

pophysectomized-gonadectomized or hypophysectomized-normal parabiotic rats.

The results indicate that the failure of the ovaries of the hypophysectomized partner of hypophysectomized-gonadectomized

pairs to develop corpora lutea is due to an insufficient secretion of LH following gonadectomy rather than to an unresponsive state of the ovaries of the hypophysectomized animal.

15509 P

Feather Growth Rates in Thyroidectomized Hens Following Administration of Thyroxin.*

BEN B. BLIVAISS. (Introduced by L. V. Domm.)

From the Whitman Laboratory of Experimental Zoology, The University of Chicago.

The feather growth rates of normal fowl have been shown to be modified by the administration of thyroid¹⁻³ as well as by estrogens.⁴⁻⁶ Although a general retardation in feather regeneration has been noted in spontaneous⁷ and experimental^{8,9} hypothyroid conditions in fowl, no measurements were previously made on feather growth in the various body areas. Consequently we were interested in studying the effects of thyroid removal on feather growth in brown Leghorn hens and to see if thyroxin administration had the same effect on growth rates in athyroidic hens as follows its administration in normal individuals.

For the study of feather growth rates, 25

papillae in 5 rows of 5 papillae each were selected and marked in comparable areas in each bird for each of the regions measured. Measurements were made at 2- or 4-day intervals on posterior breast, anterior breast, back and saddle. All individuals studied were adults and beyond 6 months of age.

Regenerating feathers of adult thyroidectomized females, operated on or before 10 days of age, did not become measurable until 12 to 14 days after plucking as compared to 9 or 10 days in normals. During the period of rapid growth, the breast and back feathers grew more rapidly than the saddle, as seen in their growth rates and lengths on the 48th day (Table I). This is in marked contrast to the order of growth rates in normal hens where posterior breast and saddle feathers grow more rapidly than back and anterior breast. Feather growth continued for a longer period in thyroidectomized hens than in normals. Breast and back feathers revealed a lesser reduction in length and growth rate than the saddle.

In view of the well-known feather growth-promoting action of thyroid preparations in normal fowl, it seemed advisable to study the effects of various doses of thyroxin on the slow-growing feathers of athyroidic hens.

Injection of 0.5 mg of thyroxin was followed by an increase in feather growth rates within 24 hours which persisted for 12 to 16 days (Table II). The maximum growth was attained between the 2nd and 4th days after injection when growth rates attained their normal level. With this as well as higher

* This investigation was aided by a grant from the Dr. Wallace C. and Clara A. Abbott Memorial Fund of The University of Chicago. Grateful acknowledgment is made to Dr. L. V. Domm for his suggestions and interest during the prosecution of this investigation.

¹ Torrey, H. G., and Horning, B., *Biol. Bull.*, 1925, **49**, 275.

² Domm, L. V., *Anat. Rec.*, 1929, **44** (Suppl.), 227.

³ Juhn, M., and Barnes, B. O., *Am. J. Physiol.*, 1931, **98**, 463.

⁴ Domm, L. V., *J. Exp. Zool.*, 1927, **48**, 31.

⁵ Domm, L. V., and Gustavson, R. G., *Anat. Rec.*, 1929, **44** (Suppl.), 228.

⁶ Juhn, M., Faulkner, G. H., and Gustavson, R. G., *J. Exp. Zool.*, 1931, **58**, 69.

⁷ Landauer, W., *Am. J. Anat.*, 1929, **43**, 1.

⁸ Parhon, C. F., *C. R. Soc. Biol.*, 1924, **91**, 765.

⁹ Greenwood, A. W., and Blyth, J. S. S., *Proc. Roy. Soc. Edin.*, 1929, **49**, 313.

TABLE I.
Feather Growth Measurements (in mm).

Ftr. age days	2 normal females				6 complete thyroidectomized females			
	Post. br.	Ant. br.	Back	Sad.	Post. br.	Ant. br.	Back	Sad.
	Average length.							
12	5.3	5.4	6.5	6.3	<1.0	<1.0	<1.0	<1.0
24	32.4	29.1	33.3	31.6	9.8	8.3	8.5	7.8
36	57.5	55.5	57.9	57.1	22.2	20.4	21.3	17.5
48	77.1	69.0	73.9	77.3	33.9	30.3	32.7	26.1
60	87.2	71.7	77.3	87.0	45.0	38.0	42.5	33.1
72	89.9	71.7	77.5	87.9	52.7	41.2	50.6	36.7
80					54.9	42.1	53.9	37.5
	2-day growth increments.							
12-24	4.5	3.9	4.5	4.2	1.6	1.4	1.4	1.3
24-36	4.2	4.4	4.1	4.2	2.1	2.0	2.1	1.6
36-48	3.3	2.2	2.7	3.4	1.9	1.7	1.9	1.4
48-60	1.7	0.4	0.6	1.6	1.8	1.3	1.6	1.2

TABLE II.
Modifications in Feather Growth Rates After Thyroxin Administration in Thyroidectomized Hens.

Dose, mg	Days inj. A	Ftr. areas	Two-day growth rate increments in millimeters Days measured post injection			
			R-6-0	0-4	2-4	0-12
0.5	42		A-36-42	42-48	44-46	42-54
		Ant. br.	1.7	3.7	4.4	3.0
		Back	1.6	3.0	3.8	3.0
		Sad.	1.7	3.1	3.7	3.1
			R-6-0	0-6	6-14	14-20
1.0	19, 26, 33		A-13-19	19-25	25-33	33-39
		Post. br.	2.3	3.8	3.9	4.9
		Ant. br.	2.2	2.7	5.2	5.1
		Back	1.9	3.6	4.0	3.8
		Sad.	1.0	2.5	4.0	4.6
			R-4-0	0-6	6-12	12-18
1.5	18, 24, 30		A-14-18	18-24	24-30	30-36
		Post. br.	2.2	4.2	5.5	5.0
		Ant. br.	2.0	2.7	3.7	4.5
		Back	2.3	3.4	5.7	3.4
		Sad.	2.2	3.8	4.8	5.8
			R-4-0	0-6	6-12	12-18

R = Days of measurement in relation to injection time.

A = Actual days of measurement based on feather age.

Figures represent average of right and left feather areas in all cases.

doses, the increased growth rate persisted for a longer period in the saddle than in the other feather areas, indicating a lower threshold for saddle feathers.

In an attempt to obtain normal growth rates for a longer period, larger doses of thyroxin were administered. With successive injections of larger doses, further acceleration of feather growth was obtained (Table II). After 2 administrations of 1.5 mg thyroxin with an interval of 6 days between injections, all areas attained or exceeded feather growth rates observed in normal hens. The posterior

breast reached a higher growth rate than the other areas, though the period of acceleration was for a longer period in the saddle.

As a consequence of thyroidectomy in brown Leghorn hens there is a marked reduction in feather growth rates and an alteration in the order of growth-rate relations between the various body areas. A decrease in estrogen production¹⁰ is probably responsible for the

¹⁰ Blivaiss, B. B., and Domm, L. V., *Anat. Rec.*, 1942, **84** (Suppl.), 79.

¹¹ Wang, H., *Physiol. Zool.*, 1945, **18**, 335.

¹² Blivaiss, B. B., 1946, unpublished data.

assumption in such individuals of a growth-rate order of feather areas typical of gonadectomized males^{6,11,12} and females.¹² The feath-

er areas of athyroidic hens following thyroxin administration reveal the characteristic threshold differences.

15510

Relaxation of the Pubic Symphysis in Guinea Pigs Following Injections of Desoxycorticosterone Acetate.*

FREDERICK E. EMERY.

From the Department of Physiology and Pharmacology, University of Arkansas Medical School, Little Rock.

The recent reports¹ on the concentration and purification of relaxin have led to a renewal of interest in the relaxation of the pelvic symphysis of guinea pigs. It seems progesterone acts on the uterus to release relaxin, which acts on the pelvis and relaxes the symphysis pubis. Since progesterone and desoxycorticosterone induce similar responses, such as prolongation of life and growth in adrenalectomized animals,²⁻⁴ progestational changes in the uterus⁵ and growth of the lobules of the mammary glands,⁶ it seems likely that desoxycorticosterone could also induce relaxation of the pelvic symphysis of guinea pigs. This report contains data supporting this view.

Methods. Forty-eight virgin oophorectomized guinea pigs were used in this study. They were injected as outlined below, and after a recovery period of at least 2 weeks, they were sometimes used again for these ex-

periments. The estrogens[†] in the form of theelin, and stilbestrol, were given in olive and peanut oils, and injected subcutaneously daily, for 2 days. The site of injection was on the shoulder and back, as this area⁷ gives less oil cysts than any other area commonly used for injecting oils. Four days after the estrogens were started, progesterone and desoxycorticosterone acetate in olive oil were given, either intramuscularly or intraperitoneally.

Pelvic examination was gently carried out while the guinea pig rested quietly on one's lap or knee. The state of pelvic relaxation was determined by manual manipulation of the tuber ischi; these were held between the middle finger and thumb of each hand, while one of the fingers was pressed against the symphysis to determine the extent of movement present. By this method, there was almost no danger of mechanically forcing the pelvic ligaments to yield. The degree of movement was recorded from one to 4+, and those cases of 2+ or more, were considered to be positive for pelvic relaxation. Since the chief interest was to know whether the pubic symphysis was or was not relaxed, it seemed unnecessary to arrange the response into further gradations.

Fluoroscopic examination was also carried

* Research paper No. 597, Journal Series, University of Arkansas.

¹ Hisaw, F. L., Zarrow, M. X., Money, W. L., Talmage, R. V. N., and Abramowitz, A. A., *Endocrinology*, 1944, **34**, 122.

² Emery, F. E., and Schwabe, E. L., *Endocrinology*, 1936, **20**, 550.

³ Gaunt, R., and Hays, H. W., *Am. J. Physiol.*, 1938, **124**, 767.

⁴ Schwabe, E. L., and Emery, F. E., *Proc. Soc. Exp. Biol. and Med.*, 1939, **40**, 383.

⁵ Van Heuverswyn, J., Collins, V. J., Williams, W. L., and Gardner, W. U., *Proc. Soc. Exp. Biol. and Med.*, 1939, **41**, 552.

⁶ Mixner, J. P., and Turner, C. W., *Endocrinology*, 1942, **30**, 706.

[†] Appreciation for supplies is recognized as follows: Theelin, Dr. Oliver Kamm, Parke, Davis and Company; progesterone and desoxycorticosterone acetate, Dr. Erwin Schwenk, Schering Corporation.

⁷ Emery, F. E., Matthews, C. S., and Schwabe, E. L., *J. Lab. and Clin. Med.*, 1942, **27**, 622.