fibers the primary endings will be deformed to a greater degree than the secondary, with the result that the discharge will be intensified. This explanation may account for the differences in the response of the primary and secondary endings in the animals receiving thyroid.

Changes in the sensitivity of primary endings of the intrafusal fibers may evidently be one cause of the motor disturbances arising in thyrotoxicosis.

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AGE DIFFERENCES IN THE ACID – BASE BALANCE AND BLOOD CLOTTING SYSTEM DURING STARVATION

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The state of the acid–base balance and of the blood clotting system during starvation was studied in young (5-6 months) and old (24-26 months) male rats. The times of maximal changes in the two systems were found to coincide, but in the young animals the acidotic crisis and hypercoagulation developed earlier and were more severe. The old animals were more resistant to starvation and died later than the young rats.

KEY WORDS: starvation; age; acid–base balance; blood clotting.

Some workers have regarded starvation as a therapeutic factor in certain diseases and also as a condition favoring the prolongation of life [1, 3, 4, 8]. This latter view is particularly interesting in the light of data

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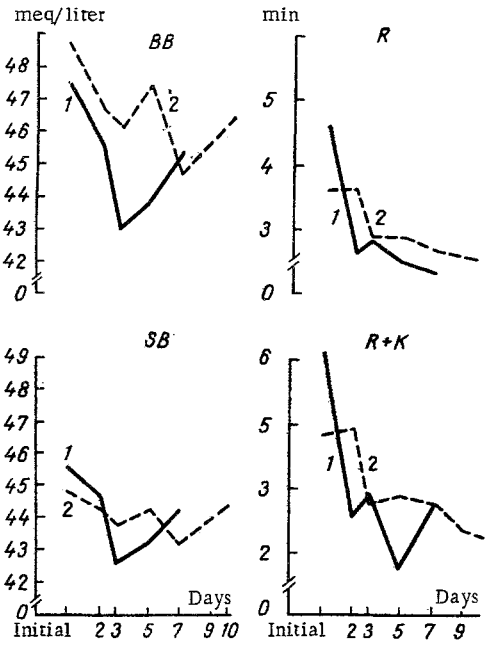

Fig. 1. Effect of starvation on indices of ABB (BB – buffer bases, SB – standard bicarbonate) and blood clotting (T – reaction time, R + K – clotting time) in young (1) and old (2) rats.

showing that the system of homeostasis is less reliable in the later stages of ontogeny, largely as a result of changes in the physicochemical properties of the blood [7].

The state of the systems of acid–base balance (ABB) and blood clotting and their interconnection were investigated in animals of different ages totally deprived of food.

EXPERIMENTAL METHOD

Male rats aged 5-6 and 24-26 months were used. After determination of the initial state of the ABB in whole blood and of the blood clotting system the animals were kept in separate cages and completely deprived of food (with no restriction on water), and the parameters of the two systems were determined periodically until the rats died. The ABB was investigated on a micro-Astrup apparatus (Radiometer, Denmark). The following parameters were determined: pH, the partial pressure of carbon dioxide (pCO_2, in mm Hg), buffer base (BB, in meq/liter), the buffer base shift (BE, in meq/liter), standard bicarbonate (SB, in meq/liter), actua bicarbonate (AB, in meq/liter), and the total carbon dioxide (tot CO_2, in meq/liter). The state of the blood clotting system was investigated by means of the Tromb-2 (USSR) thromboelastograph. The following parameters of the thromboelastogram were determined: reaction time (R, in min), clot formation time (K, in min), the clotting time (R + K, in min), maximal amplitude (Ma, in mm), maximal elasticity of the clot (ME, in %), and the angular constant ($< \alpha$, in deg). The dynamics of loss of weight of the animals and of their survival also was recorded. The numerical results were subjected to statistical analysis [2, 5].

EXPERIMENTAL RESULTS AND DISCUSSION

Changes in the ABB system were similar in direction in the two age groups and indicated the onset of compensated metabolic acidosis during starvation. For instance, after starvation for 48 h all indices of the metabolic components of the ABB system were lowered, especially in the young animals: BE from -0.9 ± 0.21 to -2.0 ± 0.20 meq/liter; SB from 23.6 ± 0.20 to 22.6 ± 0.14 meq/liter; BB from 47.5 ± 0.27 to 45.6 ± 0.23 meq/liter; tot CO_2 from 23.1 ± 0.31 to 21.7 ± 0.18 meq/liter ($P < 0.001$ in all cases). No significant change took place in the pH of the blood as a result of a compensatory decrease in the CO_2 concentration.

After starvation for 48 h the blood clotting activity of the young animals was considerably increased: R, K, and R + K were reduced by 1.9, 0.7, and 2.6 min respectively ($P < 0.05$); $< \alpha$ rose by 7.8° – a tendency was observed for Ma and ME to increase also. In the old rats there was only a tendency toward the corresponding changes in most of the indices studied; only the R + K index fell by a statistically significant degree, by 1.34 min ($P < 0.05$).

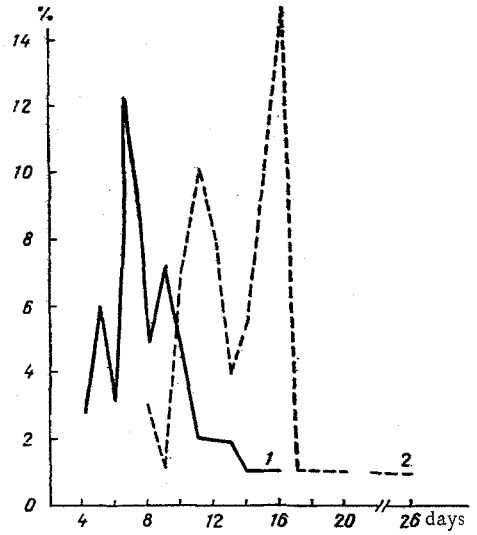

Fig. 2. Time of death of young (1) and old (2) rats during starvation. Abscissa, period of starvation (in days); ordinate, percentage of animals dead.

On the subsequent days of starvation the changes described above increased in the animals of both age groups; they were more severe in the young animals and reached their maximum sooner than in the old rats (Fig. 1). For instance, the sharpest changes in the ABB indices (the acidotic crisis) were observed on the third to fourth day in the young animals. The thrombogenic potential of the blood also was highest at these times. The pH of the blood fell in the young animals from 7.41 ± 0.003 to 7.36 ± 0.004, BB to 43.0 ± 0.34 meq/liter, BE to − 4.5 ± 0.13 meq/liter, SB to 20.6 ± 0.20 meq/liter, and tot CO_2 to 21.7 ± 0.24 meq/liter ($P < 0.001$ in all cases). The thromboelastographic indices R, K, and R + K decreased by 2.1, 0.8, and 2.9 min respectively ($P < 0.05$), ME increased by 92.6% ($P < 0.05$), and $< \alpha$ by 14.2° ($P < 0.05$).

In the old animals the corresponding changes were less marked and the acidotic crisis did not develop until the seventh day of starvation; the blood pH at that time was reduced from 7.38 ± 0.002 to 7.34 ± 0.11 ($P < 0.05$), BB from 48.8 ± 0.28 to 44.7 ± 0.2 meq/liter; SB from 22.8 ± 0.21 to 21.2 ± 0.29 meq/liter, and tot CO_2 from 24.1 ± 0.88 to 22.9 ± 0.32 meq/liter ($P < 0.05$). Whereas pCO_2 for the young rats showed a compensatory decrease throughout the period of starvation, in the old animals the curve of the changes in pCO_2 was wavelike in character with a tendency toward accumulation of CO_2. In the old animals also the greatest increase in blood clotting activity was observed at the time of the acidotic crisis.

The mean daily loss of body weight of the young rats was 2.8% and of the old 2.4%. The young animals began to die on the 4th day of starvation and the highest mortality was observed on the seventh day, but individual animals survived until the 16th day. The total loss of body weight at the time of death averaged 41.2%.

The old animals started to die only on the eighth day of starvation; the mortality was highest on the 15th day. The total loss of body weight of the old rats was 42.9%. Some individuals actually survived until the 26th day (Fig. 2).

The acidotic state thus developed earlier in the young animals than in the old and it was more severe; this evidently led to a greater increase in clotting activity of the blood than in the old rats.

In the young organism the modification of metabolism during starvation (development of endogenous lipemia, accumulation of ketone bodies in the blood, etc.) [6, 10] is probably more marked than in old animals [8]; young rats, as these experiments showed, are less resistant also to conditions of endogenous feeding.

The greater resistance of old animals to starvation can probably be explained by the development of adaptive mechanism in them to age changes in metabolism and also to certain features that distinguish the functional state of the aging organism [3, 7].

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CHANGES IN CORTICAL ELECTRICAL ACTIVITY IN POISONING BY Clostridium perfringens TYPE A TOXIN

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In cats lightly anesthetized with pentobarbital (15-20 mg/kg) cortical electrical activity was recorded during the development of poisoning by the toxin of Clostridium perfringens type A, injected intramuscularly (100 MLD/kg). Changes in cortical electrical activity occurred in two phases. In the first phase desynchronization of activity, preservation of evoked potentials and changes in the rhythm structure in response to photic stimulation were observed. Desynchronization was not observed after preliminary mesencephalic section (mesencephalic preparation), indicating involvement of the reticular formation in the pathological process and its role in the desynchronization effect. In the second phase cortical electrical activity was deeply inhibited, evoked potentials depressed, and the rhythm reconstruction reaction was disturbed.
KEY WORDS: electrocorticogram; electromyogram; evoked potential; rhythm reconstruction reaction; electrocardiogram; Clostridium perfringens type A toxin.

There is clinical and experimental evidence [1-3, 7, 8, 12, 13, 17] of a lesion of the CNS in anaerobic gas gangrene infection. Many aspects of the nature and pathogenetic mechanisms of these lesions still remain unexplained.

The object of this investigation was to study cortical electrical activity in the course of development of poisoning caused by Clostridium perfringens type A toxin.

EXPERIMENTAL METHOD

Experiments were carried out on 32 cats. In the experiments of series I (17 animals) intact cats were used, and to synchronize their EEG potentials, pentobarbital was injected intraperitoneally in a dose of 15-20 mg/kg; in series II (15 animals) the experiments were carried out on cats with high mesencephalic section. The brain stem was divided between the superior colliculi and thalamus. A wedge-shaped section of the mesen-

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