one copulating at the age of 70 and the other at the age of 76 days, and 10 dams with ages of first estrus ranging between 58 and 73 days (mean, 65.3 days). In the 6 succeeding generations the early pubescent animals selected for breeding never exceeded the puberal age of 49 days; the means for males and for females ranged between 37 and 43 days, with that of the males always slightly lower. The puberal age of males and females representing the late strain never fell below 55 days. For the late males the means ranged between 70 and 75 days and for females between 62 and 65 days.

The cumulative effects of selective breeding on age of puberty shown by the F_6 generation is given in Table I and is graphically

TABLE I.
Frequency Distributions of Ages of Puberty in Albino Rats of the 6th Selectively Bred Generation.

Ages	Early Males	Early Females	Late Males	Late Females
34-36	19	11	1	0
37-39	16	21	0	1
40-42	20	31	1	1
43-45	23	26	2	8
46-48	29	26	2	12
49-51	18	10	6	7
52-54	11	1	9	12
55-57	8	1	10	14
58-60	6	0	10	8
61-63	6	0	9	6
64-66	3	0	7	2
67-69	0	0	7	6
70-72	2	1	9	5
73-75	0	0	1	2
76-78	0	0	1	1
79-81	3	0	2	1
82-84	0	0	1	1
85-87	0	0	0	2
88-90	0	0	1	0
91-93	0	0	0	0
94-96	1	0	0	0
97-99	1	0	1	0
Total	166	128	80	89
Mean	47.56	42.98	61.18	56.87
σ	10.56	5.07	10.47	10.38

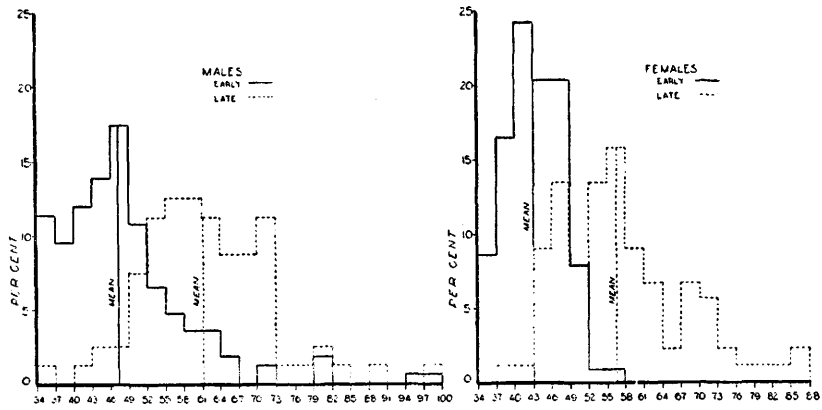

FIG. 1.

represented in Fig. 1. The mean ages of puberty for early and late males of the F_6 generation differ by 13.6 days; those for females by 13.9 days. For each sex the difference in means is statistically significant.

As the distributions clearly show, there is still a large amount of overlapping in the two strains. Further selective breeding should reduce this amount, but it is unlikely that it will eliminate it entirely. Two reasons for this may be given. Mild cases of illness and malnutrition tend to retard a few animals of the early strain in each generation and thus contribute to overlapping. Also the experimenter is unable to differentiate with the required exactitude those animals that are genetically late in maturing from those that are late because of both the genetic factor and adventitious factors that cause retardation. Thus he is not able to obtain in every instance the very best breeders to represent the late strain.

Summary. In this paper evidence is given which clearly indicates the possibility that lowering of the mean age of puberty in rat colonies during the past 30 years may have been due, in part, to selective breeding of early pubescent stock.