tion of cases was much more uniform for group 1 than for group 2, in which small responses predominated sharply. The distribution curves based on the results obtained with high angular velocities (group 200 to 400 °C/sec) showed roughly the same pattern (Fig. 2b).

The results show that the character of the stretch reflex in patients with clonus was close to normal, or even showed a higher level of excitation, in agreement with data in the literature [4]. In the patients without clonus, on the other hand, reflex excitability was considerably depressed, so that the threshold of the responses were raised and their amplitude reduced.

Because of these results, attention was directed to the difference in the degree and character of recovery of functions in these patients. Comparison of the ability of different groups of patients to contract their calf muscles actively showed that in 9 out of 10 patients in group 1, during the attempt to carry out voluntary movements activity was observed in the calf muscle; in the patients of group 2, on the other hand, activity was observed in only 5 of the 12 patients. Eight of the 10 patients in group 1 but only 3 of the 12 patients in group 2 could walk or move about. The gamma-system is evidently more activated in patients with clonus [3], and this is a favorable condition for restoration of motor function.

LITERATURE CITED

1. E. K. Sepp, M. B. Tsuker, and E. V. Shmidt, Nervous Diseases [in Russian], Moscow (1954).
2. G. L. Gottlieb and G. C. Agarwal, Exp. Neurol., 54, 616 (1977).
3. A. J. Szumski, D. Burg, A. Struppler, et al., Electroenceph. Clin. Neurophysiol., 37, 589 (1974).
4. E. D. Walsh, J. Neurol. Neurosurg. Psychiat., 39, 226 (1976).

MECHANISMS OF SENSATION OF RESPIRATORY DISCOMFORT DURING ARTIFICIAL VENTILATION OF THE LUNGS

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The primary reason why hyperventilation is necessary in patients with paralysis of the respiratory muscles is insufficiency of the Hering–Breuer inhibitory reflex.

KEY WORDS: paralysis of the respiratory muscles; artificial ventilation of the lungs; dyspnea; vagotomy.

Patients with paralysis of the respiratory muscles experience respiratory discomfort even though the artificial ventilation of the lungs maintains the normal composition of their blood gases. To overcome respiratory discomfort, the pulmonary ventilation must be increased by 20-30%. This leads to hypocapnia. The sensitivity of the respiratory center to CO_2 rises. The patients therefore require additional ventilation of their lungs [1-3].

But why do the patients require an increase in their lung ventilation even before the onset of hypocapnia?

The investigation described below showed that this is because of insufficiency of the Hering–Breuer inhibitory reflex in these patients.

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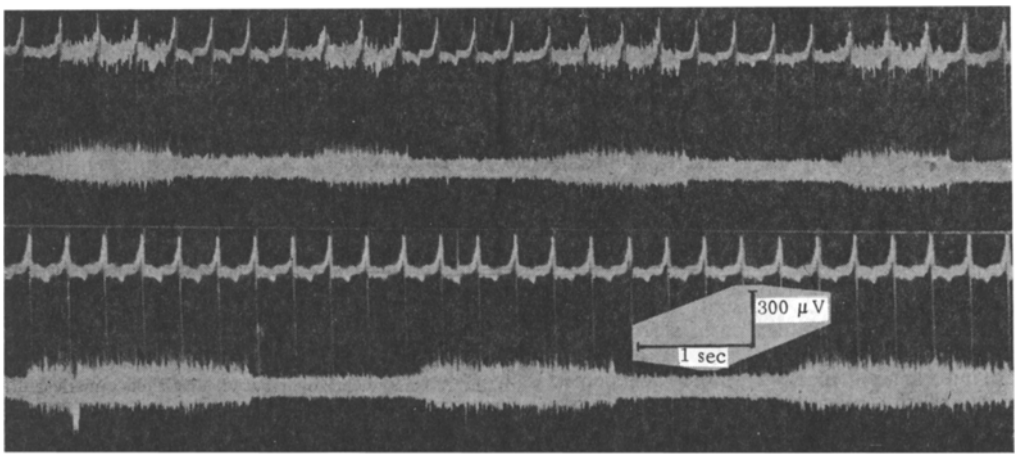

Fig. 1. Electromyogram of diaphragm (top) and respiratory discharges of central end of divided phrenic nerve (bottom). Cessation of activity of diaphragm in normal subjects causes immediate strenghtening of respiratory discharges in phrenic nerve.

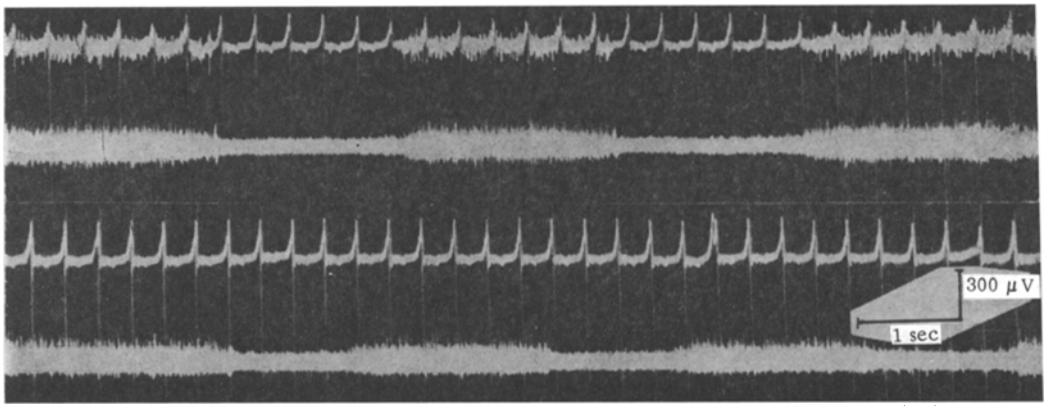

Fig. 2. Electromyogram of diaphragm (top) and respiratory discharges in central part of divided phrenic nerve (bottom) in a vagotomized animal. Cessation of activity of diaphragm does not cause immediate strengthening of discharges in phrenic nerve.

EXPERIMENTAL METHOD

Experiments were carried out on five cats anesthetized with pentobarbital (30 mg/kg). The muscles were paralyzed with tubocurarine (1 mg/kg). Electrical activity was derived and recorded from the sternal part of the diaphragm and the central end of the divided phrenic nerve. When paralysis developed, artificial ventilation of the lung was commenced.

EXPERIMENTAL RESULTS

With the onset of paralysis of the diaphragm (Fig. 1, top trace) respiratory volleys in the central end of the divided phrenic nerve quickly increased (Fig. 1, lower trace). The same result followed cessation of artificial ventilation: The inspiratory discharge in the phrenic nerve quickly increased. Since the increase in the inspiratory discharge developed immediately, before any change in the composition of the blood gases, this suggested that it depends on cessation of impulses from the pulmonary stretch receptors, which normally exert an inhibitory effect on the respiratory center. The next series of experiments accordingly was carried out on vagotomized animals. The vagus nerves were divided in the neck. Cessation of artificial ventilation of the lungs of the vagotomized animals was found not to cause an immediate increase in the discharges from the respiratory center (Fig. 2). The discharges increased gradually as a result of asphyxia.

Regardless of the normal composition of the blood gases, during paralysis of the respiratory muscles the respiratory center is in a state of excessive excitation. Artificial stretching of the muscles within the normal respiratory volume in patients with paralysis of the respiratory muscles does not have

its normal inhibitory effect on the respiratory center. That is why, despite the normal composition of the blood gases, the patient needs additional stretching of the muscles and additional artificial ventilation of the muscles, which causes hypocapnia. The latter, in turn, makes it necessary to increase the hyperventilation still more. However, the primary reason why hyperventilation is necessary in patients with paralysis of the respiratory muscles is insufficiency of the inhibitory Hering–Breuer reflex.

LITERATURE CITED

1. L. M. Popova, Zh. Nevropatol. Psikhiat., No. 1, 12 (1970).
2. J. E. Affeldt, in: Handbook of Physiology, Section 3, Vol. 2, Washington (1965), p. 1509.
3. J. H. Auchincloss, in: Handbook of Physiology, Section 3, Vol. 2, Washington (1965), p. 1553.

CHANGES IN BLOOD CHOLESTEROL AND TRIGLYCERIDE LEVELS DURING SELF-STIMULATION AND AVOIDANCE REACTIONS

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Change in the blood cholesterol and triglyceride levels during self-stimulation and avoidance reactions were studied in rabbits of both sexes. Self-stimulation was accompanied by a significant fall in the blood cholesterol and triglyceride levels. During the avoidance reaction the character of changes in the cholesterol level varied. In avoidance reactions of the "aggression" type the blood cholesterol was raised, whereas in reactions of the "fear" type it was lowered. The maximal deviation of the blood cholesterol from its initial level in all types of reactions was observed 15-30 min after stimulation.

KEY WORDS: electrical stimulation of the hypothalamus; self-stimulation and avoidance reactions; lipids.

In an earlier chronic experimental investigation [8] it was shown that compulsive stimulation of the emotiogenic zones of the hypothalamus through implanted electrodes, giving rise to qualitatively different emotional behavioral responses, both negative and positive, is accompanied by opposite changes in the blood cholesterol level.

In the investigation described below, in order to obtain more objective conclusions regarding the appearance of a positive emotional state in the animal, the self-stimulation method was used; according to most investigators, this method is associated either with the appearance of an emotional state of positive sign only, or with predominance of positive components in the emotional state [2-5, 15]. The avoidance reaction was used as the criterion of a negative emotional state. The character of changes in the blood cholesterol and, in some cases, the triglyceride levels were investigated in these states.

EXPERIMENTAL METHOD

Experiments were carried out on 20 adult rabbits of both sexes weighing 3-3.5 kg. Bipolar nichrome electrodes 0.1 mm in diameter were implanted into the brain structures by a random method [14] in accordance with coordinates of a stereotaxic atlas [16]. To obtain a self-stimulation reaction the electrodes were inserted into the region of the lateral hypothalamus and medial forebrain bundle, and to obtain negative emotional and

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