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Glutamine metabolism in lymphocytes of the rat.

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Abstract

The metabolism of glutamine in resting and concanavalin-A-stimulated lymphocytes was investigated. In incubated lymphocytes isolated from rat mesenteric lymph nodes, the rates of oxygen and glutamine utilization and that of aspartate production were approximately linear with respect to time for 60 min, and the concentrations of adenine nucleotides plus the ATP/ADP or ATP/AMP concentration ratios remained approximately constant for 90 min. The major end products of glutamine metabolism were glutamate, aspartate and ammonia: the carbon from glutamine may contribute about 30% to respiration. When both glucose and glutamine were presented to the cells, the rates of utilization of both substances increased. Evidence was obtained that the stimulation of glycolysis by glutamine could be due, in part, to an activation of 6-phosphofructokinase. Starvation of the donor animal increased the rate of glutamine utilization. The phosphoenolpyruvate carboxykinase inhibitor mercaptopicolinate decreased the rate of glutamine utilization by 28%; the rates of accumulation of glutamate and ammonia were decreased, whereas those of lactate, aspartate and malate were increased. The mitogen concanavalin A increased the rate of glutamine utilization (by about 51%). The rate of [³H]thymidine incorporation into DNA caused by concanavalin A in cultured lymphocytes was very low in the absence of glutamine; it was increased about 4-fold at 1 microM-glutamine and was maximal at 0.3 mM-glutamine; neither other amino acids nor ammonia could replace glutamine