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Precocious Development of Sexual Characters in the Fowl by Daily Injections of Hebin. II. The Female.*

L. V. DOMM AND H. B. VAN DYKE.

From the Whitman Laboratory of Experimental Zoology, and the Department of Pharmacology, University of Chicago.

The precocious development of sexual characters followning homeoplastic hypophyseal implants in juvenile Leghorn females was previously discussed by Domm.[1] In a second series the effects of daily subcutaneous injections of hebin on these characters were studied.[2]

Light brown Leghorn females ranging from 21 to 47 days at the beginning of the experiment received daily injections of hebin over a period ranging from 14 to 36 days. The daily dosages administered per bird varied from 4 to 32 rat units. Head furnishings were measured and birds weighed at regular intervals as in experiments on cockerels. All treated females remained active and in good condition. In none of the experiments did there seem to be a significant difference in weight between treated and control, both groups showing consistent gains throughout.

Here, as in the male, the first effect to be noticed was a phenomenal growth of head furnishings. This was definitely noticeable within 48 hours in individuals receiving higher concentrations. In such experiments the head furnishings revealed a continuous high rate of growth throughout, becoming large and masculine in character. Bird No. 249, 28 days old when the experiment began, received 20 rat units daily for 21 days and was killed on the day following the last injection. Its comb measured 1.7 cm. in length and 0.5 cm. in height when experiment began and 4.5 cm. by 2.3 cm. on the day the bird was killed. The best control increased from 1.3 cm. length and 0.4 cm. height to 2.1 cm. by 0.7 cm. during this period. The growth of head furnishings in treated females frequently approximates that of similarly treated males. The comb in such individuals is stout of blade and erect whereas that of similar size in

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[1] Domm, L. V., PROC. SOC. EXP. BIOL. AND MED., 1931, **29**, 310.

[2] For similar experiments with cockerels see Domm, PROC. SOC. EXP. BIOL. AND MED., 1932, **30**, 349.

normals, only found in much older individuals, shows a thin lobby blade. Plumage, spurs, and behavior were apparently unaffected.

Postmortem revealed considerable hypertrophy of ovaries. These were larger and heavier than controls but showed no indications of ovulation. The ovary of bird No. 249 (See above) weighed 0.466 gm. while those of 2 controls weighed 0.089 and 0.090 gm. respectively. The oviducts likewise showed an astonishing hypertrophy comparable to that normally preceding ovulation. That of bird No. 249 weighed 0.696 gm. whereas those of 2 controls weighed but 0.042 and 0.041 gm. respectively. Thyroid weights showed similar differences in favor of treated birds. These in No. 249 weighed 0.122 gm. while those of 2 controls weighed but 0.011 and 0.019 gm. respectively. Differences in weights of liver, spleen, and heart were probably not significant, though curiously experimental livers and spleens were usually heavier, whereas the converse was generally found in the male. Rudimentary right gonads and Wolffian ducts hypertrophied.

Preliminary histological studies seem to show a greater abundance of interfollicular tissue and somewhat larger follicles in experimental ovaries. Sections of treated and control oviducts, however, revealed striking differences. Normals showed low mucous folds devoid of tubular glands and conspicuous muscle layer whereas experimentals showed high mucous folds, well developed tubular glands and conspicuous peripheral muscle layer.

The results confirm the earlier observations of Domm[1] following daily hypophyseal implants on juvenile Leghorn females. However, as in the male, certain characters showed a greater response following injections. This is particularly true of head furnishings though it probably applies to other characters as well. Here also, thyroids showed perceptible hypertrophy only following injections, which probably signifies that the injections have supplied a greater quantity of hypophyseal hormone. Preliminary tests on young sinistrally ovariotomized Leghorns revealed hypertrophy of thyroids, rudimentary right gonad and Wolffian ducts, and some growth of head furnishings.

It is assumed that the injected gonad-stimulating hormone acted directly on thyroids and gonads, that its stimulation of the latter caused a precocious endocrine, rather than gametogenetic, functioning, which in turn is responsible for the development of other sexual characters. It is further assumed that the male hormone liberated by the stimulated medullary tissue is responsible for the growth of head furnishings and rudimentary Wolffian ducts while

the female hormone liberated by the stimulated cortical tissue is responsible for the growth of the oviduct.

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Transient Hyperglycemia and Glycosuria Following Discontinuation of Insulin Given Non-Diabetic Patients.

W. D. PAUL, B. B. CLARK AND R. B. GIBSON.

From the Laboratory of Pathological Chemistry and the Department of Internal Medicine, State University of Iowa.

The rise in blood sugar following the discontinuation of insulin administered to an anorexia case suggested that a temporary hyperglycemia and even a glycosuria might be induced in this way in non-diabetic subjects. Accordingly, 5 other non-diabetic patients were given insulin, starting with Units V before each meal, and the dosage increased at intervals of a few days until one patient was receiving Units XVII and another Units XXV 3 times a day. The injections were given 15 to 30 minutes before meals. Blood sugars 2 hr. after meals were usually normal, sometimes above normal. Hypoglycemic symptoms were rarely encountered. Upon discontinuation of the insulin all of these patients showed a hyperglycemia and 4 of them a temporary glycosuria. Glucose tolerance curves were done on 3 of the 6 patients and showed a diminished tolerance, even in one case where there was failure to produce a glycosuria.

For example, a female patient, age 34 years, entered the University Hospital June 2, 1932, following a pleurisy with effusion; she had lost weight and her appetite was poor. On June 4 a 50 gm. sugar tolerance test was normal, fasting blood sugar was 87 mg., the maximum at the half hour was 159 mg. Insulin was started at noon on this day with an initial dosage of Units V 3 times a day with the patient on a general diet. A second glucose tolerance test was done June 18 when the patient was receiving Units X 3 times a day; blood sugar reached a maximum of 231 mg. after 1 hr. The patient had been receiving insulin Units XXV 3 times a day on July 10 and insulin was discontinued the following day. A glucose tolerance test was of the mildly diabetic type, starting with a fasting figure of 87 mg. and with subsequent half-hour values of 208, 231, 253, and 176 mg.; the urine during the first hour contained 0.8% of sugar and during the second 1.1%. Tolerance