unable to act on target cells. Such a situation may perhaps be observed sometimes in both animals and man, and it may lead to weakening of the immune activity of the body.

LITERATURE CITED

1. A. F. Vanin, P. I. Mordvintsev, and A. L. Kleshchev, Stud. Biophys., **102**, 135 (1984).
2. L. N. Kubrina, P. I. Mordvintsev, and A. F. Vanin, Byull. Éksp. Biol. Med., No. 1, 31 (1989).
3. J. B. Hibbs, R. R. Taintor, and Z. Vavrin, Science, **23**, 473 (1987).
4. J. B. Hibbs, R. R. Taintor, Z. Vavrin, and E. M. Rachlin, Biochem. Biophys. Res. Commun., **157**, 87 (1988).
5. R. I. Iyengar, D. J. Stuehr, and M. A. Marletta, Proc. Nat. Acad. Sci. USA, **84**, 6369 (1987).
6. D. Kivelson and R. Neiman, J. Chem. Phys., **35**, 149 (1961).
7. J. R. Lancaster and J. B. Hibbs, Proc. Nat. Acad. Sci. USA, **87**, 1223 (1990).
8. M. A. Marletta, P. S. Yoon, R. I. Iyengar, C. D. Leaf, et al., Biochemistry, **27**, 8706 (1988).
9. C. Pellat, Y. Heury, and J.-C. Drapier, Biochem. Biophys. Res. Commun., **166**, 119 (1990).
10. U. Pohl and R. Busse, Am. J. Physiol., **252**, H159 (1988).
11. G. M. Rubany and P. M. Vanhoutte, Am. J. Physiol., **250**, H815 (1986).
12. D. J. Stuehr and M. A. Marletta, Proc. Nat. Acad. Sci. USA, **82**, 7738 (1985).
13. D. J. Stuehr and M. A. Marletta, Cancer Res., **47**, 55 (1987).
14. D. J. Stuehr, N. S. Kwon, S. S. Gros, et al., Biochem. Biophys. Res. Commun., **161**, 420 (1989).
15. D. J. Stuehr and C. F. Nathan, J. Exp. Med., **169** (1989).

EFFECT OF EXCESS AND DEFICIENCY OF THYROID HORMONES ON BLOOD MELATONIN LEVEL IN MATURE MALE RATS

L. A. Bondarenko

UDC 616.831.45-008.937.51-02:616.441-008.7-092.9

KEY WORDS: pineal gland; thyroid gland; melatonin; thyroid hormones

The writer showed previously [1-4] that saturation of the body with thyroid hormones has a significant effect on serotonin metabolism in the pineal gland: injection of thyroxine causes activation of the N-acetylation and subsequent O-methylation pathways of serotonin, with the formation of N-acetylserotonin and melatonin, whereas removal of the thyroid gland lowers the pineal concentration of these substances to the trace level. It has been concluded from these findings that thyroid hormones activate pineal function.

Meanwhile, determination of the pineal melatonin concentration alone cannot answer the question of whether, in the case of an increase in the hormone concentration in the gland, biosynthesis in the gland is stimulated and its release into the blood stream is simultaneously increased, or whether this increase takes place without any change in the intensity of biosynthesis and with simultaneous blockade of passage of the hormone into the circulation. If the melatonin concentration in the pineal gland falls, there may be two explanations: either a decrease in the intensity of biosynthesis and, correspondingly, of release of the hormone into the blood stream, or the decrease in the concentration of the hormone in the pineal gland takes place due to the rapid passage of the hormone into the circulation.

Laboratory of Biochemistry of Endocrine Diseases, Khar'kov Research Institute of Endocrinology and Hormone Chemistry.

(Presented by Academician of the Academy of Medical Sciences of the USSR L. T. Malaya.) Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 111, No. 6, pp. 590-591, June, 1991. Original article submitted August 14, 1990.

0007-4888/91/0006-0768$12.50

TABLE 1. Effect of Thyroid Hormone Deficiency and Excess in Young Sexually Mature Male Rats on Blood Melatonin Level (M ± m, n = 10-12)

Conditions	Blood melatonin concentration	
	pM	%
Intact control	994,36±195,99	100
Injection of thyroxine for 10 days	2560,52±322,04*	257,5
Total thyroidectomy	117,13±16,35*	11,8

Legend. Asterisk indicates values differing significantly ($p < 0.05$) from control.

The investigation described below was undertaken to answer these questions.

EXPERIMENTAL METHOD

Experiments were carried out on 44 young mature male Wistar rats in winter (12 h of daylight: 12 h of darkness). The animals were kept in the animal house at room temperature, under conditions of natural alternation of day and night.

Experimental thyroxine-induced toxicosis was caused by daily intramuscular injection of thyroxine into the experimental animals in a dose of 100 μg/100 g body weight daily for 10 days. Acute thyroid hormone deficiency was produced in the rats by total thyroidectomy. The animals were decapitated after midnight, 20 days after removal of the thyroid gland (between midnight and 3 a.m. — in the period of maximal pineal activity), in red light.

The melatonin concentration in the blood was determined by radioimmunoassay using standard commercial kits from "DRG Instruments" (USA).

The numerical data were subjected to statistical analysis by Student's test.

EXPERIMENTAL RESULTS

The experiments showed (Table 1) that the melatonin concentration in the blood of intact mature rats is 994.36 ± 195.99 pM. Administration of thyroxine for 10 days led to a marked increase (by 2.5 times) in the melatonin concentration in the experimental animals, whereas bilateral thyroidectomy led to an even more marked decrease (by 8.5 times) in the circulating blood level of the hormone.

Comparison of the data described above with those obtained previously indicates that when thyroid hormones are present in the body in excess, both biosynthesis and secretion of melatonin are activated, whereas if thyroid hormones are deficient, there is a sharp fall in biosynthesis of the hormone, leading to a marked fall in its entry into the blood stream. Release of melatonin into the circulation is not blocked after removal of the thyroid gland.

Consequently, the concentration of thyroid hormones in the blood largely determines the level of the nocturnal melatonin peak, and thus has an effect on many psychophysical reactions of the body.

The results of this investigation confirm the earlier view that the pineal and thyroid glands interact in accordance with a negative feedback principle, and they add to existing ideas relating to the role of thyroid hormones in pineal gland function.

LITERATURE CITED

1. E. S. Rom-Bugoslavskaya, L. A. Bondarenko, and V. S. Shcherbakova, Probl. Éndokrinol. (1984).
2. E. S. Rom-Bugoslavskaya and L.A. Bondarenko, Probl. Éndokrinol., No. 5, 82 (1984).
3. E. S. Rom-Bugoslavskaya, L. A. Bondarenko, and V. S. Shcherbakova (V. S. Scherbakova), Third Colloquium of the European Pineal Study Group, Pex (1984), p. 53.
5. E. S. Rom-Bugoslavskaya and L. A. Bondarenko, Acta Physiol. Hung., **70**, No. 4, 397 (1987).