to the finger valve, through which the oxygen is already running.

The thorax is then opened by passing a blunt probe from above under the sternal notch with the tip directed anteriorly, away from the heart. By means of the probe, traction is exerted on the sternum away from the heart, and a scissor point passed alongside the probe. The sternum is cut in the midline. With this incision the thorax is opened, and the lungs are now inflated by activating the finger valve.

Ether may be administered during the procedure if Nembutal is to be avoided by introducing a plenum chamber between the high pressure limit tube and the finger valve. For extended procedures a 95% oxygen-5% CO_2 gas mixture is commercially available and may be desirable to prevent respiratory alkalosis.

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Quantitative Response of Rat Mammary Glands to Mammogens. III. Growth Hormone and/or Lactogen with Estrogen.* (28718)

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Growth hormone (STH) is dependent upon the presence of a steroid hormone for an expression of mammogenic properties, whereas lactogen (LTH) is mammogenic when administered alone to hypophysectomized, castrated, and adrenalectomized rats(1). The simultaneous injection of STH and LTH stimulates mammary growth(2) and crude anterior pituitary extracts stimulate mammary growth in suckling, ovariectomized rats when given alone(3) or in conjunction with estrogen(3,4). Since mammary growth response to these mammogens had not yet been placed on a quantitative basis, an attempt to do so was made in the experiment reported here.

Methods. Assay animals and time sequences(5) and mammary area measurement (6) were as previously described. Estradiol dipropionate (ED), 1.0, 2.0, or 4.0 μg/0.05 ml corn oil, was injected (sbc) every other day. Lactogen (Squibb, Prolactin S-Pro-1†), 0.5, 1.0, or 2.0 mg/0.1 ml distilled water, and STH (Armour Somar A‡), 0.5 mg/0.05 ml distilled water, were injected (sbc) daily for 10 days.

Results and discussion. Either 1 mg LTH or 0.5 mg STH in combination with 1 μg ED significantly increased mammary area (mm^2 per 100 cm^2 of body surface area) of suckling, ovariectomized rats over that of similar rats receiving 1 μg ED alone, 52.3 and 59.6 *vs* 37.5 ($P < 0.01$). Mammary areas of rats injected with 2 μg ED alone (51.8), 2 μg ED + 0.5 mg LTH (57.1), 2 μg ED + 1.0 mg LTH (58.1), 2 μg ED + 2.0 mg LTH (53.4), 2 μg ED + 0.5 mg STH (54.8), or 2 μg ED + 1.0 mg LTH + 0.5 mg STH (58.2) were not significantly different ($P > 0.05$) one from another, but all were significantly greater ($P < 0.01$) than the mammary area of rats injected with 1 μg ED alone. Injecting 4.0 μg ED alone, 4 μg ED

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TABLE I. Mammary Growth Response of Suckling, Ovariectomized Rats to Lactogen and/or Growth Hormone with Estrogen.

Treatment*				
μg ED /2 days	mg LTH /day	mg STH /day	No. of animals	Mammary area†
—‡	—	—	11	17.4 ± 1.1
1.0‡	—	—	10	37.5 ± 3.1
1.0	1.0	—	12	52.3 ± 3.3
1.0	—	.5	6	59.6 ± 4.4
2.0‡	—	—	12	51.8 ± 2.7
2.0	.5	—	6	57.1 ± 3.0
2.0	1.0	—	22	58.1 ± 2.7
2.0	2.0	—	6	53.4 ± 3.2
2.0	—	.5	6	54.8 ± 1.6
2.0	1.0	.5	6	58.2 ± 2.0
4.0‡	—	—	11	51.7 ± 2.3
4.0	1.0	—	6	53.2 ± 2.7
4.0	2.0	—	6	49.8 ± 4.4

* ED, 17B-estradiol dipropionate—5 injections; LTH, lactogen—10 injections; STH, growth hormone—10 injections.

† mm^2 per 100 cm^2 of body surface area ($W^{2/3} \times 10$) with S.E.

‡ Data from Macdonald and Reece(5).

+ 1.0 mg LTH, or 4 μg ED + 2.0 mg LTH resulted in mammary areas (51.7, 53.2, and 49.8, respectively) which were not significantly different from all other treatments ($P > 0.05$) except no treatment and 1.0 μg ED alone in which comparisons they were significantly greater (Table I).

Although different levels of estrogen were used with various doses of LTH and one level of STH, all glands showed end-buds typical of estrogen stimulation. There appeared to be no distinct difference among glands treated with various doses of LTH. The extent of side budding in the distal region of the gland and the lateral budding on the main galactophores was greater in the LTH plus ED injected rats than in either ED or ED plus STH injected rats. Glands stimulated by STH plus estrogen showed poorly developed buds along the primary ducts. Mammary glands of STH injected animals, as in those which received lactogen, showed ducts with more branching in the peripheral regions than those injected with ED alone.

These results indicate that LTH and STH show mammogenic activity when injected with 1 μg ED into suckling, ovariectomized rats. When higher doses of ED (2 or 4 μg) were used, neither LTH nor STH elicted a mammogenic response. This failure of both LTH and STH to produce a mammogenic response may be due to the stimulation of maximal secretion and release of pituitary mammogens by the higher doses of ED(3).

In the intact animal, it appears that the pituitary gland indirectly controls the mammary gland by way of the ovary and directly by its mammogenic secretions. Ovarian steroids influence the mammary gland directly, and indirectly by stimulating the secretion and release of anterior pituitary mammogens.

Summary. The mammogenic activity of LTH and STH was demonstrated when injected in combination with 1 μg, but not 2 or 4 μg, of estradiol dipropionate. Injecting either 2 or 4 μg of estrogen with 2 mg LTH failed to stimulate mammary growth greater than that produced by either 2 μg estrogen alone or 1 μg of estrogen plus 1 mg LTH. Mammary growth was not enhanced when STH was given with LTH to rats receiving 2 μg estrogen.

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