In an earlier study it was found that the amount of interstitial albumin in 100 g of dog kidney was equivalent to the albumin content of 6.4 ml of plasma[6]. From this value and the turnover time it can be calculated that the albumin content of $^1/_6$ ml of plasma entered and left the interstitium each minute. This value is in agreement with the estimate by SZABO and MAGYAR[12] of 10 g plasma protein per day. As the albumin concentration in lymph is about 40–70% that of blood plasma, a lymph flow of approximately $^1/_4$ to $^1/_3$ ml per min/100 g kidney can account for all the drainage of interstitial albumin. This corresponds to the value of 0.35 ml per min/100 g, which can be obtained from the figures given by O'MORCHOE and O'MORCHOE[13] if, instead of body weight, kidney weights are taken into account. We conclude from these calculations that renal lymph flow may be sufficient to drain all the albumin from the interstitium of the dog kidney, and that, although a direct reflux of albumin into the capillaries cannot be excluded, the latter process does not seem to play a significant role under our experimental conditions.

Experiment no.	Duration of collection (min)	Mean flow (mg/flow)	Mean transit time (min)
1	0– 50	8.0	15.9[b]
2	0– 43	6.5	58.4
	0– 60	12.8	23.9[b]
3	0– 60	16.5	34.1
	0– 60	23.9	41.8
5	0–180	21.6	63.7
6 Hilar	0– 60	28.0	32.0
Capsular	0– 60	2.6	32.8
7	0– 60	7.9	51.1
	0– 43	2.1	21.1[b]
8	0–105	22.6	38.2

Mean, 37.5; S.D., 14.5. In experiments Nos. 2, 3 and 7 the determination was repeated after 2 h. [b] indicates mannitol diuresis.

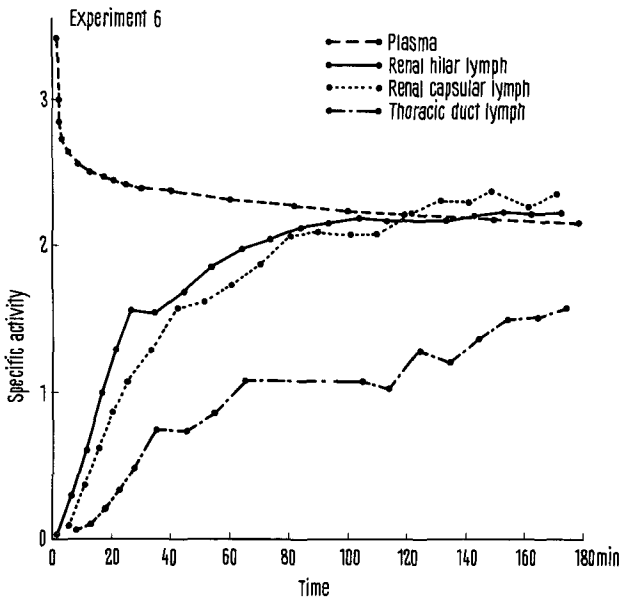

Fig. 2. I^{131}/I^{125} albumin ratio vs. time curves in arterial plasma, renal hilar and capsular lymph and in thoracic duct lymph.

Résumé. On a déterminé le renouvellement de l'albumine plasmatique dans les interstices du rein. Le temps moyens de passage fut de 37,5 min. Un flux lymphatique de 0,3–0,4 ml par min/100 g tissu rénal parut suffisant pour le drainage total de l'albumine interstitiel du rein.

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Calorigenic Effect of Noradrenaline in the Norwegian Lemming, *Lemmus lemmus* (L.)

Control of non-shivering thermogenesis is mediated through the sympathetic nervous system, and noradrenaline (NA) is the main mediating hormone[1–4]. NA may mobilize the release of free fatty acids (FFA) and also activate their subsequent oxidation or re-esterification[5,6]. The calorigenic action has been observed to be mediated by the adrenergic β-receptors[7], and because propanolol (Inderal) is a specific β-receptor blocking agent, it has been used in these studies[8,9]. The aim of the present study was to measure the non-shivering thermogenesis in the lemming and the possible effect of NA on the plasma level of FFA.

Material and methods. Adult male lemmings weighing 60.6 ± 11.7 g were maintained individually in cages at 0 °C or at 30 °C in constant light conditions for 3–4 weeks. Care of animals was as described earlier[10]. Oxygen consumption was measured at 5 °C and at 28 °C using Beckman E 2 oxygen analyzer with open circuit system[10]. Doses of NA and Inderal were 0.3 mg and 10 mg/kg of body weight, respectively. All injections were given i.p. Controls received the same amount of saline solution.

The effect of NA on the FFA content in the blood plasma was measured from the decapitated animals 15 min after the application of 0.3 mg/kg of NA. Blood was heparinized, centrifuged, and 0.5 ml of the serum was analyzed for the FFA content according to the method of DOLE[11] as modified for microdetermination by NOVAK[12].

Results. At 28 °C, which represents the thermoneutral zone, the control level of the oxygen consumption was significantly higher ($P < 0.01$) in cold-acclimatized than in warm-acclimatized animals (Figure). The calorigenic effect of NA seems to depend at this temperature on the acclimatization level. In warm-acclimatized lemmings the metabolic rate increased 105% and in cold-acclimatized lemmings 117% above the basal level. At the same time body temperature was elevated from 37.8–41.1 °C and

from 38.9–42.2 °C, respectively. At lower ambient temperature there was no significant difference between control values. The metabolic effect of NA was lower than in the former ambient temperature or 36% in warm- and 41% in cold-acclimatized lemmings.

The Figure also shows the effect of Inderal. At higher ambient temperature neither warm- nor cold-acclimatized animals were affected. However, in warm-acclimatized animals the oxygen consumption was significantly lower ($P < 0.01$) after an injection of Inderal than in the cold-acclimatized animals. At lower ambient temperature the Inderal decreased metabolic rate in cold- and warm-acclimatized animals 67% and 78%, respectively. At the same time, body temperatures were decreased from 38.2–37.1 °C and from 38.0–36.7 °C, respectively. Shivering was seen, but its magnitude was not measured.

The basic value for FFA content in the blood of cold-acclimatized lemmings was 369 ± 10.9 µEg/L (S.E.M.) ($N = 7$) and in warm-acclimatized lemmings 283 ± 20.4 µEg/L (S.E.M.) ($N = 8$). The difference is significant at the level of $P < 0.01$. After the application of NA, the FFA content increased up to 1340 ± 61.1 µEg/L (S.E.M.) ($N = 8$) and to 1096 ± 76.3 µEg/L (S.E.M.) ($N = 8$) in cold- and warm-acclimatized lemmings, respectively. This difference is not significant.

Conclusion. In the rat and the guinea-pig there is a positive correlation between the cold-induced non-shivering thermogenesis and the heat production after the injection of NA[13,14]. The present result is, however, in contrast to those observations. In spite of 30 ° difference in acclimatization temperature, the heat production after the dose of NA was as great in both acclimatizing groups both at 28 °C and at 5 °C. It may be that still lower ambient temperature would have been needed to uncover a possible difference between these groups. On the other hand, this result resembles those obtained in cold- and warm-acclimatized hedgehogs[13] and in hamsters[15]. The similarity in the magnitude of NA mediated heat production was confirmed with specific non-shivering thermogenesis blocking agent.

The FFA content in the blood plasma is in agreement with the results obtained in the cold- and warm-acclimatized rats by HANNON et al.[16]. Thus the result obtained does not support the observations that the effect of NA is secondary to its effect on the plasma FFA content. Although it was not studied, the turn-over rate of lipids may be higher in cold-acclimatized animals. In conclusion, the similarity in the magnitude of the non-shivering thermogenesis in both acclimatized groups suggests that its cold-induced elevation is not a general phenomenon in cold-acclimatized mammals.

Zusammenfassung. Der kalorigene Effekt des Noradrenalins wurde bei *Lemmus lemmus* L. untersucht. Die Hälfte der Tiere wurde bei Kälte (0 °C) und die andere Hälfte bei Wärme (30 °C) akklimatisiert. Beide Gruppen zeigten nach NA-Injektion Übereinstimmung auch hinsichtlich der freien Fettsäuren.

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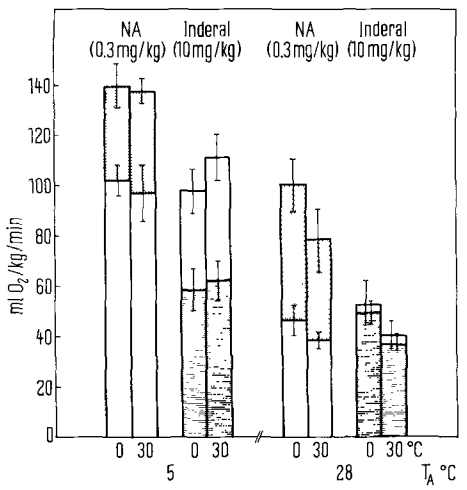

Metabolic response of cold-acclimatized (0 °C) and warm-acclimatized (30 °C) lemmings measured at 5 ° and at 28 °C. (1) Open bars are the control values, (2) solid bars indicate metabolic rate after the injection of 0.3 mg/kg of NA, and (3) transverse-hatched bars indicate metabolic rate after blocking non-shivering thermogenesis with Inderal as measured 20 min after the application. Each bar gives the average of 7–8 measurements and standard deviations are indicated.

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Electrophysiological Evidence for the Action of Light on the Pineal Gland in the Rat

Environmental lighting exerts important effects on pituitary-gonadal functions which are in part mediated by the pineal gland, i.e. by the methoxy indoles synthesized and elaborated by the pineal[1]. Light reduces the ability of the rat pineal gland to synthetize melatonin, one of the methoxy indoles[1]. This inhibitory effect of light is mediated via a pathway involving the retina, the inferior accessory optic tracts and postganglionic sympathetic fibers from

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