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EFFECT OF THYROXINE TREATMENT ON PITUITARY RESPONSIVENESS TO LUTEINIZING HORMONE RELEASING HORMONE IN RATS[1]

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Hypothyroidism in rats demonstrated a remarkable decrease of LH in pituitary[10], but not necessary in serum[2,7]. A decrease of hypothalamic luteinizing hormone (LHRH) was also showed[9], but a challenging of submaximum does of LHRH demonstrated an overall increase of an LH and FSH secretion[7]. It was suggested that the reproductive defects in thyroid hormone deficiency is due to the lack of LHRH stimulation on pituitary. In the present study, the responsiveness of pituitary gland to synthetic LHRH (Calbiochem, San Diego) in higher thyroxine (T_4) environment has been examined.

Adult Long-Evans male (weighing 280-320 g) and female (weighing 180-210 g) rats were used for the present studies. The experiment group received ten-fold of physiological dose of T_4 (22 μg/100 g B. W./day, i. p.) for 10 days, while control rats received saline vehicle. Under light ether anesthesia, LHRH (0.25 μg/100 g B. W.) was injected through right common iliac artery of male rats, immediately after 1.5 ml blood was obtained. Twenty minutes after the injection, animals were exsanquinated through dorsal aorta. Female rats were treated similarly, and were sacrificed at 3:00-4:00 p. m. on estrus day. Serum LH were measured by double antibody radioimmunoassay[5] using NIAMDD-RAT-LH Kit, and the reference sandard preparation was NIAMDD-RAT-LH-RP-1.

As shown in Table 1 and 2, it is obvious there are differences in serum LH level in different sex, with T_4 treatment and LHRH

TABLE 1
Serum LH level of rats with thyroxine (T_4) treatment and Luteinizing-Hormone-Releasing Hormone (LHRH) challenging

Sex	T_4 (μg/100 g B. W./day)	Serum LH Level (ng/ml) after LHRH (0.25 μg/100 g BW) Challenging	
		Before	After
Male	22.0	87.2±39.6(1)	805.4±200.8
	0.0	48.4±31.9	480.9± 51.5
Female	22.0	60.0±39.2	445.7±189.0
	0.0	38.3±18.4	341.9±150.9

(1) All with 5 animals in a group, and expressed as mean±SE. The significant level see table 2.

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TABLE 2
Analysis of variance of serum LH level after thyroxine (T_4) treatment and luteinizing-hormone-releaing hormone (LHRH) challenging(1)

Source of Variance	df	F
Sex(s)	1	13.4**
T_4 administration (t)	1	11.**
LHRH challenging (r)	1	159.7**
s×t	1	2.8
s×r	1	10.2**
t×r	1	6.5*
s×t×r	1	1.9
Error	32	

* ** indicates the significant level at 5% and 1% respectively.

(1) The treatment refer to table 1,

$$LSD = t \times \sqrt{MSE} \times \sqrt{2/10} \times \frac{2.042}{2.750} \times \sqrt{13202.9} \times \sqrt{1/5} = \frac{104.93}{141.31}.$$ Explanation see text.

administration, By least significant difference (LSD) comparsion, serum LH inceased, in both sex, after LHRH challenging, and that of males are even higher than in females in response to LHRH administration. which may indicate that, with the similar dose of LHRH, the pituitary of males respond more vigorously and rapidly than that of females. The T_4 treatment increased the serum LH level but not significant in either sex, however, with LHRH superimposed on T_4 treatment greater elevation of LH is showing in males but not in females. It is possible that an elevated level of T_4 in serum facilitates the responsiveness of male pituitary. This is in agreement with findings in human subjects, it was reported that a significant increase in both LH and FSH in hyperthyroidism[3,8].

In human hyperthyroidism, a sex hormone-binding globulin, which binding to testosterone twice as much as estrogen[1], were found to be strikingly among of testosterone binding to proteins was also reported[6]. Thus, it is very possible, the less quantity of free-form testosterone is responsible for the high level of LH in hyperthyroid male rats with LHRH challenge.

In this study, the suppression effect of T_4 on pituitaries seems not exist, but might enchance the responsiveness of pituitaries to LHRH, at least, in male rats.

REFERENCES

1. Burke, C. W. and D. C. Anderson. (1972). Sex hormone binding globulin is an oestrogen amplifier. *Nature* **240**: 38-40.
2. Chen, Y. F. (1977). Effects of prolonged thyroidectomy on luteinizing hormone releasing hormone (LHRH) and gonadotropins (FSH and LH) in female rats. MS. Thesis, Graduate Institute of Zoology, National Taiwan University.
3. Chopra, I. J., G. E. Abraham, U. Chopra, D. H. Solomon, and W. D. Odell. (1972). Alterrtions in circulating estradiol 17 β in male patients with Graves disease. *New Engl. J. Med.* **286**: 124-129.
4. Freeman, M. E., F. T. LaRochelle, Jr., and R. B. Moore. (1976). Effect of thyroidstatus on spontaneous and induced surges of luteinizing hormone. *Endocr*inol. **99**: 713-719.
5. Niswender, G. D., L. E. Reichert, Jr., A. R. Midgley, Jr., and A. V. Nalbandov. (1969). Radioimmunoassay for bovine and ovine luteinizing Hormone. *Endocrinol.* **84**: 1166-1173.
6. Olivo, J., A. L. Southren, G. G. Gordon, and S. Tochimoto. (1970). Studies of the protein binding of testosterone in plasma in disorders of thyroid function: effect of therapy. *J. Clin. Endocrinol. Metab.* **31**: 539-545.
7. Pan, J. T. (1977). The effects of luteinizing hormone releasing hormone (LHRH) on LH and FSH of thyroidectomized male rat. MS. Thesis, Graduate Institute of Zoology, National Taiwan University.
8. Ruder, H., P. Corvol, J. A. Mahoudeau, G. T. Ross, and M. B. Lipsett. (1971). Effects of induced hyperthyroidism on steroid metabolism in man. *J. Clin. Endocrinol. Metab.* **33**: 382-387.
9. Wan, W. C.-M. and Y. F. Chen. (1977). A preliminary report on the effect of thyroidectomy on rat hypothalamic gonadotropin-releasing hormone (GnRH) content. *Bull. Inst. Zool., Academia Sinica* **15**: 77-779.
10. Wan, W. C.-M. and J. C. Hwang. (1973). Effect of thyroidectomy on pituitary luteinizing Hormone (LH) concentration in female rats. *Bull. Inst. Zool. Academia Sinica* **12**: 39-44.

大鼠於甲狀腺處理後其腦下腺對性腺釋放激素刺激的反應

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Long-Evans 品系之大鼠，於 10 倍於生理劑量之甲狀腺素處理 10 日，再以 0.25 μg/100 g B. W. 之性腺釋放激素 (LHRH) 刺激之。於甲狀腺素處理時，性別間血清中 LH 無顯著差異。而於 LHRH 刺激後雄鼠血清中 LH 大量出現，且於甲狀腺素之同時處理相關，其可能在於高濃度甲狀腺素在血液中可以減少自由型式睪丸素所使然。