

Influence of Relaxin on Mammary Development in Sexually Immature Female Rats.*

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The only physiological action so far established for relaxin¹ is the relaxation of the pelvic ligaments in the guinea pig. This preliminary paper reports observations on the effects of relaxin on mammary gland development in immature rats.

Various combinations of estradiol, progesterone and relaxin were given to ovariectom-

ized immature rats to determine the effects on the growth of mammary glands. The estradiol and progesterone were dissolved in sesame oil and injected once a day. The relaxin was dissolved in distilled water and injected in two equal doses, one in the morning and one at night. All injections were made subcutaneously. The animals used were immature female rats which had been ovariectomized at 30 days after birth. After 6 days of postoperative rest they were in-

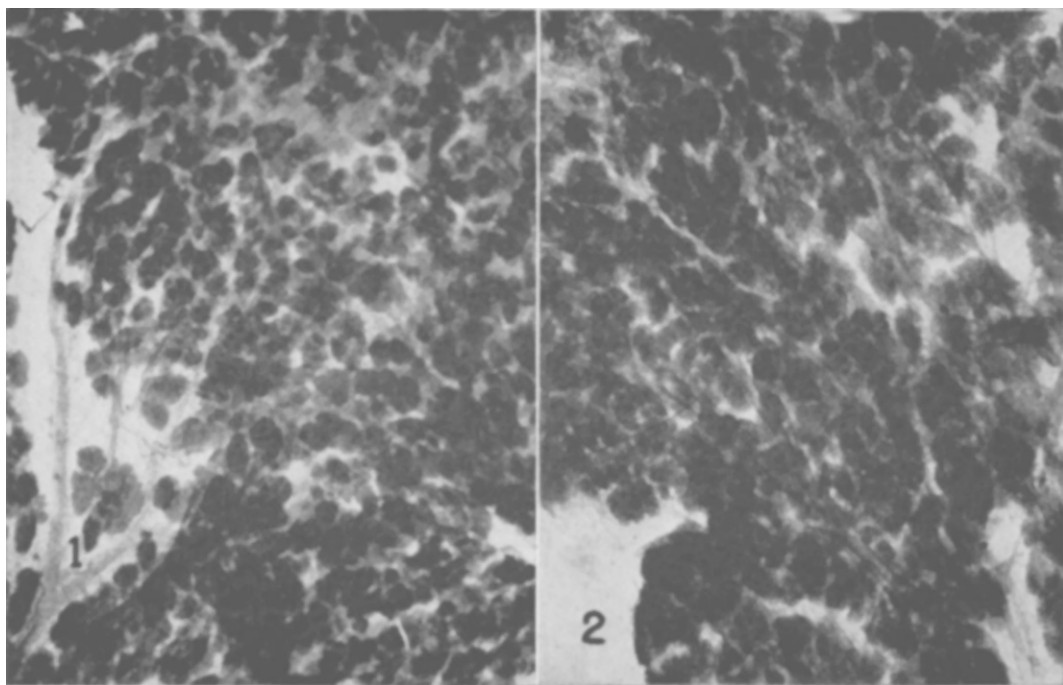


FIG. 1.

FIG. 1. Mammary gland of female rat ovariectomized at 29 days of age and given 13 days pretreatment with 0.83 μ g estradiol daily, followed by daily injections of 0.83 μ g estradiol, 1 mg progesterone, and 25 GPU relaxin for 9 days.

FIG. 2.

FIG. 2. Treatment same as for animal in Fig. 1 but injections of the three hormones were continued through 13 days.

ized immature rats to determine the effects on the growth of mammary glands. The estradiol and progesterone were dissolved in

jected daily with 0.83 μ g estradiol for 13 days. This was the standard pre-treatment given all animals before each of the following experiments. A minimum of 4 animals was used in each group cited below and the reactions within each group were uniform.

Daily injections of estradiol (0.83 μ g per 0.05 cc oil), progesterone (1 mg per 0.05 cc

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

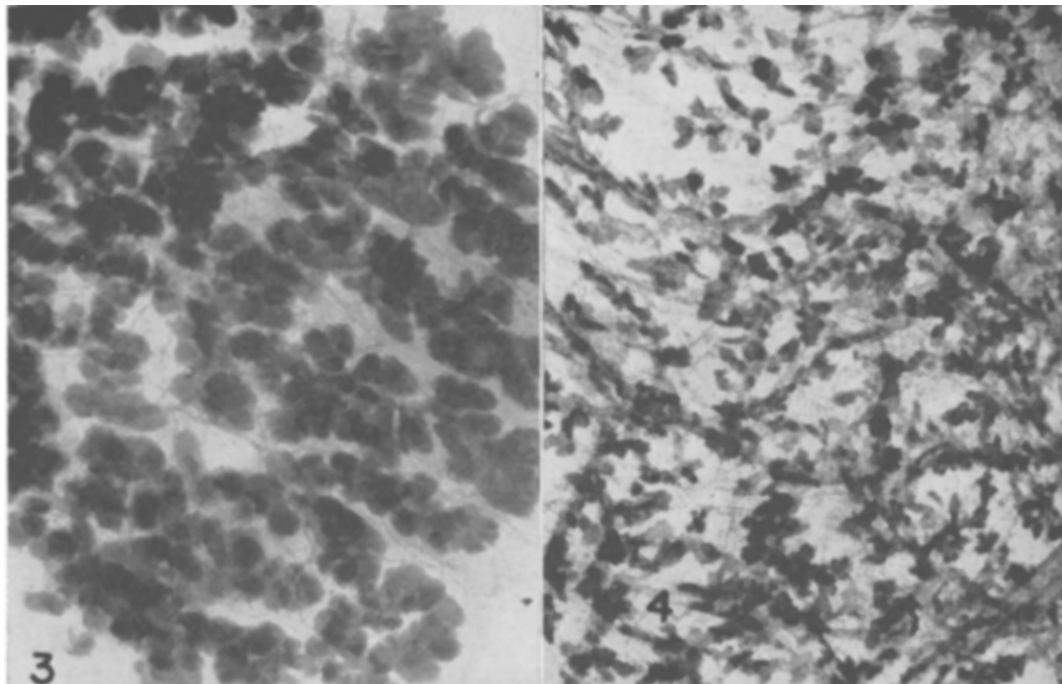


FIG. 3.

FIG. 3. Mammary gland of a normal pregnant rat on the 18th day of pregnancy.

FIG. 4.

FIG. 4. Mammary gland of a rat given the same treatment as that of Fig. 1 except relaxin was omitted.

oil), and relaxin (25 guinea pig units² per 0.5 cc distilled water) produced growth in the mammary glands by the ninth day of treatment (Fig. 1). By the thirteenth day of this treatment the glands had the appearance of mammary glands during late pregnancy in normal animals (Figs. 2 and 3). Daily injections (for 13 days) of estradiol (0.83 μ g) and progesterone (1 mg) but without relaxin caused a slight growth by the ninth day (Fig. 4). This was much less than in animals treated with all 3 hormones (compare Fig. 1 and 4) and there was no increase in the size of the glands following the ninth day. When animals were given estradiol (0.83 μ g) and relaxin (25 GPU) or when they were injected with progesterone (1 mg) and relaxin (25 GPU) there was no demonstrable growth in the glands beyond that ordinarily obtained with estradiol or progesterone alone. When the animals were hypophysectomized follow-

ing the pretreatment and then injected with 0.83 μ g estradiol, 1 mg progesterone, and 25 GPU relaxin the mammary glands remained immature.[†]

Our experiments show that estradiol, progesterone and relaxin given together will cause mammary gland growth and lobulation in immature, ovariectomized female rats. We were unable to obtain mammary gland growth and lobulation with combinations of any two of these hormones and there was no growth of the mammary gland in hypophysectomized rats given all 3 hormones. Therefore we believe that an interaction of relaxin, estradiol and progesterone stimulated mammary gland growth and lobulation in these animals. Hypophysectomy either (1) removed one or more hormones necessary for the interaction to take place or (2) so changed bodily conditions (hormonal or otherwise) that growth of the glands was not obtained.

² Abramowitz, A. A., Money, W. L., Zarrow, M. X., Talmage, R. V. N., Kleinholz, L. H., and Hisaw, F. L., *Endocrinology*, 1944, **34**, 103.

[†] Relaxin does not promote growth of the crop glands in pigeons nor maintain luteal function in hypophysectomized rats. Hisaw, unpublished.