SHORT COMMUNICATION

DECREASE IN PITUITARY GROWTH HORMONE LEVEL IN RAT AFTER PROLONG ADMINISTRATION OF BOVINE THYROTROPIN

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SUMMARY

Female Fisher rats aged 35 days were injected intraperitoneally with 50 µg and 100 µg per day of bovine thyrotropin(TSH) for 44 days. GH content and concentration in the TSH treated groups were significantly lower than that of the control group. Wet weight of anterior pituitary and thyroid gland were not altered by TSH treatment, while the doses of 100 µg TSH significantly lowered adrenal, ovarian and uterine weights. The formation of antibodies to bovine TSH after chronic administration, which can cross react to rat endogenous TSH, may lead to thyroid hypofunction which in turn lower pituitary GH synthesis. The bovine TSH antiserum may also cross react with rat FSH and LH and lead to adrenal and ovarian hypofunction.

The biological role of TSH in stimulating thyroid function has been well documented. Acute effects of TSH include the stimulation of adenylate cyclase and cyclic-AMP formation (1,2), increasing the height of thyroid follicular cells (3,4) and the stimulation of thyroid hormone secretion (5,6). Thyrotropin may also cause subsequent enzyme induction leading to T_3 and T_4 synthesis (7). However, chronic administration of TSH has been reported to cause a suppression of metabolic rate and T_3 and T_4 levels (8,9) The serum of animals that had been treated chronically with TSH, when given to other animals for a prolong period, caused

a drop in the basal metabolic rate. Werner et al (10) suggested that the antibodies to bovine TSH in the rabbit can neutralize the thyrotropic effect of the hormone. Passcasio and Selenkow (11) reported that antisera to bovine TSH was capable in neutralizing the biologic effects of endogenous guinea pig and rat TSH. Hays et al (12) also showed that highly purified heterologous TSH was an antegenic substance in man. Thus, it is interesting to examine the chronic effects of bovine TSH on rat pituitary GH content as presented in this study.

MATERIALS AND METHODS

Female Fisher rats aged 35 days were used in this study. They were kept in room temperature of 25-30° c with 12 hours of daily light. Zuelling diet (Gold Coin Mills) and tap water were available *ad libitum*. The animals were injected intraperitoneally and daily with 50 µg or 100 µg of bovine TSH for 44 days. The control animals were injected with equivalent volume of sterile normal saline solution. They were sacrified one day after the last injection and the pituitary GH was assayed by the quantitative compliment fixation immunoassay (see 13 for detail description). Body length (from nose to tip of tail) and wet weight of the ovary, uterus, thyroid and adrenal glands were also measured. A student t-test was used to determine for the difference between several mean values.

RESULTS

The final body weight and length and pituitary wet weight of animals treated with bovine TSH were not different from control animals. Significant decreases in pituitary GH content and concentration were produced by prolong administration of either 50 µg or 100 µg of bovine TSH (Table 1). The absolute and relative weights of thyroid gland, absolute adrenal weight, and ovarian weight of rats treated with 50 µg of TSH

Table 1 Effects of prolong treatments with bovine thyrotropin (TSH) in female rats.

	Control	TSH injected 50 µg/day	TSH injected 100 µg/day
Final Body Weight (g)	150.0± 1.9	154.0± 3.6	161.0± 4.0
Final Body Length (cm)	35.4± 0.43	34.8± 3.16	34.3± 0.31
Anterior Pituitary Wet Weight			
Absolute (mg)	6.75± 0.41	6.78± 0.38	6.30± 0.33
Relative (mg/100 g BW)	4.41± 0.24	4.26± 0.23	3.90± 0.16
Anterior Pituitary GH			
Content (µg/gland)	285.0± 17.6	151.0± 9.9**	172.0± 17.1**
Level (µg/mg tissue)	39.7± 3.94	23.5± 1.64**	27.4± 2.56**
Thyroid Gland Weight			
Absolute (mg)	9.94± 0.76	9.98± 0.60	7.16± 0.29**
Relative (mg/100 g BW)	6.64± 0.56	6.63± 0.37	4.45± 0.17**
Adrenal Gland Weight			
Absolute (mg)	46.24± 2.47	42.18± 2.46	40.04± 2.31
Relative (mg/100 g BW)	30.68± 1.38	28.45± 1.56	24.68± 0.96
Ovary Weight			
Absolute (mg)	87.58± 5.40	81.52± 5.10	70.97± 3.16*
Relative (mg/100 g BW)	58.48± 3.97	52.59± 2.45	43.60± 2.78**
Uterus Weight			
Absolute (mg)	331.1± 16.6	250.0± 18.3**	224.6± 27.2**
Relative (mg/100 g BW)	218.7± 11.7	173.4± 10.1**	137.9± 15.1**

* and ** represent significant differences from control group with $p < 0.05$ and $p < 0.01$ respectively. All values are mean ± S.E. of 10 rats in each experimental group.

were not significantly changed ; but those of the 100 μg TSH treated group were significantly lower than the corresponding values in the saline-injected controls. The uterine weight in both TSH treated groups were significantly lower than the corresponding control values.

DISCUSSION

It is shown in the present experiments that pituitary GH content and concentration in rats decreased significantly following chronic administrations of bovine TSH. The reduction in pituitary GH in this study may be due to the formation of antibodies to bovine TSH and neutralization of the thyrotropic effect of endogenous rat TSH leading to thyroid hypofunction. Cross reactivity of bovine TSH antiserum against endogenous rat TSH has been suggested by investigators (see 8, 11, 12). The decreases in pituitary GH and growth rate due to low serum thyroid hormone have been well documented (see 13-18).

The formation of antibodies to bovine TSH may also responsible for the suppression of ovarian and uterine weight in rats found in this study, as cross reactivities between TSH antiserum and the endogenous LH or FSH may occur since LH, FSH and TSH molecules posses similar α - chain. Koneff (19) and Wong (18) had demonstrated decreases in pituitary LH and FSH following the decrease in serum thyroid hormone level. Additionally, the decrease in serum thyroid hormone level may lead to lowering of cell metabolism in general, including the gonadal cells and the FSH and LH cells. Further investigations are necessary to elaborate the mechanisms responsible for the reduction of pituitary GH and ovarian and uterine weight observed in the present study.

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