

clining hyperpnea. The subsequent administration of room air gave a decided rise of muscular activity to a nearly normal level of contraction accompanied by the usual respiratory changes. When the condition of the animal became more critical, post administration level was gradually lowered below previous starting levels. In some animals both the muscular and respiratory responses were well augmented over long periods of administration of low oxygen mixtures. Other animals gave no initial rise in muscular activity. The muscular response gradually decreased until room air was administered though the usual hyperpnea prevailed.

It is suggested that the augmented respiratory movements of lowered alveolar oxygen in most of the observations may be partly accounted for by peripheral chemical changes occurring within the respiratory muscles themselves. In other cases the hyperpnea was maintained despite decreased muscular response to direct stimulation.

4544

Effects of Low Alveolar Oxygen and High Alveolar Carbon Dioxide on Rate of Flow of Cerebro-Spinal Fluid of the Dog.

HAYDEN NICHOLSON. (Introduced by Robert Gesell.)

From the Department of Physiology, University of Michigan.

The fluid was obtained either by placing a cannula in the *cisterna magna* or by lumbar puncture, in most cases the former method being used. The rate of flow was recorded by the drop method.

High percentages of carbon dioxide in room air (8-14%) invariably increased the rate of flow, in one case reaching 1000%. This increase appeared promptly on administration of the gas, rapidly increased to a maximum, and persisted practically undiminished up to the readministration of room air, when the flow quickly returned to the preadministrational rate.

The effects of low oxygen are somewhat more complex. Low oxygen almost invariably caused a decrease in flow, followed, after prolonged administration, by a gradual increase, approaching, but practically never reaching, the preadministrational rate. The initial decrease in flow was usually preceded by a slight and very brief increase. When room air was again administered there was usually a brief but distinct decrease in flow, followed by a marked increase above the rate during administration of low oxygen and approaching the preadministrational rate.

These results seem to be in agreement with those obtained by Eddy¹ on salivary secretion. The effects of high carbon dioxide resemble the results of Gesell² on the rate of flow of lymph but the resemblance does not hold for low oxygen.

4545

Effect of High Oxygen Pressures on Blood Acidity, Oxygen Consumption, Volume Flow of Blood and Respiration.

JOHN W. BEAN. (Introduced by Robert Gesell.)

From the Department of Physiology, University of Michigan.

With the purpose of throwing new light on the causes of hyperpnea as seen in animals breathing pure oxygen at high pressures, apparatus was devised whereby respiration, blood pressure, blood acidity changes, and blood volume flow could be recorded on smoked paper, with the experimental animal exposed to increased oxygen pressure.

A Hutchinson type spirometer was used; the bell counterbalanced by a solenoid around a glass tube; the writing point attached to a moveable iron core in the bore of the tube which was open to atmospheric pressure. Blood pressure was recorded in similar manner, the solenoid floating on the mercury; heart rate by an electrical contact device on the femoral artery; blood acidity changes by the continuous method (manganese dioxide electrode); volume flow of blood changes by the thermo-electrical method.

The experimental animals were dogs of from 5 to 12 kg., anesthetized with morphine sulphate and urethane. The pressures used were from 3 to slightly less than 5 atmospheres pure oxygen.

The results indicate an increase in the acidity of the arterial blood and decrease in the heart rate of the animals under high oxygen pressures. The oxygen consumption of animals under pressure showed some variation but the weight of the evidence pointed to a decrease in metabolism with a tendency to return after decompression to atmospheric pressure. In several experiments periodic respiration with an accompanying periodicity in the volume flow of blood in the common carotid artery was obtained. Hyperpnea was not invariably a response to high oxygen pressure exposure. On the contrary some individuals showed a decrease in respiratory rate to the extent of apnea.

¹ Eddy, N. B., *Am. J. Physiol.*, 1929, lxxxviii, 524.

² Gesell, R., *Am. J. Physiol.*, 1929, lxxxviii, 546.