

Thyroid-Catecholamines Interrelationships in Free Fatty Acids Release from Adipose Tissue

It was previously found that in hyperthyroid rats there is greater release of free fatty acids (FFA) from the mesenteric adipose tissue (MAT), as well as the enhancement of this FFA release after addition of adrenaline¹. It is known that the effect of exogenous catecholamines on FFA release from adipose tissue can be blocked by use of a suitable sympatholytic drug, e.g. by phentolamine (PA)^{2,3}. This sympatholyticum was used in the present work to ascertain the possible role of endogenous catecholamines in the enhancement of the release of FFA from adipose tissue in hyperthyroidism.

Method. White female rats of Konárovce strain were used in 3 experimental series. The hyperthyroid state was elicited by augmenting the diet by 0.1 g of desiccated thyroid (Spofa) per animal per day for one month in the first series; in the third series 1 mg of thyroxine (Roche) per animal per day was injected intraperitoneally for 6 consecutive days prior to termination of experiment. In the second series only euthyroid rats without any treatment were used. The incubation medium and procedure were the same as in previous work¹. The FFA concentration was determined by DOLE's method⁴. The concentration of adrenaline (A) was always 2.5 µg/ml of incubation medium, the concentration of phentolamine (Regitin, Ciba) is given in the Table.

Results. Only statistically significant results (given in the Table) are discussed.

Series I: It is evident that after addition of PA there is an inhibition of FFA release from MAT of hyperthyroid and, somewhat surprisingly, in euthyroid rats also. The increased release of FFA after A addition was blocked by PA in both groups also, but it was somewhat higher in comparison with 'native' values recorded without addition of A.

Series II: The results of this series confirm the observation of series I, namely that PA prevents the release of FFA from MAT even in normal, euthyroid animal. In this series also the adrenaline-enhanced release of FFA blocked by PA was higher than the 'native' release, i.e. without any addition.

Series III: In this series different concentrations of PA were used in order to find the amount of PA which will lower the enhanced FFA release in hyperthyroidism to the euthyroid values and thus semiquantitatively show the increased catecholamines concentration in hyperthyroid adipose tissue. From the Table it is clear that in the presence of PA – 2.10⁻⁵ M in incubation medium – the release of FFA from MAT of hyperthyroid group was lowered to the 'native' euthyroid value, i.e. there occurred

a small net uptake of FFA from medium to the MAT. With increasing the concentration of PA, an enhancement of FFA uptake by MAT was found. As in the first series, the 'speed' of FFA release from (or uptake to) MAT remains higher (or lower uptake) in hyperthyroid group regardless of the presence of PA (or A in first series).

Discussion. PA inhibited the 'native' release of FFA from rat MAT not only on hyperthyroid but also in normal, euthyroid group. This finding suggests that the presence of certain amounts or activity of endogenous catecholamines is a condition *sine qua non* for mobilization of depot fat in the form of FFA. From this it further follows that such a factor – e.g. hyperthyroidism⁵ – which enhances the activity of catecholamines can influence the FFA release by augmenting the lipolytic effect of endogenous catecholamines; analogously to the case of exogenous catecholamines in eu- and hyperthyroid state¹. It can be mentioned here that the mobilization of fat from depots was shown to cease when regional afferent sympathetic fibres are dissected^{6,7}. The findings of the present work substantiate the possibility that high level of blood FFA in hyperthyroid individuals⁸ is caused by enhanced activity or greater amount of catecholamines. The question whether or not the thyroid can exaggerate the FFA release from adipose tissue in the total absence of catecholamines remains to be investigated.

Zusammenfassung. Die Abgabe freier Fettsäuren aus dem mesenterialen Fettgewebe kann durch Phentolamin nicht nur bei hyperthyreoten, sondern auch bei euthyreoten Ratten blockiert werden. Die erhöhte Freisetzung bei Hyperthyreose lässt sich wahrscheinlich durch eine gesteigerte Katecholaminaktivität erklären.

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FFA release from MAT in mEq/l incubation medium (mean ± standard error)

Series	Group	No. of animals	Medium albumin	Albumin + phentolamine 4 · 10 ⁻⁴ M	Albumin + adrenalin	Albumin + adrenalin + phentolamine 4 · 10 ⁻⁴ M
I.	Euthyroid	6	0.017 ± 0.08	−0.13 ± 0.03	0.56 ± 0.17	0.12 ± 0.06
	Hyperthyroid	6	0.33 ± 0.17	−0.05 ± 0.04	1.22 ± 0.51	0.44 ± 0.16
II.	Euthyroid	10	0.12 ± 0.08	−0.11 ± 0.05	0.95 ± 0.12	0.26 ± 0.13
			Medium albumin	Albumin + phentol- amine 2 · 10 ⁻⁵ M	Albumin + phentol- amine 4 · 10 ⁻⁵ M	Albumin + phentol- amine 4 · 10 ⁻⁴ M
III.	Euthyroid	5	−0.004 ± 0.036	−0.09 ± 0.05	−0.11 ± 0.05	−0.17 ± 0.05
	Hyperthyroid	5	0.07 ± 0.03	−0.006 ± 0.01	−0.06 ± 0.10	−0.09 ± 0.03