Structural analogues of the substrate (2-acetamido - 2 - deoxy - (1 → 5) - D - gluconolactone, 2-acetamido-2-deoxy-D-glucose, acetamide, acetic acid, 2-amino-2-methyl-propane-1,3-diol, 2-amino-2-(hydroxy-methyl)-propane-1,3-diol) inhibited competitively (K_is were 5×10^{-4}, 5, 8, 15, 4 and 1mM respectively) the enzymic hydrolysis of I.

The maximum velocity ($V_{max.}$) of hydrolysis of I rose 1·05-fold from pH 3·8–4·3 and fell 15-fold from pH 4·3–7·8 (maximum p$V_{max.}$/pH slope, 0·65) whereas the Michaelis constant (K_m) varied only 0·8mM to 1·8mM over the same pH range (maximum pK_m/pH slope, 0·25): according to theory described by Dixon & Webb (1964), these results would suggest multiple ionic species in the enzyme–substrate complex.

The enzyme could be absorbed on CM-cellulose at pH 4·5 and eluted as two peaks with 0·05M-citrate, pH 5·5 in the absence (fraction A), and presence (fraction B) of 0·1M-NaCl (cf. Caygill, Roston & Jevons (1966). Fractions A and B, were free from detectable β-D-galactosidase, β-D-glucosidase and β-D-glucuronidase, had relative activities about 1:2, behaved on DEAE-cellulose similar to the human-spleen enzyme (cf. Robinson & Stirling (1966), were almost completely excluded by Sephadex G-200, and were indistinguishable by heat stability, by K_m and $V_{max.}$/pH characteristics, or by their action on the substrates II.

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An Effect of Carnitine on Gluconeogenesis from Propionate in Kidney Cortex

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Rat-kidney cortex slices readily oxidize both long- and short-chain fatty acids. These can supply 70–90% of the fuel of respiration. The rate of utilization of fatty acids in the slices was not markedly affected by the addition of carnitine except in the case of propionate where carnitine can accelerate the rate by up to 100%. Propionate occupies a special position among the fatty acids because, in addition to being oxidized, it is also a glucogenic precursor. Under optimum conditions, with carnitine present, propionate formed $93·3 \pm 3·3$ μmoles glucose/g. of dry wt./hr. (9 observations). The contribution of propionate to tissue respiration, on the other hand, was usually less than 20% and this was not altered by the addition of carnitine.

The rate of gluconeogenesis from propionate is optimal at 1mM–2mM-propionate and is inhibited by higher concentrations. This inhibition can be partly relieved by the addition of DL-carnitine (1·0mM). The extent of the relief depends on the interplay of bicarbonate and phosphate buffers in the medium. In the absence of phosphate, at either 2mM- or 25mM- bicarbonate, propionate readily forms glucose without the addition of carnitine as long as the concentration of propionate is not higher than 2·5mM. At higher propionate concentrations (5mM–20mM) carnitine must be added to obtain high rates of gluconeogenesis. When the bicarbonate buffer is replaced by 1mM- or 6mM-phosphate buffer, gluconeogenesis is strongly inhibited at all concentrations of propionate. This 'inhibition' is not solely due to the exclusion of the bicarbonate system which is a reactant in the metabolism of propionate. High rates of gluconeogenesis can be achieved with phosphate buffer, by the addition of carnitine, as long as the propionate concentration is below 2·5mM. At higher propionate concentrations (5mM–20mM) addition of bicarbonate is also necessary for high rates of gluconeogenesis.

The optimal concentration of DL-carnitine for gluconeogenesis varies with the propionate concentration, and approximately equimolar amounts are required. At 1·0mM-propionate higher concentrations than 4mM-DL-carnitine progressively inhibit gluconeogenesis. Inhibitory effects of high concentrations of carnitine have been reported by Ontko (1967) for ketone body formation in rat liver homogenates.

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