similar phenomenon has also been described in bats[7]. Assuming this comparison is justified, it may be concluded that the 'arousal cycle' has a Q_{10} equal to 1 and is an endogenous rhythm little influenced by the environment. The absence of any relationship between the level of metabolism and these cyclic phenomena, the fact that the sleep cycle is almost identical with that of the guinea-pig (16 min), and the small coefficient of variation of the cycle at 13 °C, suggest that the length of the sleep cycle is more related to the index of encephalization[8] than to metabolic rate.

Résumé. L'étude des états de vigilance chez le hérisson (*E. europeanus*) à la température centrale de 34 °C et de 13 °C montre que la durée du cycle de sommeil (17,0 ± 3,7 mn) durant l'été est très proche de celle du cycle d'éveil (18,9 ± 1,1 mn) pendant l'hiver. Cette analogie est en faveur du caractère purement endogène d'un tel rythme.

P. L. TOUTAIN and Y. RUCKEBUSCH[9]

Laboratoire de Physiologie, Ecole Nationale Vétérinaire, 23, chemin des Capelles, F-31076 Toulouse Cedex (France), 17 July 1974.

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Artificial Lung Ventilation During Diaphragmatic Paralysis

Section of one phrenic nerve increases the activity of the respiratory centre. According to DOLIVO[1], the reason for this phenomenon is the following: when half of the diaphragm is paralyzed the respiratory volume of the lungs also decreases, and in this way the inhibitory reflex from the lungs on the respiratory centre diminishes. Actually, artificial respiration with a constant lung volume in a rabbit with an open chest prevents the increase of the activity of the respiratory centre evoked by the section of the phrenic nerve. But, as shown in the present papaer, a constant artificial respiration when the chest is intact (that is in conditions in which artificial respiration is made during reanimation in patients with paralysis of the respiratory muscles) does not prevent the increase of the activity of the respiratory centre. Under these conditions, besides the reflex from the lungs, the accumulation of carbon dioxide plays a great role in the increase of the activity of the respiratory centre evoked by the paralysis of the diaphragm.

Methods. The experiments were performed on 10 adult rabbits anesthetized with 30–40 mg/kg Nembutal. After tracheotomy the respiratory frequency (F) and the tidal volume (V_t) were measured and then the animals were subjected to passive ventilation in which the frequency and the volume of the respiratory pump coincide with the same parametres of spontaneous respiration. Section of the phrenic nerves was performed at a low level in the neck, just before the nerves enter the thoracic cavity. Electromiograms were recorded by bipolar steel-wire electrodes affixed to the intercostal muscles. Blood samples were obtained from femoral arteries. Blood pH and $PaCO_2$ measurements were made in micro Astrup.

Results and discussion. One min after bilateral section of the phrenic nerves, there is a marked decrease of V_t (from 12.0 to 5.0 ml). Correspondingly the pH decreases (from 7.32 ± 0.04 to 7.20 ± 0.03) and the $PaCO_2$ increases (from 38.0 ± 3.5 to 51 ± 8.3) (Table I). Simultaneously the electrical activity of the intercostal muscles increases sharply (Figure). To normalize the $PaCO_2$ and the EMG, one must increase the volume of the respiratory pump from 12.0 to 22.5 ml (Table II, Figure). If the passive ventilation was not increased, the animals died in 0.5–1 h after bilateral phrenicotomy.

Thus the size of the passive ventilation which satisfied animals with intact respiratory muscles does not satisfy animals with diaphragmatic paralysis. Diaphragmatic paralysis in rabbits leads to a decrease of lung compliance, alveolar hypoventilation and hypercapnia. Thus not only the reflex from the lungs but accumulation of carbon dioxide plays a great role in the increase of the activity of the extradiaphragmatic muscles during diaphragmatic paralysis.

On the basis of these observations, the following conclusions were reached: 1. As is known, patients with respiratory paralysis require artificial ventilation which is much greater than the ventilation calculated on the

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Table I. The influence of bilateral phrenicotomy on the respiration in rabbits

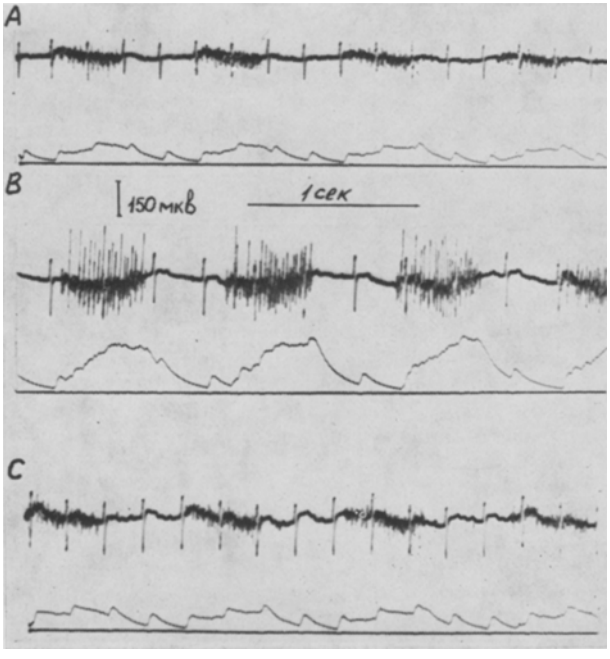
	Tidal volume (ml)		Respiratory frequency (resp./min)		pH		Pa CO_2 (mm Hg)	
	Before	After	Before	After	Before	After	Before	After
Mean	12.0	5.0	46.0	46.0	7.32	7.20	38.0	51.0
SD	± 2.4	±0.5	±15.0	±15.0	±0.04	±0.03	± 3.5	± 8.3
P		0.001		0.5		0.001		0.001
$n = 10$								

pHa, pH arterial blood; Pa CO_2, partial pressure of carbon dioxide in arterial blood; Mean, mean values; SD, standard deviations; *P*, significance of differences from values for normal animals; *n*, number of animals.

Table II. The influence of artificial ventilation on pH and Pa CO_2 in the phrenicotomized rabbits

	During the artificial ventilation which coincides with the respiratory frequency and tidal volume of the spontaneous breathing				The increase of the volume of the pump which was need to normalize pH and Pa CO_2			
	Volume of the pump (ml)	Frequency of the pump	pH	Pa CO_2 (mm Hg)	Volume of the pump (ml)	Frequency of the pump	pH	Pa CO_2 (mm Hg)
Mean	12.0	46.0	7.24	48.5	22.5	46.0	7.28	38.0
SD			±0.04	±5.6			±0.01	±3.5
$n = 10$								

See the glossary of abreviations in Table I.



The electrical activity from intercostal inspiratory muscles (the thin lines – integral activity of the same muscle). A) while the frequency and the volume of the respiratory pump coincides with the spontaneous breathing. Before phrenicotomy. B) the size of the artificial respiration remains the same as in A. After phrenicotomy strong increase of the electrical activity. C) while the volume of the respiratory pump was increased from 10 ml to 20 ml. The electrical activity is normalized.

basis of nomograms. Perhaps their demand depends on the decrease of the lung compliance and alveolar hypoventilation evoked by paralysis of the respiratory muscles.

2. There are some attempts to prevent breathlessness by means of a block of the phrenic nerves[2]. As is stressed by the authors there was only a partial diaphragmatic paralysis after the block. It may be thought that in the case of total paralysis of the diaphragm, this method may evoke a quite contrary result.

ВЫВОДЫ. Несмотря на искусственное сохранение нормальной лёгочной вентиляции, френикотомия вызывает у кроликов резкое увеличение напряжения CO_2 в крови. Для восстановления нормального напряжения CO_2 необходимо значительно увеличить лёгочную вентиляцию. Этим повидимому объясняется то, что больные с параличом дыхательных мышц требуют увеличения лёгочной вентиляции, значительно превосходящей нормальную.

S. I. Frankstein, T. I. Sergeeva,
Z. N. Sergeeva and E. S. Ivanova

Institute of Normal and Pathological Physiology, Academy of Medical Sciences, Baltijskaya 8, Moskwa (USSR), 1 July 1974.

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Age-Dependent Changes in (Na, K)-ATPase Activity in Brains of Mice Susceptible to Seizures

Mice of the DBA strain, susceptible to audiogenic seizures, have convulsions at the age of 30 days when they are exposed to heat, whereas mice of the C57 strain do not[1]. Since DBA mice do not have convulsions with elevated temperature at 20 or at 40 days, they seem to be a model of febrile convulsions in humans[1], and interest attaches to features that distinguish them from the seizure-resistant C57 strain. Curiously enough the findings of Abood and Gerard[2] have never been confirmed that brains of DBA mice have lower ATPase and a lower P/O ratio than those of C57 mice at the age of seizure-susceptibility but not before or after. The authors could not then differentiate the form of ATPase; it is now known that ATPase activity in brain is largely in the form activated by Na^+ and K^+, i.e. (Na, K)-ATPase[3].

For this reason I studied ATPase activity in microsomal membranes of brains of DBA mice at the age of susceptibility; 30 days; and before and after, at 20 and 60 days. The results were compared with those of non-

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