XLVII. A NOTE ON THE OXYGEN CONSUMPTION OF NERVE IN THE PRESENCE OF GLUCOSE AND GALACTOSE.

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IN a previous communication [Sherif, 1930] reference was made to the effect of galactose on the oxygen uptake of mammalian (rabbit) peripheral nerve, as measured in Barcroft's apparatus. Since then, a good many more experiments have been performed, and the results, though at present isolated observations, seem worth recording briefly, in the expectation that they may have a bearing on future work.

It was found that, if galactose in concentrations of 0.1 to 0.25 % was added to the fluid (Ringer or Ringer plus phosphate buffer) in which one of the nerves under observation was bathed, the oxygen uptake, measured over the usual three hour period, was very nearly linear, while that of the "control" nerve (no galactose) usually showed a distinct falling off. If glucose were substituted for galactose, the same effect could not be demonstrated with certainty. Since, however, in a number of experiments, the oxygen uptake of the control nerve was itself almost linear, a certain doubt was thrown on the reality of the result, although the average values for oxygen uptake, calculated for a number of experiments, substantiated the findings. By prolonging the experiments over periods of 9 hours it has been possible to obtain definite results; errors due to bacterial growth in these experiments were avoided by washing the nerve and renewing the fluid at intervals of somewhat less than 3 hours. In these circumstances, a very definite falling off of the rate of oxygen uptake by the "control" nerve occurs, while that of the nerve in the presence both of galactose and glucose remains linear (Figs. 1 and 2).

Gerard [1927] found that glucose in concentrations of 0.1 % had no effect on, or in greater concentrations diminished, the oxygen uptake of frog nerve. Such would have been our own conclusion for rabbit nerve had we not finally prolonged our experiments. Holmes and Gerard [1929, 1930] have found that carbohydrate disappears from nerve during rest in oxygen, though the nature of the carbohydrate remains uncertain. Nerve contains at least 5 mg. of galactose per g. tissue, combined as cerebroside. If this carbohydrate were available for oxidation, it is hard to see why further additions should affect the oxygen uptake.

Loebel [1925] has found that, while the oxygen uptake of slices of brain tissue is very markedly increased by glucose, it is diminished by galactose. We have confirmed this effect with glucose, and we find that, provided Ringer's

Fig. 1.

Time (minutes)

Fluid—4 parts Ringer, 1 part phosphate buffer, p_H 7.6.

Arrows indicate where fluid was renewed.

Fig. 2.

Time (minutes)

Fluid—4 parts Ringer, 1 part phosphate buffer, p_H 7.4.

Arrows indicate where fluid was renewed.

solution is used as suspension medium, galactose does not affect the oxygen uptake.

The quantitative difference in the behaviour of brain and nerve towards the two sugars is thus very striking.

SUMMARY.

Both galactose and glucose prolong the period for which isolated mammalian nerves take up oxygen at a steady rate.

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