treated with the D form.

Discussion. The resolution of 5HTP into the D and L forms has permitted establishment of the optical specificity of one of the enzymes involved in the biogenesis of serotonin, 5HTP decarboxylase. It has also made it possible to further substantiate the claim that the central effects of 5HTP are due to its *in vivo* conversion to serotonin. It may also be of some interest that the anti-insulinase activity previously reported for D,L-5HTP has likewise been shown to be restricted to the L antipode.§

Summary. The D and L forms of 5-hydroxytryptophan were prepared. Only the L form was found to be acted on by 5HTP decarboxylase, to increase brain serotonin levels *in vivo*, and to be pharmacologically active.

§ Dr. Martha Vaughan, personal communication.

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Relation of Adrenal Weight to Social Rank of Mice. (23067)

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Recent work(2) has shown that mice in groups have significantly heavier adrenal glands than mice kept in isolation. Other work has shown that mice in a group will arrange themselves in an ordered social rank such that each mouse is dominant over those below it in rank(4,5). It seemed logical to investigate whether or not there is a relationship between social rank and adrenal weight. This report describes experiments designed to determine if there is such a relationship, after first performing pilot experiments to determine if the procedures used would in themselves produce changes in adrenal weight.

Methods. The mice used were "wild-strain" house mice (*Mus musculus*). These were descendants of wild mice captured in buildings and had been maintained in the laboratory for more than 10 generations. This strain is superior to albino mice for the present purpose, because past work(2) has shown that their adrenals and reproductive organs are more responsive to stressing stimuli. Male mice were weaned at 20 days and placed individually in jars, where they were kept until becoming sexually mature, usually at an age of 2 months and weight of 20-25 g. The jars were kept on shelves with partitions between the jars. Thus the mice were isolated visually, but not auditorily or olfactorily. The experimental design called for placing mice in groups for 4 hours each day, observing the social rank of each individual and then returning each mouse to its own jar for the remaining 20 hours of the day, and repeating this procedure daily. It was therefore important to determine by a pilot experiment whether daily handling would itself produce increase in adrenal weight and

TABLE I. Pilot Experiment on Procedures.

Treatment for 10 days	n	Body wt, g*	Adrenal wt, mg*
A. Isolated but not handled	16	25.9 1.1	4.49 .77
B. Isolated but change jar daily	7	25.7 .7	4.49 .61
C. Grouped for 4 hr a day	7	25.7 2.5	5.48 .54
D. Grouped continuously	7	26.0 1.0	5.38 .79

* Mean and S.D. given.

whether being grouped only 4 hours a day would be as effective in producing adrenal enlargement as leaving the mice continuously in groups. The pilot experiment (Dec. 1954) consisted of comparing the adrenal weights of 4 groups of mice. One group (A) consisted of 16 male mice which were left in isolation without handling. A second group (B) consisted of 7 mice which for 10 days were kept in individual jars, but transferred from one jar to another for 4 hours and then returned to their original jar. The third group (C) had 7 mice which for 10 days were placed together each day in a 20 gal. metal container for 4 hours and then returned to their individual jars for the remaining 20 hours. The final group (D) were left grouped continuously in a 20 gal. metal container for 10 days. After the 10 days of experimental handling all mice were sacrificed and their adrenal weights obtained and compared. The results (Table I) showed that handling isolated mice twice a day did not alter adrenal weight and that the adrenal weights of the grouped mice (C and D) were significantly greater than of isolated mice (groups A and B). No significant difference in adrenal weight was noted irrespective of whether the mice were grouped for 24 or only 4 hours a day. It was considered desirable to give the mice 20 hours in their own private jar to recuperate and feed. The results of the pilot studies indicated that this procedure could be followed. On the basis of the above results and accumulated experience, the following routine was fixed for subsequent experiments. For practical reasons the number of mice per group was reduced from 7 to 6. Six male mice were randomly chosen and kept in their visually isolated individual jars. Selection of mice for each experimental group was made by choosing groups of mice with body weights as homogeneous as possible. The weights sometimes varied as much as 6 g within a group, but this difference was not considered important in mature mice since all adrenal weights were to be expressed in terms of mg/100 g body weight. The 6 mice in each group were placed in a 20 gal. metal can for 4 hours daily (except Sunday) for 10 days. The basal area of the container was 6 times that of the individual jars. The floor of the can was covered with sawdust. At first food and water were supplied, but these were eliminated because the mice rarely fed or drank when grouped. Usually 2 groups were run simultaneously and all experiments were done from December to March in 1954, 1955, and 1956. Social rank was determined by observation of fighting. Each mouse could be identified by the position of a shaved patch of skin, so the identification of the victor and loser in contests was possible. Usually the top-ranking mouse was obvious, even on the first day. Rank determination was further confirmed on the last day of the experiment by a round-robin of contests between pairs of mice. Usually rank was clearly determined by the latter procedure, although ties did occur occasionally. There was no indication that the rank as displayed in a paired comparison differed from the rank when the same 2 mice were part of the larger group. In every group the most dominant mouse (rank I) was obvious. Usually the second and sixth ranks were also easily determined, but it was frequently difficult to separate the third ranking mouse from the fourth, or the fourth from the fifth. This difficulty was due to a lack of fighting rather than reversals or ties. Thus assigned rank may be erroneous for mice in the middle of the hierarchy and in some ways it would be better to treat mice in ranks III, IV and V as a group rather than as 3 separate ranks. It should be kept in mind that these ranks are not necessarily equally spaced within a group or between groups. Occasionally rank changed during the 10 days and usually was a reversal between the 2 top mice in the first few days. In

TABLE II. Results of Social Rank and Adrenal Weight Determinations for 18 Groups of 6 Mice Each. (Body wt in g. Adrenal wt in mg/100 g of initial body wt. Social rank (Roman numerals) is non-parametric.)

Rank	I		II		III		IV		V		VI	
Group	Body wt	Adrenal wt	Body wt	Adrenal wt	Body wt	Adrenal wt	Body wt	Adrenal wt	Body wt	Adrenal wt	Body wt	Adrenal wt
B	30.	15.7	28.	19.6	30.	17.5	30.	19.2	30.	20.7	28.	17.3
C	30.	17.9	30.	16.7	28.	17.3	30.	23.7	28.	18.3	30.	17.7
D	28.	13.	26.	17.1	28.	18.1	26.	19.2	28.	22.9	28.	17.8
E	28.	18.9	28.	19.1	28.	8.6	26.	13.3	26.	20.7	28.	17.1
F	32.	18.3	34.	18.4	34.	21.1	32.	12.3	32.	15.9	26.	14.3
G	30.	15.4	30.	20.6	24.	22.	24.	19.9	24.	21.6	30.	19.7
H	20.2	23.2	19.	26.5	23.5	26.9	20.	26.9	21.5	17.6	23.7	20.4
I	25.	19.8	21.5	21.1	22.8	24.3	21.9	24.3	23.	23.1	22.6	26.7
J	23.9	20.2	25.5	23.6	22.5	24.2	26.1	22.3	26.1	23.7	22.	27.5
K	24.6	23.9	23.8	23.2	24.3	21.5	23.1	28.4	24.5	22.4	23.5	27.1
L	24.8	21.7	24.1	19.6	24.9	20.5	21.9	31.1	23.3	33.2	21.3	21.9
N	24.9	22.8	22.6	15.9	24.5	19.	23.4	22.8	22.6	24.2	20.3	21.3
O	24.8	23.3	24.5	25.5	25.2	21.8	22.8	21.4	25.2	21.	23.	29.9
P	25.4	21.8	24.8	23.	23.8	22.1	25.3	19.3	23.	27.1	23.8	24.
Q	25.2	18.5	22.2	22.9	24.	20.4	23.1	21.9	25.1	19.8	25.6	21.6
R	22.5	20.9	24.	24.7	23.6	17.	23.3	23.	22.1	17.4	25.1	26.7
S	24.5	17.8	26.1	19.	24.6	19.2	24.2	17.9	23.7	17.9	24.1	22.
T	24.3	20.	22.8	18.9	25.8	21.5	24.8	19.2	24.4	19.3	24.8	22.7
Mean	26.	19.6	25.4	20.9	25.6	20.2	24.9	21.5	25.1	21.5	25.	22.

other cases a mouse became ill and declined in rank. Rank on the tenth day was always used for the results. The mice were killed by a blow, weighed, and the adrenals removed and fixed in formalin. They were later weighed on a Roller-Smith torsion balance. Since rank was assigned without any measure of the degree of difference between ranks, a non-parametric method of statistical analysis of the relationship between rank and adrenal weight had to be used. The "ordering test" described by Quenouille(3) was used.

Results. The details of each experiment are given in Table II. Body weight is the initial weight at the beginning of the experiment. Adrenal weights are given as mg 100 g of initial body weight. The initial body weight is preferred rather than the final weight, as in most cases rank was decided on the first or second day and in addition does not reflect losses in weight during the 10 days. The results are shown graphically in Fig. 1. It is apparent that all but the top-ranking mouse (I) lost weight during the 10-day period of grouping. It is equally apparent that adjustment of adrenal weight to final body weight could suggest a greater increase in adrenal weight than was actually the case.

The order test(3) gives a significance of $P<0.01$ for the relationship between social rank and adrenal weight.

On the basis of this analysis and graphical presentation of the data, it is concluded that

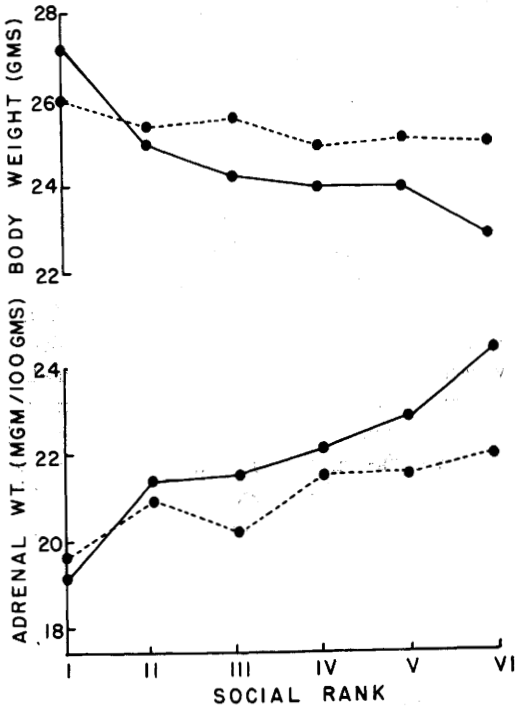

FIG. 1. Relation of body weight and rank (upper lines) and adrenal size and rank (lower lines). Dotted line refers to weight at start and solid line refers to weight at end of 10 days.

low-ranking mice have larger adrenals at the end of 10 days under these experimental conditions than do high-ranking mice. The biological significance appears to be that low-ranking mice are subjected to more physical and psychological stressing stimuli. Barnett (1) noted that the function and size of the adrenal cortex was greater in subordinate rats than in dominant rats.

Summary. Mature male "wild-strain mice," isolated from weaning, were placed in groups of 6 for 4 hours a day for 10 days. The social or dominance rank of each mouse was determined. Adrenal and body weights were obtained for each mouse. A significant relationship was found between adrenal weight and social rank. It is concluded that high-ranking mice have smaller adrenals than do low-ranking mice.

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Role of Estrogen in Sex Difference of the Electrocardiogram of the Chicken.* (23068)

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Data from this laboratory show a sex difference in the blood pressure and heart rate of chickens(1) but not in the pigeon and duck(2). It was also shown that estrogen played a role in the blood pressure difference (3). Earlier studies on the electrocardiogram of chickens by Kisch(4) and Sturkie(5) were not concerned with a possible sex difference as their experiments dealt with only one sex, or sex was not indicated.

This report shows that the amplitude of the male chicken ECG is considerably greater than that of the female and that administration of estrogen to the male decreases amplitude significantly.

Procedure. The data pertaining to the normal sex difference in amplitude of ECG are based on records of yearling males and females taken in March and June of 1955. The estrogen experiments were conducted about one year later on yearling males fed a standard commercial diet. ECG's were run on males before, during and 2 months after discontinuance of estrogen treatments. Control ECG's were taken, and one week later the males received one 15-mg pellet of diethylstilbestrol as an implant. Two weeks later another 15-mg pellet was implanted. The second ECG was taken 29 days after the first pellet was implanted. The birds then received a third pellet, and the third ECG was taken 14 days later or 43 days after estrogen was first administered. The last ECG was taken 57 days after the last administration of estrogen. Based upon comb size, the birds appeared to have recovered from estrogen.

ECG's were recorded on unanesthetized birds, using a Sanborn 150-1600-amplifier and a 151-100A recorder, at a chart speed of 50 mm per second. Needle electrodes were inserted in the muscles at the base of right and left wings and the muscle of the left thigh, to form the standard limb leads(5). Amplitudes of 5 or more R and S waves per bird were measured on all ECG's of leads II and III and the averages recorded. P waves of a few selected records were measured, but it is difficult to measure amplitudes of P and T waves because they are often fused in the chicken ECG(6). To measure amplitude accurately at the usual standardization of 1

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