has observed distinct biochemical and physiological differences between these states(15). The second stage, which commences 5-10 days after operation has been termed the stage of stable hyperfunction, and is characterized by hyperfunction of the organ as a whole due to an increase in muscle mass but without hyperfunction of the cellular elements. The animals in the present study were studied in this state and the finding of normal distensibility of the hypertrophied myocardium correlates with Meerson's view that the unit structure is qualitatively grossly normal despite an increase in mass. Although no obvious abnormality of one fundamental mechanical property of the hypertrophied myocardium was observed, these findings must not be interpreted to indicate that no biochemical or ultrastructural changes are present in hypertrophied tissue. Such changes do occur and are currently under investigation, but it appears that they do not affect the muscle's distensibility.

If the type of experimental hypertrophy utilized in this investigation is similar to that observed clinically, then it is likely that the marked decrease in the apparent distensibility of hypertrophied human ventricles(9-12) results primarily from an increase in muscle mass, rather than from a fundamental change in the properties of a given unit of tissue. Although the basic process of hypertrophy in the rat with aortic constriction may be similar to that occurring in patients with arterial hypertension, coarctation of the aorta and aortic stenosis, other factors such as the duration of the systolic overload and the presence of myocardial ischemia which might induce fibrosis could also influence the distensibility of the hypertrophied ventricle.

Summary. Length-resting tension curves were recorded from strips of left ventricle obtained from 10 rats with myocardial hypertrophy produced by subdiaphragmatic suprarenal aortic constriction, and 8 rats subjected to aortic constriction in which hypertrophy did not develop. No differences were noted between the distensibility of the normal and hypertrophied myocardium after corrections were made for differences in muscle mass and cross-sectional area.

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Effect of Estrogen and Progesterone on Mammary Gland DNA and Feed Intake in Hypophysectomized Female Rats.* (31086)

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The determination of DNA has been used extensively in this laboratory as a quantitative index of mammary gland growth under normal and experimental conditions(1,2,3). It has been recognized for many years that hypophysectomy depresses lobule-alveolar growth in rats(4). Although the recent studies have established the fact that ovarian hormones fail to stimulate lobule-alveolar growth of the mammary gland in hypophysectomized rats(5,6,7,8), these studies had

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TABLE I. Effect of Estrogen and Progesterone on Mammary Gland DNA in Hypophysectomized Rats.

Group	Treatment	No. of animals	Final B.W. (g) mean	DFFT (g) mean	DNA (μg/mg) DFFT	Total DNA (mg/100 g B.W.) mean ± S.E.
I	Hypox control	25	211.2	213	19.7	2.01 ± .105[1]
II	Ovarx* control	15	274.0	362	23.2	3.05 ± .14 [2]
III	Hypox + 2 μg E.B. + 6 mg P	18	189.9	254	21.1	2.79 ± .092[3]

Hypox = Hypophysectomy
DFFT = Dry, fat-free tissue
E.B. = Estradiol benzoate
P = Progesterone
S.E. = Standard error of mean

* Data from Moon *et al*(1)

Student's "t" probability
[1-2,3] P <.001
[2-3] P <.40

been limited to visual examination of whole mounts of the glands. The present study was undertaken to present quantitative data on feed intake and mammary gland growth in hypophysectomized female rats with administration of ovarian hormones using DNA as an index of growth. These data will serve as a basis of comparison in a study of the extent of mammary gland growth in hypophysectomized rats stimulated with various other hormones.

Materials and methods. Hypophysectomized virgin female rats of the Sprague-Dawley strain, weighing a mean of 226 g at operation, were purchased from a commercial source.† Animals were housed individually in metabolism cages and fed Purina Lab Chow with an energy value of 4.41 cal/g and 23.4% total protein, in an animal room maintained at a constant temperature of 78 ± 1°F. Both control and experimental hypophysectomized rats were allowed at least seven days for recovery and the feed consumption was determined prior to treatment by the method previously described(9). The feed intake was then determined again during the period of 14 to 34 days of treatment. For controls, 0.2 ml of sesame oil (usp) was injected daily subcutaneously and experimental animals were injected subcutaneously with 2 μg estradiol benzoate (EB) + 6 mg progesterone (P) in 0.2 ml sesame oil each day for 19 days. The levels of these hormones were found to be optimal in rats(10). Animals were killed on day 20 and the 6 posterior mammary glands were removed for DNA determination as previously described(11).

† Hormone Assay Laboratory Inc., Chicago, Ill.

Results. Mean total DNA of 25 hypophysectomized control rats (Group I) sacrificed 33 days after the operation was 2.01 mg/100 g final body weight (Table I), while mammary gland proliferation in hypophysectomized rats stimulated by injection of 2 μg EB + 6 mg P per day for 19 days had a mean DNA value of 2.79 mg/100 g final body weight (Group III). This difference was highly significant (P<.001) from Group I, but the DNA value of Group III was not significantly different from the DNA value of ovariectomized rats (Group II).

In the group of 20 hypophysectomized control rats, normal feed intake was determined during a period of 26 days covering the experimental period. The mean body weight and daily feed intake were 212.4 g and 5.23 g/100 g bw, respectively, during the first 7 days (Table II). It will be noted that the mean daily feed intake decreased 5.4% (P< .025) whereas the mean body weight was unchanged during the last 19 days. In the group of 19 experimental animals, the mean body weight and daily feed intake prior to estrogen and progesterone administrations were 216.7 g and 5.28 g/100 g bw, respectively. During the experimental period of 19 days, the rats showed a mean of 196.9 g in body weight and 4.60 g/100 g bw/day in feed intake. This is a decrease of 9.1% and 12.9% (P<.001), respectively.

Discussion. In this study, it was shown that involution of the duct system from the ovariectomy level followed hypophysectomy. This observation suggests that a pituitary factor or factors are involved in maintenance of the duct system at the level observed in

TABLE II. Effect of Estrogen and Progesterone on Feed Intake in Hypophysectomized Rats.

Group—Treatment	No. of animals	Pretreatment (mean of 7 days) B.W. (g)	Pretreatment (mean of 7 days) Feed/day (g)	Pretreatment (mean of 7 days) Feed/100 g B.W. (g) mean ± S.E.	Post-treatment (mean of 19 days) B.W. (g)	Post-treatment (mean of 19 days) Change (%)	Post-treatment (mean of 19 days) Feed/day (g)	Post-treatment (mean of 19 days) Change (%)	Post-treatment (mean of 19 days) Feed/g B.W. (g) mean ± S.E.	Post-treatment (mean of 19 days) Change (%)
Hypox control	20	212.4	11.11	5.23 ± .09[1]	211.8	−3	10.48	− 5.7	4.95 ± .08[2]	− 5.4
Hypox + 2 μg E.B. + 6 mg P	18	216.7	11.45	5.28 ± .07[3]	196.9	−9.1	9.06	−21.9	4.60 ± .07[4]	−12.9

Student's "t" probability: [1-2] $P < .025$, [3-4] $P < .001$

ovariectomized rats and without it involution of the duct system occurs. These observations confirm the work of Cole and Hopkins (12). They found that the lactogenic hormone not only maintained the DNA, but also increased it above the normal level.

In ovariectomized rats, it has been shown that a combination of 2 μg EB + 6 mg P stimulated the growth of the lobule-alveolar system from 3.05 mg/100 g bw to 6.06 mg/100 g bw(1,10). The present study shows that the injection of EB + P into hypophysectomized female rats failed to stimulate the DNA even up to the ovariectomized value. These results are in agreement with previous qualitative studies. However, in view of the fact that the mean DNA value of experimental and ovariectomized rats shows a highly significant difference from hypophysectomized control rats it suggests that ovarian hormones seem to stimulate either duct growth or slow the rate of mammary gland involution which follows hypophysectomy, and a pituitary factor or factors are essential for mammary gland stimulation by ovarian hormones.

In a study of the effect of hypophysectomy on feed intake in rats(13), it was observed that the mean daily feed intake was reduced about 30% and the mean body weight 11.2% during a postoperative period of 10 to 17 days. In the present study it was shown that EB + P had a further depressing effect upon feed intake and body weight in hypophysectomized female rats. However, the mean total DNA of the experimental group was significantly higher than the control DNA value. Noble(14) reported a reduction in growth and fluid intake with estrogen in the absence of the pituitary. No quantitative data are available in regard to the feed intake of hypophysectomized rats treated with P alone or in combination with EB.

Summary. With DNA as a measure of the presence of mammary gland tissue, a significant involution of the duct system from the ovariectomized level following hypophysectomy was observed. The injection of 2 μg EB + 6 mg P for 19 days failed to stimulate the DNA even up to the ovariectomized value. The significant reduction in body weight and feed intake of experimental ani-

mals due to the injection of EB + P had no effect on the content of DNA of the mammary gland.

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Postnatal Changes in the Cardiac Ventricles of the Pig.* (31087)

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The ratio of the right ventricular weight to total ventricular weight (RV/T) is greater in the newborn human than in the adult. However, within the first month of life, the ratio decreases rapidly and nearly approaches the adult value. Keen(1) is of the opinion that the change is due to a relatively slower weight gain of the right ventricle as contrast to the left and that there is no evidence to suggest postnatal atrophy of the right ventricle. Emery and Avinash(2) report similar findings but Recavarren and Arias-Stella(3) state that postnatal atrophy of the right ventricle does occur as indicated by a weight reduction as great as 23.9%.

Concomitant with a decreasing RV/T ratio in the first month of life, the left ventricular to total ventricular ratio (LV/T) increases. Following this period, a more gradual change occurs in the infant until at 6 months of age the left ventricle has attained a degree of preponderance which no longer changes with increasing age. These observations were essentially confirmed and similarly reported by Emery and Avinash(2).

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In newborn animals, such as the lamb(4) and puppy(5,6), it has been reported that the left ventricle in both species is slightly heavier at birth than the right ventricle. Averill, Wagner and Vogel(7) observed that during the first week of life in the puppy, the right ventricular pressures fell rapidly to adult levels along with a parallel decline in the RV/T ratio. Their data suggest that the RV/T relationship is a sensitive indicator of right ventricular and pulmonary arterial pressure.

In swine, the normal weight relationship of the right ventricle has been determined for adult animals(8,9). To our knowledge, ventricular weight ratios in the newborn piglet have not been determined. It is, therefore, the purpose of this study to report postnatal changes in the ventricular weight ratios of the piglet.

Methods and materials. A total of 75 Yorkshire, Hanford miniature† and York-

† Breeding stock was originally supplied through the courtesy of the Biology Dept., Pacific Northwest Laboratory, Battelle Memorial Inst. for the U. S. Atomic Energy Commission (formerly Hanford Atomic Products Operation and operated by General Electric Co.), Richland, Wash.