

Maximal activity of phosphate-dependent glutaminase and glutamine metabolism in septic rats.

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Abstract

The activity of phosphate-dependent glutaminase and glutamine metabolism by tissues known markedly to utilize or synthesize glutamine (or both) were studied in rats made septic by cecal ligation and puncture technique and compared with the same measures in rats that underwent sham operation (laparotomy). Blood glucose level was not markedly different in septic rats, but lactate, pyruvate, alanine, and glutamine levels were markedly increased. Conversely, blood ketone body concentrations were significantly decreased in septic rats. Both plasma insulin and glucagon levels were markedly elevated in response to sepsis. The maximal activity of phosphate-dependent glutaminase was decreased in the small intestine, increased in the kidney and mesenteric lymph nodes, and unchanged in the liver of septic rats. Arteriovenous concentration difference measurements across the gut showed a decrease in the net glutamine removed from the circulation in septic rats. Arteriovenous concentration difference measurements for glutamine showed that both renal uptake and skeletal muscle release of the amino acid were increased in response to sepsis, whereas measurements across the hepatic bed showed a net uptake of glutamine in septic rats. Enterocytes isolated from septic rats exhibited a decreased rate of utilization of glutamine and production of glutamate, alanine, and ammonia, whereas lymphocytes isolated from septic rats showed an enhanced rate of utilization of glutamine and production of glutamate, aspartate, and ammonia. It is concluded that, during sepsis, glutamine uptake and metabolism are enhanced in renal and lymphoid tissue but decreased in that of the small intestine, with increased rates of release by skeletal muscle; however, the liver appears to utilize glutamine in septic rats