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Fuel utilization in colonocytes of the rat.

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Abstract

In incubated colonocytes isolated from rat colons, the rates of utilization O2, glucose or glutamine were linear with respect to time for over 30 min, and the concentrations of adenine nucleotides plus the ATP/ADP or ATP/AMP concentration ratios remained approximately constant for 30 min. Glutamine, n-butyrate or ketone bodies were the only substrates that caused increases in O2 consumption by isolated incubated colonocytes. The maximum activity of hexokinase in colonic mucosa is similar to that of 6-phosphofructokinase. Starvation of the donor animal decreased the activities of hexokinase and 6-phosphofructokinase, whereas it increased those of glucose-6-phosphatase and fructose-bisphosphatase. Isolated incubated colonocytes utilized glucose at about 6.8 mumol/min per g dry wt., with lactate accounting for 83% of glucose removed. These rates were not affected by the addition of glutamine, acetoacetate or n-butyrate, and starvation of the donor animal. Isolated incubated colonocytes utilized glutamine at about 5.5 mumol/min per g dry wt., which is about 21% of the maximum activity of glutaminase. The major end-products of glutamine metabolism were glutamate, aspartate, alanine and ammonia. Starvation of the donor animal decreased the rate of glutamine utilization by colonocytes, which is accompanied by a decrease in glutamate formation and in the maximum activity of glutaminase. Isolated incubated colonocytes utilized acetoacetate at about 3.5 mumol/min per g dry wt. This rate was not markedly affected by addition of glucose or by starvation of the donor animal. When colonocytes were incubated with n-butyrate, both acetoacetate and 3-hydroxybutyrate were formed, with the latter accounting for only about 19% of total ketones produced