

A COMPARISON OF THE EFFECTS OF ANTERIOR PITUITARY EXTRACT AND SUBSTANCE, INJECTED AND ORALLY ADMINISTERED, ON THE GROWTH AND SEXUAL DEVELOPMENT OF THE CHICK

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INTRODUCTION

The experiments described in this paper were designed to test and compare the gonadotropic and growth stimulating properties of commercially prepared pituitary extract and pituitary substance designed for injection and oral administration respectively.

The chick was chosen as the experimental animal because of ease of handling and comparatively early appearance and ease of recognition of secondary sexual characters.

Experiments by Smith and Engle with mice have shown that the hormones of the anterior lobe of the pituitary gland not only cause significant increases in growth, but also bring about a precocious sexual maturity.

Work done by Domm with the chick has shown that these hormones possess gonadotropic power to the extent of hastening sexual maturity to a point where nine-day-old male chicks would crow and attempt to tread their immature mates. Increased development of head furnishings and spurs also testified to the gonadotropic properties of the hormones.

The stability of the gonadotropic factor, however, is open to question. The work of Smith and Engle, as well as that of Domm, was carried on with pituitary transplants placed in the peritoneal cavity daily, in order to study the effects of increased amounts of the hormone in as nearly a natural condition as possible. There is evidence that when the hormones are extracted and stored for any length of time there is a gradual loss of gonadotropic power. Evans and Long have reported an actual postponement of sexual maturity in the rat by injection of extracted bovine pituitary hormone.

PROCEDURE

Fifteen three-day-old male Buff Orpington chicks of approximately the same weight and body condition were selected and divided into three groups of five each. One group was injected daily for a period of ten days with one-half cc of commercially prepared bovine anterior pituitary extract. Injections were given intraperitoneally since the lack of muscular development of the chick at this age eliminates the possibility of intra-muscular injection.

Each chick of the second group received a daily oral dose of one grain, about seven hundredths of a gram, of the compressed bovine anterior lobe of the pituitary gland for a period of ten days.

The final group was reserved as a control. All chicks were kept in the same brood chamber to avoid possible differences in growth and development that might arise as a result of variations in food, water, or environmental conditions.

All the chicks were weighed at the beginning of the experiment and on alternate days thereafter for a period of twenty-one days, with an individual

record being kept for each chick. Observations and measurements were also made on the size and development of the combs and spurs.

RESULTS

Table I shows the results of these experiments with respect to body weight. As can be seen from these figures, the average increase in weight of the experimental chicks was only slightly greater than that of the controls for the first six days after the treatments were started. However, there seemed to be a sudden increase in rate of gain of the experimental animals on the eighth day. A study of the chicks revealed that the increase in weight was due to a proportional enlargement of all parts of the body and not to a deposit of extra amounts of fatty tissue.

Those injected gained more rapidly than those fed on the compressed substance, but the difference was not great compared with the gain which both showed over the controls.

A thorough study of the development of secondary sexual characters failed to reveal any differences between the experimental and the control animals, other than that which normally would accompany the greater size of the experimental individuals. Autopsies conducted at the conclusion of the experiment also showed no significant differences between the gonads of the various groups.

CONCLUSIONS

1. The growth stimulating factor of the hormones from the anterior lobe of the pituitary gland seems to possess a high degree of stability since this factor is not greatly affected by commercial extraction or desiccation, nor by the digestive juices in the alimentary tract of the chick.
2. Oral administration of compressed pituitary substance seems to be almost as effective in stimulating growth in the chick as the intraperitoneal injection of the extract of the anterior pituitary lobe.
3. The gonadotropic or sex-stimulating factor of the hormones from the anterior lobe of the pituitary gland, on the other hand, seems to be very unstable and is completely lacking in both the extracted hormones and the desiccated substance of this lobe.

LITERATURE CITED

- Dommm, L. V. Precocious development of sexual characteristics in the fowl by homeoplastic hypophyseal implants in the male. Proc. Soc. Exp. Biol. and Med. 29:308-312.
- Evans, H. M. and J. A. Long. The effect of the anterior lobe administered intraperitoneally upon growth, maturity and oestrus cycles of the rat. Anat. Rec. 21:62-63.
- Smith, P. E. and E. T. Engle. Experimental evidence regarding the role of the anterior pituitary in the development and regulation of the genital system. Amer. Jour. Anat. 40:159-217.

TABLE I

Average gain in grams, of chicks treated with anterior pituitary extract or substance

Days	2	4	6	9	11*	13	15	18	20
Injected	2.05	7.1	7.85	16.45	24.85	36.2	46.71	59.9	63.4
Fed Substance	2.1	5.6	5.5	13.15	25.35	30.1	39.8	55.56	67.9
Controls	2.0	4.1	5.58	11.32	15.4	22.64	29.46	42.8	52.72

* Treatment discontinued on eleventh day.