these workers in adult animals.

The variation in ovarian, testis and accessory weights in the hypophysectomized partner may be a reflection of the degree to which the pituitary gland undergoes castration changes following gonad removal. We have previously reported[11] that approximately 11% of a large number of control parabiotic rats failed to undergo the typical ovarian enlargement following gonadectomy of one parabiont. The percentage of rats failing to show the typical castration changes in this study when the recipient parabiont was hypophysectomized is slightly higher (17%), which indicates that the gonads of hypophysectomized rats respond less readily to gonadotrophic stimulation than those of normal rats.

Summary. Using immature hypophysectomized-gonadectomized parabiotic rats it has been demonstrated that following gonad removal in both sexes follicular stimulation only is obtained in the ovaries of the hypophysectomized parabiont for as long as 53 days following the operation. If the hypophysectomized partner is a male, the testes are maintained in the scrotum and their average weight is somewhat less than that of normals, whereas the weight of the accessory glands is approximately the same as that of normal animals.

Approximately 17% of the pairs failed to show any gonadal stimulation following the hypophysectomy-gonadectomy procedure. This percentage failure is slightly greater than that occurring in nonhypophysectomized pairs.

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Luteinization of the Ovaries of Immature Hypophysectomized Parabiotic Rats with Gonadotrophic Hormone Preparations.*

ROLAND K. MEYER, CLYDE BIDDULPH, AND W. H. MCSHAN.

From the Department of Zoology, University of Wisconsin, Madison.

It has been shown that following hypophysectomy of an immature female parabiotic rat and gonadectomy of its male or female partner only follicular stimulation is obtained in the ovaries of the hypophysectomized parabiont.[1,2] The question arose as to whether or not the ovaries of the hypophysectomized rat failed to become luteinized because they were unresponsive to luteinizing hormone (LH), or whether the condition of follicular stimulation was the result of a failure of LH to either be released from the castrate pituitary gland or to reach the ovaries in sufficient quantities to produce luteinization. In an effort to gain information on this question, one parabiont of a group of parabiotic rats was hypophysectomized and the intact rat was injected with gonadotrophic hormone preparations and the response determined in the ovaries of the hypophysectomized rat.

Materials and Methods. Littermate rats weighing 70 g or more were united in parabiosis at 31 to 33 days of age. The operative technic was that of Bunster and Meyer[3] except that metal skin clips were used instead of silk sutures in closing the skin incisions. On the 6th day following parabiotic union of the animals one partner was hypophysectomized and the other was either gonadectomized or left intact. All operations were performed under sterile conditions and under ether anesthesia.

Within a few hours after the operation,

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1 Biddulph, C., and Meyer, R. K., PROC. SOC. EXP. BIOL. AND MED., 1946, **63**, 92.

2 Greep, R. O., PROC. SOC. EXP. BIOL. AND MED., 1940, **44**, 214.

3 Bunster, E., and Meyer, R. K., *Anat. Rec.*, 1933, **57**, 339.

TABLE I.
Injection of Gonadotrophic Extracts into Hypophysectomized Parabiotic Rats.

Condition of pair		Right partner			Left partner*	
Left	Right	Material injected	Days inj.	Sex of pairs	Ovarian wt, mg	Qual. response
Hypophysectomized	Gonadectomized	100 mg eq. per day LH 114	3	♀♂	24	Follicles
			5	♀♂	25	"
			7	♀♂	39	"
			7	♀♂	46	Foll. and C. L.
			10	♀♂	21	Follicles
			10	♀♂	37	"
			10	♀♂	7	No. stim.
			10	♀♀	9	" "
			10	♀♀	7	" "
		100 mg eq. per day LH 54	10	♀♀	97	C. L.
			10	♀♀	64	" "
			10	♀♀	77	" "
			10	♀♀	48	" "
	Normal	1.2 cc eq. per day pregnancy urine prep.	8	♀♀	48	" "
			10	♀♀	40	" "
			10	♀♀	46	" "
			10	♀♂	50	" "
	Gonadectomized	1.2 cc eq. per day pregnancy urine prep.	6	♀♂	112	" "
			8	♀♂	133	" "
			10	♀♂	185	" "
			10	♀♂	179	" "
			10	♀♀	117	" "
			10	♀♀	103	" "
			10	♀♀	153	" "
	Normal	50 mg eq. per day unfract. sheep pit.	3	♀♂	41	Follicles
			3	♀♂	30	"
			3	♀♂	30	"
			3	♀♀	35	"
			4	♀♀	30	"
			7	♀♂	37	Foll. and C. L.
			10	♀♀	74	C. L.
			10	♀♀	78	" "
			10	♀♂	99	" "
			10	♀♂	55	" "
			10	♀♂	14	" "
			10	♀♂	49	" "
			10	♀♂	60	" "
		100 mg eq. per day unfract. sheep pit.	10	♀♀	157	" "

* The average adrenal weight of the hypophysectomized partner was 17 mg; that of the other parabiont was 32 mg.

injection of either LH, gonadotrophin prepared from the urine of pregnant women, or unfractionated (FSH and LH)) sheep pituitary extracts was begun. Five-tenths cc of aqueous solution of the preparations was injected subcutaneously once daily into the gonadectomized or normal parabiont for 3 to 10 days following the hypophysectomy and gonadectomy. The various doses used are recorded in Table I.

At autopsy the ovaries of the hypophysectomized partner were removed and examined for their qualitative response and weighed. The adrenals of each partner were also dissected and weighed.

Results and Discussion. The results of the gonadotrophic hormone injections are found in Table I. It will be seen that both male and female rats were gonadectomized or left intact and injected with the various

preparations, the hypophysectomized partner always being a female. No difference is apparent in the results obtained with each preparation regardless of whether the gonadectomized or intact partner was a male or female.

The injection of LH54 produced an abundance of corpora lutea in each rat and the ovaries were heavier than those obtained with LH114. The latter preparation was prepared by a different method, and corpora lutea were found in the ovaries of only one animal, probably because of the low luteinizing activity of the preparation.

Injection of the pregnancy urine preparation into the normal rat of hypophysectomized-normal pairs produced corpora lutea in the ovaries of the hypophysectomized rat in all cases, the average ovarian weight being 41 mg. When the same preparation was injected into the gonadectomized partner of hypophysectomized-gonadectomized pairs it was found that corpora lutea were formed in the ovaries of the hypophysectomized rat in every instance, and the ovarian weight was much greater than before, the average being 140 mg.

The response obtained with the pregnancy urine preparation is an interesting one, for reports in the literature indicate that this type of gonadotrophin is by itself ineffective, or relatively so in hypophysectomized rats.[4-6] Regardless of whether the injected rat was normal or gonadectomized the pregnancy urine gonadotrophin used in this study luteinized the ovaries of the hypophysectomized rat.

The greater weight of the ovaries of the hypophysectomized-gonadectomized pairs was undoubtedly due to the greater stimulation of the ovaries by the combination of endogenous gonadotrophin from the gonadectomized rat's pituitary gland and injected gonadotrophin. It seems probable that the follicles present in the ovaries of the hypophysectomized partner of both types of pairs did not undergo involution immediately following hypophysectomy, and since the injections of the pregnancy urine preparation were begun immediately after the operation, the follicles became luteinized. In addition, the ovaries of the hypophysectomized partner of the hypophysectomized-gonadectomized pairs were apparently stimulated to produce new follicles by FSH from the pituitary gland of the gonadectomized partner.[1] The LH of the injected preparation acted on these stimulated follicles to produce luteinization, and consequently a greater ovarian weight was found in these pairs.

The injection of the unfractionated sheep pituitary preparation also produced luteinization of the ovaries of the hypophysectomized parabiont. In this group of animals the injections were made into the normal parabiont. A greater ovarian weight was obtained in the hypophysectomized rat with a high dose of the preparation than with a low dose.

Of interest is the fact that the adrenals of the hypophysectomized rat were partially maintained (weight 17 mg) by the adrenotrophic hormone from the nonhypophysectomized partner (adrenal weight 32 mg). The average adrenal weight of single hypophysectomized control rats of the same age was 10 mg.

From the above data it would seem that the presence of only follicular stimulation in the ovaries of the hypophysectomized-gonadectomized parabiotic rats in the previous study,[1] is due to the fact that the gonadotrophin secreted in the early stages of gonadectomy is largely FSH, little or no LH being secreted. Furthermore, the ovaries of the hypophysectomized parabiont are responsive to LH if sufficient quantities are present.

Summary. The injection of LH, gonadotrophin prepared from the urine of pregnant women, and unfractionated sheep pituitary extracts into the nonhypophysectomized partner produced luteinization in the ovaries of the hypophysectomized partner of either hy-

[4] Reichert, F. L., Pencharz, R. I., Simpson, M. E., Meyer, K., and Evans, H. M., PROC. SOC. EXP. BIOL. AND MED., 1931, **28**, 843.

[5] Reichert, F. L., Pencharz, R. I., Simpson, M. E., Meyer, K., and Evans, H. M., *Am. J. Physiol.*, 1932, **100**, 157.

[6] Evans, H. M., Meyer, K., and Simpson, M. E., *Am. J. Physiol.*, 1932, **100**, 141.

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.

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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 thyroid[1-3] as well as by estrogens.[4-6] Although a general retardation in feather regeneration has been noted in spontaneous[7] 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

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

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

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