Effect of Lactogenic Hormone, Growth Hormone and Thyroxine in the Lactating Albino Rat.* (25898)

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It has been shown that oxytocin§ (OXT), growth hormone‖ (GH) and thyroxine (T4) improve significantly milk yields of lactating rats(1,2). Lactogenic hormone‖ (LGH) requirements have been investigated in the intact lactating rat. These data indicated that normal milk secretion required not only LGH, but also other pituitary hormones(3). In continuing these studies, the effect of lactogen alone and combinations of lactogen, growth hormone and thyroxine upon litter weight gain and milk yield on day 14 of lactation are reported.

Materials and methods. 121 Sprague-Dawley-Rolfsmeyer lactating rats were housed, fed, and killed under identical standardized conditions as described previously(1,2). Nursing was standardized in all rats with 1 USP unit OXT given subcutaneously immediately before young were allowed to suckle. One mg LGH/day, 1 mg GH plus 1 mg LGH/day and 1 mg LGH plus 1 mg GH plus 3 μg T4/100 g body weight (BW)/day were injected from day 7 through day 14 of experiment. A 0.9% alkaline NaCl solution served as vehicle at rate of 0.2 mg/1 mg GH, LGH, or 1 USP unit OXT, and 0.1 mg/3 μg T4. Control animals were treated in same way but were injected with 1 USP unit OXT on day 14.

Results. Lactogen, 1 mg/day from day 7-14 of lactation, had no beneficial effect on prenursing litter weight and milk yield on day 14. Combination of same amount of LGH with 1 mg GH/day increased significantly prenursing litter weight and total milk yield as compared to controls and LGH treated group (Table I).

Addition of 3 μg T4/100 g/day to LGH plus GH resulted in a more highly significant increase in milk yield on day 14 in comparison to oxytocin alone than did treatment with LGH plus GH (from $p<.005$ to $p<.001$).

Litter weight on day 6 was significantly higher in group which received triple hormone treatment, as compared to controls and LGH, but not of GH treated rats. A significant increase in total litter weight on day 14 as compared to LGH treated rats, but not compared to control rats, was observed. Per cent litter weight gain on day 14 over day 6, more sensitive as a parameter, was significantly increased only in LGH plus GH treated rats.

Discussion. It was observed that OXT injected at nursing time increased milk removal 50%(1,2). Subsequently, it was shown that thyroxine at level of 3 μg/100 g BW/day from day 7 to 14 increased milk yield 37.7% in normal rats and 63.1% in conjunction with OXT. GH alone, at level of 1 mg/day from day 7 to 14 increased milk yield 41.1% over controls and with oxytocin an increase of 60.5% was observed. When GH, T4 and OXT were administered, milk yield was increased 74% over control(2).

In present experiment it was observed that injection of LGH from day 7 to 14 and OXT to aid in milk removal did not increase milk yield above that of OXT alone. However, when LGH and GH were administered together during increasing segment of lactation curve there was a significant increase from 60% with GH and OXT to 68% in milk yield with the 3 hormones. Further, with the combination of GH, T4 and OXT, milk yield was increased from 74 to 84% by addition of LGH.

These data are believed to indicate that

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‖ Growth hormone, bovine and lactogenic hormone, ovine kindly supplied by Nat. Inst. Health.

TABLE I. Synergistic Influence of Lactogen, Growth Hormone, Thyroxine and Oxytocin on Milk Yield and Litter Weight Gain to 14th Day of Lactation.

Treatment (hormone, day 7-14; oxytocin, day 14)	No. of rats	Litters' avg body wt				Avg wt of milk			
		Day 6, g	Day 14 prenursing, g	Gain g	Gain %	Total, g	Total as % of postnursing LW	% increase over untreated controls*
OXT: 1 USP unit	38	70 ± 3.0[1]	153	83 ± 2.9[5]	120 ± 5.6[9]	9.9 ± .3[13]	6.0 ± .1[17]	58
Idem + LGH: 1 mg/day	30	71 ± 1.7[2]	148	77 ± 3.2[6]	109 ± 5.2[10]	9.4 ± .5[14]	6.0 ± .3[18]	58
" + " + GH: 1 mg/day	33	75 ± 2.2[3]	168	93 ± 2.3[7]	128 ± 4.5[11]	11.6 ± .4[15]	6.4 ± .2[19]	68
" + " + T4: 3 μg/100 g BW/day	20	80 ± 2.0[4]	172	92 ± 2.9[8]	116 ± 4.7[12]	12.8 ± .5[16]	7.0 ± .2[20]	84

* *Data from Grosvenor & Turner(1)*

Student's "t" probability:	6–7		6–8		3–4		1–3	
	13–16	<.001	18–20	.01 < p <.025	5–6	.1 < p <.2	2–3	
	14–15, 16		1–4	.025 < p <.050	9–10		9–11	.2 < p <.4
	2–4		5–8		18–19		10–12	
	13–15	.001 < p <.005	11–12				13–14	
	17–20		15–16	.05 < p <.1				
	5–7		17–19					
	10–11	.005 < p <.01	10–20					

BW = Body wt
LGH = Lactogenic hormone
GH = Growth "
OXT = Oxytocin
T4 = Thyroxine

when GH and T4 stimulate increased milk yield separately and together, endogenous secretion of LGH became inadequate and additional exogenous LGH made possible the more intense lactation observed.

Summary. Effects of lactogenic hormone (LGH) alone and in combination with growth hormone (GH) and L-thyroxine (T4) upon lactation in the rat have been studied. All rats were nursed on day 14 of lactation with aid of 1 USP unit of oxytocin (OXT) under standardized conditions. One mg LGH alone did not show galactopoietic effects when injected daily from day 7-14. Under combined action of 1 mg LGH and 1 mg GH/day from 7-14, litter weight gain and amount of milk on day 14 have been significantly increased. Addition of 3.0 μg T4/100 g body weight/day from day 7-14 to LGH plus GH resulted in a more highly significant increase in milk yield in comparison to oxytocin alone than did treatment with LGH plus GH. The increase in mean milk yield of 84% over untreated controls by 4 hormones is the highest so far attained in laboratory.

1. Grosvenor, C. E., Turner, C. W., PROC. SOC. EXP. BIOL. AND MED., 1959, v100, 158.
2. ———, *ibid.*, 1959, v100, 162.
3. ———, *ibid.*, 1959, v101, 699.

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