4935

Distribution of Lactate Between Corpuscles and Plasma in the Dog.

JOHN FIELD 2D. (Introduced by E. G. Martin.)

From the Laboratory of Physiology, Stanford University, California.

In connection with an extensive series of studies on metabolism after anoxemia now in progress in this laboratory[1] it was found desirable to determine whether or no lactates were distributed evenly between the corpuscles and plasma of the dog.

It has long been known that a corpuscle plasma concentration gradient obtains for several substances. In 1867 Zuntz[2] showed that the serum of normal blood contains about twice as much carbon dioxide (bicarbonate) as the corpuscles. Gürber[3] found that chlorides and bicarbonates move in and out of the corpuscles as the carbon dioxide tension of the gases in contact with the blood changes, and Van Slyke and Cullen[4] demonstrated this shift with changes in carbon dioxide tension lying in the physiological range. The partition of fermentable sugar between corpuscles and plasma is unequal[5] and there is a well demonstrated corpuscle-plasma gradient of pH,[6] pNa and pK.[7]

In a series of 6 experiments on resting amytalized dogs, determinations were made of the lactate content of plasma and of whole blood by the method of Friedemann, Cotonio and Shaffer.[8] The following values were obtained.

Exp. No.	plasma lactate concentration / whole blood lactate concentration
I- (1)	1.42
H- Bl. 3	1.50
H- Bl. 4	1.68
H- Bl. 22	1.39
H- Bl. 23	1.49
H- Bl. 24	1.39

The arithmetic mean of these ratios is 1.48.

[1] Martin, E. G., Field, John II, and Hall, V. E., *Am. J. Physiol.*, 1929, lxxxviii, 407.

[2] Zuntz, H., *Centralblatt. Med. Wiss.*, 1867, p. 529.

[3] Gürber, A., *Maly's Jahresbericht.*, 1895, xxv, 164.

[4] Van Slyke, D. D., and Cullen, W. D., *J. Biol. Chem.*, 1917, xxx, 289.

[5] Somogyi, M., *J. Biol. Chem.*, 1928, lxxviii, 117.

[6] Hampson, A. C., and Manzels, M., *J. Physiol.*, 1927, lxiv, Proceedings.

[7] Van Slyke, D. D., *Physiol. Rev.*, 1921, i, 141.

[8] Friedemann, T. E., Cotonio, M., and Shaffer, P. A., *J. Biol. Chem.*, 1927, lxxiii, 335.

In 4 experiments in this laboratory it was found that the corpuscles constitute 47.3% of the blood volume. This agrees fairly well with the mean value of 45.21% found by Powers, Bowie and Howard on a series of twenty-five dogs.[9]

Assuming that the corpuscles constitute 45.2% of the blood volume, calculation from the above data gives a value of 3.34 for the ratio

$$\frac{\text{plasma lactate concentration}}{\text{corpuscle lactate concentration}}$$

While the finding is chiefly of qualitative interest, owing to the statistical inadequacy of the data, it is clear that there is a marked inequality in the distribution of lactate between the corpuscles and plasma of the dog.

4936

Dilatation of the Heart by Amytal.

J. M. D. OLMSTED AND ERIC OGDEN.

From the Division of Physiology, University of California Medical School, Berkeley, California.

Amytal, prepared as for surgical anesthesia, was added to the venous reservoir of an open-circuit heart-lung-preparation. The preparation was made under pure ether anesthesia, and in each case the experiment was postponed for at least 45 minutes for the effects of the ether to wear off. Most of the blood was defibrinated and the remainder rendered incoagulable by the addition of 25 mgm. heparin. The venous pressure and artificial resistance pressure were maintained constant; heart volume changes were recorded by a float recorder connected to a Jerusalem and Starling cardiometer. The useful (non-coronary) output of the heart was measured several times before and after each dose by collection in a graduated cylinder for 10 second periods. At the conclusion of each experiment the quantity of blood in the reservoir, cannulae and apparatus was measured and the heart and lungs were weighed and measured by displacement. The resulting estimate of quantity of tissue is probably accurate to within 10%.

[9] Powers, J. H., Bowie, M. A., and Howard, I. M., *Am. J. Physiol.*, 1930, xcii, 665.