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Effects of hypothyroidism on glucose and glutamine metabolism by the gut of the rat.

Ardawi MS, Jalalah SM.

Department of Clinical Biochemistry, College of Medicine and Allied Sciences, King Abdulaziz University, Jeddah, Saudi Arabia.

Abstract

1. The metabolism of glucose and glutamine was studied in the small intestine and the colon of rats after 4-5 weeks of hypothyroidism. 2. Hypothyroidism resulted in increases in the plasma concentrations of ketone bodies (P less than 0.05), cholesterol (P less than 0.001) and urea (P less than 0.001), but decreases in the plasma concentrations of free fatty acids (P less than 0.05) and triacylglycerol (P less than 0.001). These changes were associated with decreases in the plasma concentrations of total tri-iodothyronine, free tri-iodothyronine, total thyroxine and free thyroxine. 3. Hypothyroidism decreased both the DNA content (by 30.5%) and the protein content (by 23.6%) of intestinal mucosa, with the protein/DNA ratio remaining unchanged. The villi in the jejunum were shorter (P less than 0.05) and the crypt depth was decreased by about 26.5% in hypothyroid rats. 4. Portal-drained visceral blood flow showed no marked change in response to hypothyroidism, but was accompanied by decreased rates of extraction of glucose, lactate and glutamine and release of glutamate, alanine and ammonia. 5. Enterocytes and colonocytes isolated from hypothyroid rats showed decreased rates of utilization and metabolism of glucose and glutamine. 6. The maximal activities of hexokinase (EC 2.7.1.1), 6-phosphofructokinase (EC 2.7.1.11), pyruvate kinase (EC 2.7.1.40), citrate synthase (EC 4.1.3.28), oxoglutarate dehydrogenase (EC 1.2.4.2) and phosphate-dependent glutaminase (EC 3.5.1.2) were decreased in intestinal mucosal scrapings from hypothyroid rats. Similar decreases were obtained in colonic mucosal scrapings (except for citrate synthase and oxoglutarate dehydrogenase) from hypothyroid rats.