three sugars (one of which was glucose), the same components being found in all cases. However, quantitative analyses for protein (Lowry, Rosebrough, Farr & Randall, 1951), carbohydrate (Dubois, Gilles, Hamilton, Rebers & Smith, 1956), and free lipid (extraction with chloroform-methanol, 2:1, v/v) showed large differences. The cell walls of organisms grown under magnesium-limitation contained 40% protein, 12% carbohydrate and 30% lipid, whereas the walls from nitrogen-limited organisms contained 20%, 30% and 11% respectively. Cell walls from organisms grown for comparison in a complex medium in a shaken-flask batch culture and harvested in mid-exponential phase had 20% protein, 23% carbohydrate, and 5% lipid. There were also large differences in the amount of lipoprotein material that could be removed from cell-wall preparations by extraction with sodium dodecyl sulphate.

These results show that the lipoprotein coat of the cell wall of this strain of *B. subtilis* varied in amount when the organism was grown in a chemostat in different limiting media. This demonstrates once again the importance of defining the growth conditions of bacteria in interpreting cell-wall analytical results.

- Dubois, M., Gilles, K. A., Hamilton, J. K., Rebers, P. A. & Smith, F. (1956). *Analyt. Chem.* **28**, 350.
 Ellwood, D. C. & Tempest, D. W. (1967). *Biochem. J.* **104**, 69P.
 Ellwood, D. C. & Tempest, D. W. (1968). *Biochem. J.* **108**, 40P.
 Goundry, J., Davison, A. L., Archibald, A. R. & Baddiley, J. (1967). *Biochem. J.* **104**, 1C.
 Lowry, O. H., Rosebrough, N. H., Farr, A. L. & Randall, R. J. (1951). *J. biol. Chem.* **193**, 265.
 Nermut, M. V. & Murray, R. G. E. (1967). *J. Bact.* **93**, 1949.

Insulin-like Action of 3-Hydroxybutyrate in the Ewe

By D. A. L. SHEPHERD and MARJORIE K. JEACOCK.
 (Department of Physiology and Biochemistry, University of Reading)

The relationship between the blood ketone-body concentration and the plasma non-esterified fatty acid (NEFA) concentration in non-lactating ewes, reported by Reid & Hinks (1962), suggests the possibility that blood ketone-body concentration may influence the rate of NEFA release in the sheep. It has been shown in the dog and in man that infusion of ketone bodies lowers plasma NEFA and blood glucose concentrations (Mebane & Madison, 1964; Senior & Loridan, 1968) and also inhibits the

rise in the plasma NEFA concentration induced by noradrenaline administration (Björntorp & Schersten, 1967).

In the present study it was shown that 3-hydroxybutyrate has an anti-lipolytic action in the ewe. Infusion of 3-hydroxybutyrate at 46 or 115- μ moles/kg. body wt./min. for 20 min. resulted in a fall of 28% in the plasma NEFA concentration from the mean resting value of 380 μ equiv./l. In addition, the effect of infusion of noradrenaline (3.0 nmoles/kg. body wt./min. for 20 min), which normally results in a sixfold rise in plasma NEFA concentration, was virtually abolished by infusion of the higher dose of 3-hydroxybutyrate for 20 min. before, and during, the period of noradrenaline infusion.

3-Hydroxybutyrate infusion also influenced the plasma glucose concentration. Infusion of 3-hydroxybutyrate (115 μ -moles/kg. body wt./min. for 20 min.) significantly lowered plasma glucose concentration from 5.03 mM to 4.32 mM. The 50% rise in plasma glucose concentration normally induced by noradrenaline (3.0 nmoles/kg. body wt./min. for 20 min.) was diminished when 3-hydroxybutyrate was infused for 20 min. before, and during, the 20 min. infusion of noradrenaline.

These results indicate that 3-hydroxybutyrate has an insulin-like action in the ewe. It has been inferred that the anti-lipolytic and hypoglycaemic effects of 3-hydroxybutyrate in the dog may result from increased insulin secretion induced by 3-hydroxybutyrate (Mebane & Madison, 1964). However, Manns, Boda & Willes (1967) have shown that in the sheep infusion of 3-hydroxybutyrate does not stimulate insulin secretion. Thus the possibility that the insulin-like action of 3-hydroxybutyrate is mediated through the release of insulin seems unlikely in this species.

- Björntorp, P. & Schersten, T. (1967). *Amer. J. Physiol.* **212**, 683.
 Manns, J. G., Boda, J. M. & Willes, R. F. (1967). *Amer. J. Physiol.* **212**, 756.
 Mebane, D. & Madison, L. L. (1964). *J. Lab. clin. Med.* **63**, 177.
 Reid, R. L. & Hinks, N. T. (1962). *Aust. J. agric. Res.* **13**, 1124.
 Senior, B. & Loridan, L. (1968). *Nature, Lond.*, **219**, 83.