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Blood concentration in insulin hypoglycemia.

By D. L. DRABKIN, I. H. PAGE and D. J. EDWARDS.

[*From the Physiological Laboratory, Cornell University Medical College, New York City.*]

Fisher and Wishart[1] found that, following the hyperglycemia due to the ingestion of large amounts of glucose, a temporary blood dilution and anuria resulted. Barbour[2] found that glucose exerted an antipyretic effect in dogs with peptone fever. In subsequent communications this observer, in collaboration with other workers[3], has shown that a hydremic plethora due to hyperglycemia is the basis of antipyretic action. From this work it would appear that, under certain conditions, an increase in blood sugar calls forth a mobilization of water into the blood.

Is the antithesis of such a condition, a dehydration of the blood in certain hypoglycemic states, possible? It seemed desirable to us to study from this standpoint the condition of insulin hypoglycemia.

The procedure was as follows:

1. The dogs were anesthetized with iso amyl ethyl barbituric acid.[4] A control experiment showed that *per se* this drug had very little effect either on blood sugar or on blood concentration.
2. Blood samples were withdrawn, in some experiments from the external jugular vein, in others from the femoral, and in still another from the vena cava just above the renal veins.
3. After drawing the "control" samples a large dose of insulin (20 units per kilogram body weight) was administered intravenously.
4. Blood samples were taken at suitable intervals following the insulin.

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[1] Fisher, G., and Wishart, M. B., *J. Biol. Chem.*, 1912-13, xiii, 49.

[2] Barbour, H. G., PROC. SOC. EXP. BIOL. AND MED., 1919, xvi, 136.

[3] Barbour, H. G., and Herrmann, J. B., *J. Pharmacol. and Exp. Therap.*, 1921, xviii, 165; Barbour, H. G., and Howard, A. J., PROC. SOC. EXP. BIOL. AND MED., 1920, xvii, 150.

[4] Page, I. H., *J. Lab. and Clin. Med.*, 1923, ix, 2.

5. Each blood sample was analyzed for hemoglobin, which was taken as the index of blood concentration, and for sugar. Hemoglobin was determined by the method of Cohen and Smith;[5] the blood sugar by the method of Shaffer and Hartmann.[6] A record of mean blood pressure was taken at frequent intervals during the experiment.

The experimental results may be summarized as follows:

1. Venous blood, following the administration of large doses of insulin, shows that, with a falling blood sugar percentage, there is an increase in concentration ranging in our work from 15.1 per cent to as high as 44.8 per cent.

2. A graphical record of a typical experiment shows that the blood sugar falls steeply during the first hour and a half after insulin, then more gradually. The percentage of hemoglobin rises simultaneously with the steepest gradient of the curve shown during the second hour. This record seems to indicate that first there is a fall in the blood sugar, then, after a short delay, blood concentration takes place. The mean blood pressure tracing shows a slight decline during the first two hours after insulin, then a tendency toward a gradual return to normal. This tracing shows the absence of circulatory failure. In the shock of circulatory failure there is extreme, sudden fall in blood pressure and, according to Gasser and coworkers,[7] blood concentration is the most constant finding in that condition. In our experiments hemoglobin and mean blood pressure tracings show a striking similarity of contour in opposite directions.

3. In some of the experiments in which the fatal issue came rapidly the fall in blood sugar and in concentration of the blood also came on rapidly. Throughout the course of the experiments certain related factors of blood concentration—apparent increase in viscosity, tendency to form clots—factors observed by Macleod[8] in some of his studies, were often noted and regularly appeared only in samples of blood with high hemoglobin and low sugar.

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[5] Cohen, B., and Smith, A. H., *J. Biol. Chem.*, 1919, xxxix, 489.

[6] Shaffer, P. A., and Hartmann, A. F., *J. Biol. Chem.*, 1920-21, xlv, 365.

[7] Gasser, H. S., Erlanger, J., and Meek, W. J., *Am. J. Physiol.*, 1919-20, l, 31.

[8] Macleod, J. J. R., *Physiol. Reviews*, 1924, iv, 21.

4. In those experiments in which the urine volume has been followed, marked diuresis was observed, the rise in urine output apparently being directly related to the concentration of the blood and to the fall in blood sugar.

CONCLUSION

In insulin hypoglycemia a concentration of the blood is constantly found.

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Salt effects in bacterial growth: IV. The physical nature of bacterial growth in various concentrations of neutral salts.

By GEORGE E. HOLM and J. M. SHERMAN.

[*From the Research Laboratories of the Dairy Division, United States Department of Agriculture, Washington, D. C.*]

The physical nature of growth produced by various organisms has generally been attributed to the characteristics of the organisms themselves. Those organisms producing a pellicle upon the media in which they are growing were thought to do so because they were more strongly aerobic than those which did not form pellicles.

Of recent years, however, this view has been changed and it is known that organisms which grow in the surface of the media or settle to the bottom as they grow, do so, not alone because of the characteristic of the organism, but largely because of the physical properties of the media. It has been shown by Larson, Cantwell and Hartzell[1] that the nature of the growth of *B. subtilis, Mycobact. tuberculosis* and other organisms can be entirely changed by the addition of castor oil soap. In the case of *B. subtilis* 45 dynes prevents the formation of pellicles and growth takes place down in the body of the medium.

Neutral salts when added to the media in small quantities affect the physical nature of the growth of various organisms. *Bact. coli* when grown in medium of 1 per cent peptone broth

[1] Larson, W. P., Cantwell, W. F., and Hartzell, T. B., *J. Inf. Dis.*, 1919, xxv, 41.