Injection of NE (20–65 μg/kg i.v.) was followed by the expected depolarization of the impaled cell (Figures 2 and 3). Concurrent with this depolarization came a decrease in the resistance of the cell membrane, the resistance reaching a minimum at the time of maximum depolarization (trace 3, Figures 2 and 3). As the cell repolarized, the membrane resistance returned toward its pre-stimulus level (traces 4–6, Figures 2 and 3). Such changes in membrane conductance were noted in all brown fat cells examined. These observations thus indicate, that following NE injection an increase in the permeability of the membranes of the cells occurs concurrently with the depolarization.

The demonstration of this increased permeability lends support to the view that activation of the brown fat cell is accompanied by an increased energy requirement[2,3,7,8]. That is, if the membrane remained relatively impermeable, the depolarization-repolarization sequence might have involved the transfer of only a few ions and required little additional energy. However, as a result of the increased permeability, the ionic fluxes across the membrane must be substantially greater (i.e., the membrane behaves as if it were a 'sieve') and thus, considerably more energy may be required to restore the ionic distribution to the pre-stimulus conditions. Such an increased work load would be consistent with our previous suggestion, i.e., that maintenance of the elevated rates of oxygen consumption as observed when brown fat is activated in vivo may be sustained by an increased energy turnover rather than dissociation of cellular respiration from energy conservation[2,3,7–9].

Résumé. La dépolarisation de la membrane des cellules adipeuses brunes, produite par l'administration in vivo de noradrénaline, est aussi accompagnée d'une augmentation de la perméabilité mesurée par une augmentation de la résistance membranaire.

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Syndroma of Forced Weaning in Nursing Female Rats

Functional and morphological changes, which are obviously associated with milk production, occur in the organism of rats during lactation: Hyperphagia is accompanied by hyperplasia of the mucosa of the small intestine[1], changes occur in the liver[2], bone[3], adrenals[4], in serum lipoproteins[5], etc. It would, therefore, not be surprising if the forced weaning of the offspring led to more severe disturbances in the equilibrium of this increased metabolism.

As early as in 1936, PUGSLEY[6] demonstrated hypercalcuria after removal of the young. In our rats, the sudden interruption of suckling led to hyperphosphataemia and the development of postreproductive arteriopathy[7]. Nephrocalcinosis, appearing acutely within 24 h after forced weaning, has been detected as a further anatomical finding in our rats[8].

Recently, we investigated the serum levels of sodium, potassium, magnesium, glucose, cholesterol and β-lipoproteins after forced weaning.

Material and methods. 60 female Wistar rats aged 3–4 months were divided in 2 equal groups (according to the diet used). Each of these rats suckled 12 young of her first litter and forced weaning was carried out on the 21st day of lactation. On this day one half of the rat mothers was killed. The second half of each of the two groups was killed on the 22nd day after delivery, i.e. 24 h after forced weaning.

In the blood serum the above-mentioned components were estimated by following methods: glucose by means of the colorimetric method with *o*-toluidine[9], sodium and potassium by flame photometry, magnesium with the colorimetric method using thiazol yellow[10], cholesterol with the modified colorimetric method according to PEARSON[11] and β-lipoproteins by means of the turbidimetric method[12].

Diets: 1. The so-called Larsen diet contained 1500 mg/100 g of calcium and 600 mg/100 g of phosphorus.

2. The diet DOS-II contained 1000 mg/100 g of calcium and 850 mg/100 g of phosphorus. The detailed composition of both these diets was given in our previous paper[13].

Control animals: In both groups there were 20 virgin female rats of the same age, fed 6–8 weeks before killing by the appropriate diet.

Results and discussion. No significant differences in food consumption were ascertained between analogical groups of diet 1 compared with diet 2.

The results are given in the Table. No significant differences were found after forced weaning in the levels of glucose, sodium and magnesium. Potassium showed a mild but significant decrease the day after forced weaning

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Levels of components examined in blood serum in time of weaning and 1 day later

	Larsen Controls $\lvert C_1 \rvert$	21st day $\lvert A_1 \rvert$	22nd day $\lvert B_1 \rvert$	DOS-II Controls $\lvert C_2 \rvert$	21st day $\lvert A_2 \rvert$	22nd day $\lvert B_2 \rvert$	Significance Larsen	DOS-II	Larsen × DOS-II
Sodium	141 ± 1.81	140 ± 1.84	143 ± 2.64	138 ± 4.57	140 ± 2.48	143 ± 2.86			
Potassium	6.4 ± 0.37	7.3 ± 0.60	6.1 ± 0.53	6.9 ± 0.43	7.4 ± 0.45	6.8 ± 0.44	$\boxed{A_1 \times B_1}$ $C_1 \times A_1$	$\boxed{A_2 \times B_2}$ $C_2 \times A_2$	$B_1 \times B_2$
Magnesium	3.0 ± 0.24	3.3 ± 0.26	3.6 ± 0.46	2.9 ± 0.15	3.2 ± 0.16	3.3 ± 0.25	$C_1 \times A_1$ $C_1 \times B_1$	$C_2 \times A_2$ $C_2 \times B_2$	
Calcium	11.3 ± 0.5	15.4 ± 1.6	16.5 ± 2.0	10.8 ± 0.5	13.2 ± 1.2	14.9 ± 1.3	$C_1 \times A_1$ $C_1 \times B_1$	$\boxed{A_2 \times B_2}$ $C_2 \times B_2$	$A_1 \times A_2$ $B_1 \times B_2$
Phosphorus	8.7 ± 0.9	5.9 ± 1.2	17.2 ± 2.8	10.9 ± 0.6	11.5 ± 1.3	14.3 ± 1.9	$\boxed{A_1 \times B_1}$ $C_1 \times B_1$	$\boxed{A_2 \times B_2}$ $C_2 \times B_2$	$C_1 \times C_2$ $A_1 \times A_2$ $B_1 \times B_2$
Glucose	158 ± 10.5	188 ± 27.4	170 ± 19.5	162 ± 9.6	177 ± 25.4	157 ± 23.1	$C_1 \times A_1$		
β-Lipoproteins	521 ± 115.6	402 ± 87.6	583 ± 130.0	488 ± 101.6	533 ± 101.9	680 ± 63.7	$\boxed{A_1 \times B_1}$ $C_1 \times A_1$	$\boxed{A_2 \times B_2}$ $C_2 \times B_2$	$A_1 \times A_2$ $B_1 \times B_2$
Cholesterol	87 ± 10.3	101 ± 18.6	113 ± 14.7	106 ± 6.3	128 ± 21.1	158 ± 32.8	$C_1 \times B_1$	$\boxed{A_2 \times B_2}$ $C_2 \times A_2$ $C_2 \times B_2$	$C_1 \times C_2$ $A_1 \times A_2$ $B_1 \times B_2$

The average values ± standard deviations are given for sodium and potassium in mE/l, for all other components in mg/100 ml. The significances are calculated at 5% of probability. The significant changes after forced weaning are indicated by symbols $\boxed{A_1 \times B_1}$ and/or $\boxed{A_2 \times B_2}$.

in both groups. The lipids followed showed a significant increase with the exception of cholesterol in Larsen-group where the cholesterol level was also increased but not significantly. On comparing the controls with experimental animals, there were significant differences in the majority of the examined substances; during lactation an increase in the levels of glucose, potassium, magnesium, cholesterol and calcium can be observed, while the blood phosphorus can be lower than in the controls. Nevertheless, these results apparently depend on the composition of the diet used. Even in controls there was a significant difference in the cholesterol levels between the groups fed different diets, the same applies to comparable groups of experimental animals as regards blood cholesterol and β-lipoproteins.

We were surprised to note that the blood sugars did not rise after forced weaning. The method used is not exactly specific for glucose and the results may be influenced by the presence e.g. lactose. When in mixture, the level of lactose influences the final result so that the estimated value for 'glucose' is always lower. Under our experimental conditions, a certain amount of lactose probably enters the blood stream.

The decrease of potassium after forced weaning could perhaps reflect the higher reclease of mineralocorticoids during the 'stress' situation of forced weaning.

The 'specific' effect of the diet on the consequences of forced weaning was particularly evident in one of our previous experiments[13]. Striking differences in this respect shows the serum phosphorus and calcium. The changes in the blood calcium and/or phosphorus after forced weaning might explain PUGSLEY's observation that hypercalcuria occurs if suckling had suddenly been stopped.

The preliminary conclusion can therefore be drawn that certain biochemical changes occur in the blood, urine and possibly in some organs after forced weaning of the young in female nursing rats. However, sometimes definitely pathological morphological changes develop. The consequences of forced weaning are dependent, in addition to other factors, on the composition of the diet, as well as, of course, on the stage of lactation at which suckling was stopped. In truly 'spontaneous' weaning, for example, no anatomical changes occur[14]. May be that the abovementioned changes after forced weaning do not necessarily characterize the situation completely. Thus, a number of questions requiring further research have arisen and we have therefore decided, to draw attention to this problem.

In our opinion, these symptoms should be preliminary designated as the syndrome of forced weaning.

Zusammenfassung. Als weitere Symptome des Syndroms der gewaltsamen Entwöhnung wurden bei den Rattenweibchen leichte Senkung des Kalis und zugleich Anstieg der β-Lipoproteine und des Cholesterol im Blutspiegel gefunden.

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