TABLE 1. Thyroxine, Triiodothyronine, and 11-HCS Levels in Blood Serum of Neonatal Rats (M ± m)

| Age of rats, days | Thyroxine, μg/100 ml | Triiodothyronine, ng/100 ml | 11-HCS, μg/100 ml |
|---|---|---|---|
| 5 | 2,4±0,6 | — | 2,3±0,3 |
| 15 | 5,8±0,7 | 97,5±9,0 | 4,6±0,5 |
| 30 | 2,9±0,5 | 33,0±8,9 | 11,6±1,7 |

Legend. Triiodothyronine was not tested in the blood serum of rats 5 days old.

TABLE 2. STH Concentration in Rat Pituitary Glands (M ± m)

| Age of rats, days | STH level | |
|---|---|---|
| | μg/ml tissue | μg per whole organ |
| 5 | 13,4±0,2 | 15,5±1,6 |
| 15 | 16,5±0,4 | 42,2±2,2 |
| 20 | 16,6±0,2 | 39,6±0,8 |

TABLE 3. Effectiveness of Utilization of Milk Proteins (M ± m)

| Age of rats, days | Body weight, g | Increase in body weight during 2-day and 4-day intervals, g | Increase in total body protein during 2-day and 4-day intervals, g | Protein consumption during 2-day and 4-day intervals, g | Efficiency of protein utilization, % |
|---|---|---|---|---|---|
| 1 | 6,33±0,77 | — | — | — | — |
| 3 | 7,78±1,28 | 1,45±0,51 | 0,20±0,05 | 0,27±0,05 | 74,50±1,70 |
| 5 | 9,95±2,13 | 2,17±0,85 | 0,30±0,06 | 0,34±0,08 | 92,10±4,80 |
| 7 | 15,93±3,02 | 5,98±0,89 | 0,48±0,07 | 0,51±0,09 | 93,70±4,70 |
| 11 | 25,56±4,04 | 9,63±1,02 | 1,27±0,14 | 1,41±0,16 | 90,2±3,90 |
| 15 | 40,28±4,35 | 14,72±0,31 | 2,02±0,20 | 2,05±0,25 | 98,60±0,90 |
| 19 | 49,69±5,58 | 9,41±1,23 | 1,92±0,21 | 2,44±0,32 | 78,80±0,60 |
| 23 | 60,72±5,25 | 11,03±0,33 | 1,06±0,38 | 2,39±0,52 | 67,80±2,80 |

11-HCS were determined fluorometrically [1], thyroid hormones by radioimmunoassay [10] using labeled hormones and specific antisera from CIS (France).

The efficiency of protein utilization was determined by the method described previously [3].

## EXPERIMENTAL RESULTS

Data on the content of thyroid hormones and 11-HCS in the blood serum of rats in the early postnatal period are given in Table 1.

The serum thyroxine level in rats on the 15th day after birth was significantly higher than on the 5th day ($P < 0.001$). Later, until the 30th day, a marked fall of the thyroxine level was observed. The serum triiodothyronine concentration in the rats was considerably higher on the 15th day than on the 30th day ($P < 0.001$).

The serum concentration of biologically active glucocorticoids increased successively and significantly from the 5th to the 15th day and from the 15th to the 30th day, with the highest concentration in the stage of transition to ordinary feeding.

Table 2 gives data on the STH level in the pituitary gland of neonatal rats.

On the 15th day (compared with the 5th day) there was a statistically significant ($P < 0.001$) increase in STH production. This increase in STH production was probably connected with growth of the pituitary and its differentiation, for when calculated per milligram of tissue no significant changes in STH production could be found.

The results of determination of the efficiency of protein utilization during 23 days of the postnatal period are given in Table 3.

During the first 5 days the efficiency of protein utilization increased from 74.5 to 92.1%. This high level of productive protein utilization was maintained from the 5th through the 15th days of the postnatal period. On the transition to definitive feeding a sharp decrease in the efficiency of protein utilization was observed (to 67%).

In the stage of transition from embryonic to milk feeding an increase in the secretion of thyroid hormones and STH was thus observed, accompanied by an increase in the efficiency of protein utilization. In the next stage (milk feeding) a high level of protein utilization was maintained and an increase in the secretion of thyroxine, triiodothyronine, and STH was observed. Later, with the transition to ordinary feeding, a decrease in the serum levels of thyroid hormones and a decrease in the efficiency of protein utilization were observed: the STH level in the stages of milk feeding and transition to definitive feeding showed virtually no difference.

The quantities of thyroxine and triiodothyronine discovered in the stage of milk feeding are comparable with those found in sexually mature animals [7]. A high level of thyroid and thyrotrophic hormones in rats in the neonatal period also was observed by Dussault [5]. STH is secreted by sexually mature animals in larger quantities than in produced during the period of milk feeding [2, 6, 12].

Glucocorticoid production in the neonatal period increases to correspond to the formation of the steroid-synthesizing function of the adrenals. The quantity of 11-HCS which, as we know, stimulates protein catabolism, is significantly less in the early postnatal period than in mature animals, further evidence of the predominantly anabolic direction of regulation of protein metabolism in the stage of milk feeding.

Anabolic hormones of the reproductive system evidently do not play an essential role in maintenance of a high level of utilization of milk protein. As was shown previously [9], the limiting stage of steroid production, namely 17-$\beta$-hydroxysteroid dehydrogenase, is not formed in rats until the 45th-60th day. It is during this period that production of the principal sex hormones, testosterone and androstenedione [9, 11], reaches its maximal values.

It can be postulated that hormonal regulation of the extraordinarily high level of protein utilization in the stage of milk feeding is maintained by thyroid hormones and, to a certain degree, by STH. The alimentary specificity of the milk proteins, promoting the anabolic utilization of amino acids in the newborn, is of great importance.

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