Biochem J. 1984 Jul 1;221(1):255-60.

Metabolism of ketone bodies, oleate and glucose in lymphocytes of the rat.

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Abstract

Isolated incubated lymphocytes utilized acetoacetate, 3-hydroxybutyrate or oleate at about 0.5 mumol/min per g dry wt. These rates were not markedly affected by concanavalin A or by starvation of the donor animal. When ketone bodies replaced glucose in the culture medium, they could not support lymphocyte proliferation when cells were cultured for 48 h. Addition of oleate (0.5 mM) to isolated lymphocytes increased the rate of O2 consumption markedly, suggesting that it could contribute about 30% to O2 consumption. The rate of oleate uptake and the stimulated rate of O2 consumption were maximal at 0.5 M-oleate; this is in contrast with the effect in some other tissues, in which the rate of fatty acid oxidation is linear with concentration up to about 2 mM. Since the normal plasma concentration of fatty acid in the fed state is about 0.5 mM, this suggests that lymphocytes can utilize fatty acids at a maximal rate in the fed state. Ketone bodies or oleate decreased the rate of glucose utilization by incubated lymphocytes; ketone bodies decreased the rate of pyruvate oxidation and increased the intracellular concentration of hexose monophosphate and citrate, suggesting that 6-phosphofructokinase is inhibited by citrate, and hexokinase by glucose 6-phosphate. These effects may be important not so much in conserving glucose in the whole animal but in maintaining the concentrations of glycolytic intermediates necessary for biosynthetic processes during proliferation.