

Thyroxine Secretion Rate of Mice.* (25333)

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The thyroxine secretion rate of mice was first determined by Hurst and Turner(1) using the goitrogen technic. Secretion rate in terms of D.L-thyroxine for various strains of female mice was as follows: C₃H averaging 19.6 g, 2.2 μ g; Schwing 19.9 g, 5.5 μ g; and Rockland 32.7 g, 2.1 μ g. This method is satisfactory for groups but cannot estimate individual thyroxine secretion rate. Amin *et al.* (2) applied a radioiodine thyroxine secretion rate technic to several strains of mice. The strain of mice used in our laboratory for study of mammary gland growth is described as "Swiss-Webster" obtained originally from Taconic Farms by R. F. Beyer and Son, Billings, Mo. In the extension of our studies to determine the role of thyroxine in mammary gland growth, it became necessary to determine the variation and mean thyroxine secretion rate (TSR) as a preliminary to replacement studies.

Materials and methods. Adult male and female mice (Beyer strain) were kept under conditions of uniform temperature ($78 \pm 1^\circ\text{F}$) in a room artificially illuminated during normal daylight hours and fed Purina Lab. chow. Each animal was injected i.p. with 3 μ C carrier-free I¹³¹. Maximum uptake was observed about 24 hrs later. Recycling of metabolized I¹³¹ was prevented by feeding 0.01% tapazole in the ration. The procedure described for the rat(3) was followed except that increments of thyroxine were 0.5 μ g/100 g body weight. The dose which prevented further thyroidal-I¹³¹ output in each mouse (95-100% of previous count) was estimated as its

TSR. Animals were gonadectomized 4 weeks previous to the determination of TSR.

Results. The mean TSR of the intact male and female mouse of this strain at the same age was identical, 1.2 μ g/100 g body weight per day (Table I). In both the male and female, gonadectomy did not significantly reduce the TSR with the numbers included. In the female no significant change in TSR was noted with increasing age between 120 and 230 days of age. The mean TSR of 66 female mice was 1.25 ± 0.05 μ g/100 g body weight with a range between 0.5 and 2.0 μ g.

Discussion. Only a single previous study of thyroxine secretion rate in the mouse has appeared(2) in which the estimation was based on I¹³¹ method. The TSR of inbred strains of male and female were as follows: A/Jax 2.13 ± 0.12 μ g and 1.84 ± 0.10 ; BALB/c 2.44 ± 0.21 μ g and 1.84 ± 0.12 ; C57BR/cd 3.35 ± 0.34 μ g and 2.45 ± 0.11 and C57BL/6 4.10 ± 0.64 μ g and 3.33 ± 0.34 . The TSR of the males of each strain was consistently, but not significantly, higher than the female. In the present study no sex difference was noted in the Beyer strain. The mean TSR of the females (1.25 ± 0.05 μ g) is lower than any of the inbred strains and in 2 cases only $1/2$ as high.

The range in TSR of all age groups of female mice is of especial significance (0.5 to 2.0 μ g/100 g body weight). Optimal levels of thyroxine for mammary gland growth can now be estimated in relation to the highest observed TSR. It is suggested that part of the variation in the extent of mammary gland growth in mice may be due to low TSR of individual mice. By the administration of thyroxine, equal to or above the highest level observed, deficiencies of thyroxine in relation to mammary gland growth may be eliminated.

Summary. The mean thyroxine secretion rate (TSR) of "Swiss-Webster" intact male and female mice at the same age (120 days) was identical, 1.2 μ g/100 g body weight per

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TABLE I. Thyroxine Secretion Rate of Mice.

Group	Age, days	No. of mice	TSR ($\mu\text{g}/100$ g body wt)	Distribution of TSR				
				.5 μg	1 μg	1.5 μg	2 μg	2.5 μg
♂ Intact	140	14	1.20 $\pm$.15*	3	6	3	1	1
♂ Castrate	140	12	.83 $\pm$.06	6	5		1	
♀ Intact	120	26	1.26 $\pm$.07		16	6	4	
♀ "	140	10	1.20 $\pm$.11		7	2	1	
♀ "	180	9	1.33 $\pm$.14	1	2	5	1	
♀ "	230	13	1.19 $\pm$.01	2	5	5	1	
♀ "	All age groups	66	1.25 $\pm$.05	3	30	18	7	
♀ Castrate	180	7	.92 $\pm$.06	1	6			

* Mean $\pm$ S.E.

day. Gonadectomy produced a consistent, but not significant, reduction in TSR in both sexes. In the female no significant change in TSR was noted with increasing age between 120 and 230 days of age. The mean TSR of 66 female mice maintained at a temperature of $78 \pm 1^\circ\text{F}$ was $1.25 \pm 0.05 \mu\text{g}$ 1-thyroxine/100 g/day, with a range between 0.5 and 2 μg .

1. Hurst, Victor, Turner, C. W., *Mo. Agr. Exp. Sta. Res. Bull.* 417, 1948.

2. Amin, A., Chai, C. K., Reineke, E. P., *Am. J. Physiol.*, 1956, v187, No. 3; *Am. J. Physiol.*, 1957, v191, 34.

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Preferential Concentration of C¹⁴ in Posterior Pituitary Following Hydrocortisone C¹⁴ Injection.* (25334)

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Preferential uptake of some hormones by the pituitary gland has been reported by several investigators. Riegel *et al.*(1) have found the concentration of C¹⁴ progesterone to be much higher in the pituitary and adrenals of rats than in plasma or other tissues. Joliot *et al.*(2) and other investigators(3-5) noted a preferential accumulation of thyroxine I¹³¹ in the posterior pituitary. Courier and Zizine (6) observed that 2 hours after administration of C¹⁴ cortisone to rabbits, the kidneys and posterior pituitary had slightly higher tissue plasma ratios than other organs. In view of the great interest in the regulation of steroid hormone levels by the pituitary and hy-

pothalamus, we undertook to confirm and extend these observations.

Methods. Hydrocortisone 4-C¹⁴ (1.47 $\mu\text{C}/\text{mg}$) was injected intravenously into 4 rats, 5 guinea pigs and 2 rabbits. The amounts of hydrocortisone injected approximately doubled the hormone content in the body.[§] The animals were anesthetized with ether, and the hormone in 1 ml of aqueous alcohol was injected into the foot vein. After 15 to 30 minutes, the vena cava was severed and the animal perfused through the aorta with 0.9% sodium chloride solution. The tissues were then excised, weighed, homogenized in 75% methanol and centrifuged. Precise separation

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[§] Hydrocortisone is the normal adrenal secretory product of the guinea pig, while the rat and rabbit primarily secrete corticosterone(7). Apparently, corticosterone and hydrocortisone are handled similarly by the rat(8).