flow was obtained by ligating the vertebral arteries, and anterior spinal arteries and small arterioles of the cord, all in the region of the second cervical vertebra. All muscles at this level were severed. The vagi were left intact and one carotid was used for volume flow measurements. Blood volume flow changes were followed in the carotid and femoral arteries by the thermo-electric method (Gesell and Bronk.[1] The external jugular, vertebral, and femoral venous return was measured by the enclosed drop method; the submaxillary vein by the external drop. Blood pressure, ventilation, oxygen consumption, and time were simultaneously registered with the blood volume flow changes.

Two types of respiration were obtained. Type 1 gave typical symmetrical Traube Herring blood pressure waves whose frequency was that of the respiratory waves. Apneas were either short (2 seconds) or lacking; respiration in other characteristics was quite normal. The depth of respiration decreased as the carotid flow increased, sometimes to the extent of apnea; as the flow decreased to a minimum, respiratory depth increased to a maximum. The respiratory depth again decreased as the flow increased. Type 2 was characterized by very pronounced blood pressure changes which were not typical Traube Herring waves. Apneas occurred. An apnea of 123 seconds was obtained in one animal during periodic breathing. The respiratory groups usually begin during some phase of the decreased flow or they may begin as late as the very end of decreased flow. Increasing respiratory movements may or may not carry on into the period of increasing blood flow. These increasing respiratory movements may suddenly give way to apnea which is associated with a high flow of blood.

4542

Acid Changes in pH of Portal, Hepatic, and Arterial Blood on Administration of Sodium Cyanide.

GEORGE MC CLURE. (Introduced by Robert Gesell.)

From the Department of Physiology, University of Michigan.

In view of the fact that the liver reconverts lactic acid into glycogen (Himwich[1]), changes in acidity of blood as it passed through the liver were studied in a series of experiments undertaken on dogs. Following the intravenous injection of sodium cyanide, which leads

[1] Gesell, R., and Bronk, D., *Am. J. Physiol.*, 1926, lxxix, 61.

[1] Himwich, H. E., *J. Biol. Chem.*, 1923, lv, 525.

to excessive appearance of lactic acid in the blood, samples of blood were taken from the portal vein, hepatic vein, and femoral artery. Two sets of samples were taken at 10 minute intervals to determine the normal acidities, and 2 sets of samples were taken at 10 minute intervals after each injection of sodium cyanide. The blood samples were stored on ice in special pH tubes designed by Dr. Gesell, and analyzed immediately following the experiment by the quinhydrone method.

Constant results on 12 curves showed that: 1. Normally portal blood was more acid than hepatic blood. 2. Normally arterial blood was more acid than hepatic blood. 3. Portal blood became markedly more acid after each injection of sodium cyanide, then slowly returned towards normal again. 4. Arterial blood became more alkaline after each injection of sodium cyanide, then slowly returned towards normal again. 5. Hepatic blood became slowly but steadily more acid through the entire experiment. The absence of a marked rise in acidity of the hepatic blood could not be explained by the increased alkalinity of the arterial blood.

This flattening of the hepatic acidity curve may, therefore, be due to the fact that a portion of the surcharge of lactic acid causing the abrupt acid rise of the portal blood is reconverted by the liver into the precursor state (glycogen), with the liberation of free base. It is, therefore, suggested that the reconversion of lactic acid into glycogen by the liver is a factor in the maintenance of the acid-base control of the body.

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Effect of Low Oxygen on Muscular Contraction.

R. R. GETTEL AND L. F. KNOEPP. (Introduced by Robert Gesell.)

From the Department of Physiology, University of Michigan.

This study deals with effects of lowered alveolar oxygen on muscular activity of the dog. Twin rebreathing tanks were used containing room air and low oxygen mixtures respectively. Supermaximal stimuli were applied with an automatic stimulator to the peripheral end of the sartorius muscle whose motor nerve was severed to insure direct muscular stimulation. The results of 3-5% mixtures in most animals revealed increased respiration with a corresponding increase of amplitude of muscular response, this passing into a gradual decline to nearly zero with the continuing but de-