information readily available[2] on this subject we decided to estimate the saliva–serum ratios of tritium 3 hr. after the administration of tritiated water in human subjects. The test was performed on 6 physically healthy subjects. 10 ml. of tritiated water containing 500 μc. tritium were given orally immediately before breakfast. 3 hr. later, samples of venous blood and saliva were collected. Water was obtained from serum and saliva by the technique described by Cooper *et al.*[3] and the tritium was estimated in a liquid scintillation counter.

Table 1

Sex	Age	Saliva water (c.p.s.)	Serum water (c.p.s.)	Ratio saliva–serum
F	38	68·6	68·0	1·01
F	45	67·7	67·5	1·00
F	35	54·4	55·6	0·98
M	32	53·8	52·6	1·02
M	36	63·5	64·2	0·99
M	34	59·5	59·3	1·00
Mean		61·25	61·20	1·00

Table 1 shows the results. The saliva–serum ratio at 3 hr. ranged from 0·98 to 1·02 with a mean of 1·00. Thus 3 hr. after its oral administration the tritium in the salivary gland has reached equilibrium with the water in the serum and there is no evidence that the salivary gland is able to concentrate tritium. If the differential concentration of deuterium oxide is related to the atomic weight of deuterium it would seem that this effect should be at least as equally marked with tritium.

Taggart and Hytten raised the possibility that some substance in saliva had distilled across with the water and affected the density of the distillate and thus the estimation of deuterium oxide by the falling drop method. In view of our findings, therefore, it would be useful to have the results of saliva–serum ratios of deuterium oxide estimated by mass spectrometry.

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Effect of Thyroxine and 2,4-Dinitrophenol on Levels of Ubiquinone and Ubichromenol in the Rat

The observation by Aiyar *et al.*[1] that thyrotoxicosis in the rat is accompanied by an increase in liver ubiquinone prompts us to record our own related findings. We have investigated the effect of thyroxine and 2,4-dinitrophenol on both ubiquinone and ubichromenol-levels in the rat, using animals from a stock colony and also from a vitamin-E deficient colony. Female rats were used, aged 3–4 months in one experiment and aged 15 months in another. The animals were divided into groups of six, and test groups received thyroxine, thyroxine and α-tocopheryl acetate, or 2,4-dinitrophenol. After three weeks on test, the rats were killed, and their hearts and livers (each organ pooled with others from the same group) were analysed for ubiquinone and ubichromenol by the method of Diplock *et al.*[2].

Table 1. Female Rats of the Norwegian Hooded Strain were used in Groups of Six

In Exp. 1, the rats were 3–4 months old; in Exp. 2, 15 months old. The supplements were: Exp. 1, thyroxine, 2,4-dinitrophenol and α-tocopheryl acetate all at 25 μgm./gm. of diet; Exp. 2, thyroxine 5 mgm. and 2,4-dinitrophenol 1·25 mgm. divided into bi-weekly doses intraperitoneally

Exp.	Group treatment	Ubiquinone (μgm./gm.)		Ubichromenol (μgm./gm.)	
		Heart	Liver	Heart	Liver
1	Adequate vit. E control	205	127	4·4	80·6
	Adequate vit. E + thyroxine	179	342	8·4	119
	E-def. control	149	162	4·0	46·8
	E-def. + thyroxine	180	227	9·4	83·0
	E-def. + thyroxine + α-tocopheryl acetate	199	235	9·9	82·0
	E-def. + 2,4-dinitrophenol	241	182	25·5	69·5
2	E.-def. control	159	96	15·7	34·1
	E-def. + thyroxine	141	482	14·3	148
	E-def. + 2,4-dinitrophenol	143	114	14·4	47·4

The results are given in Table 1, the figures for ubiquinone and ubichromenol representing the total isoprenologue content[3] in each case.

In both rats receiving adequate vitamin E and those deficient in this vitamin, thyroxine produced large increases in the ubiquinone- and ubichromenol-levels in the liver, these increases being particularly marked in the older group of vitamin-E deficient rats. Indeed, the levels in the livers of the latter animals are considerably higher than any others so far observed by us in the course of several hundred tissue analyses. The effects of thyroxine on levels in the heart were less marked generally. The further supplementation of the thyroxine group with α-tocopheryl acetate produced no noticeable effects in these experiments. When 2,4-dinitrophenol was given to vitamin-E deficient rats in an amount equivalent to thyroxine on a molecular basis, little effect was observed; but, when larger, nearly toxic doses of 2,4-dinitrophenol were given, a sharp increase in ubiquinone and ubichromenol occurred in the heart, although the liver was relatively unaffected.

Although 2,4-dinitrophenol and thyroxine are both agents that uncouple oxidative phosphorylation, their mode of action is different. It is possible that the above effects on ubiquinone- and ubichromenol-levels *in vivo* may be related to this uncoupling activity and that the differences observed may reflect the difference in mode of action; alternatively, they may be caused simply by a differing uptake of thyroxine and 2,4-dinitrophenol by the heart and the liver. Whether the increases in ubiquinone and ubichromenol are due to enhanced synthesis or to less-efficient utilization of these lipids cannot be deduced from these experiments, but the results here are qualitatively different from those of other experiments on the specific influence of vitamin-E on the levels of ubiquinone in the rat, in which a direct effect on synthesis is more clearly indicated.

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