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Hepatic glutamine metabolism in the septic rat.

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Abstract

1. The hepatic metabolism of glutamine, alanine, ammonia, urea, glutathione and glucose was studied in rats made septic by caecal ligation and puncture and was compared with that in rats that had undergone sham operation (laparotomy). 2. Sepsis resulted in increases in the plasma activities of gamma-glutamyltransferase (P less than 0.001), alanine aminotransferase (P less than 0.001) and aspartate aminotransferase (P less than 0.001), the serum total and direct bilirubin concentrations (P less than 0.001), and the blood lactate (P less than 0.01), glutamine (P less than 0.05), alanine (P less than 0.001) and urea (P less than 0.05) concentrations, but produced decreases in the blood ketone body (P less than 0.001) and glutathione (P less than 0.05) concentrations and in the plasma cholesterol concentration (P less than 0.05). These changes were associated with marked negative nitrogen balance in septic rats. 3. Sepsis increased total hepatic blood flow (by 22.7%) together with hepatic arterial flow (by 25.8%) and portal venous flow (by 18.7%). Sepsis resulted in marked increases in the net rates of hepatic extraction of glutamine (by 164%), alanine (by 138%) and ammonia (by 259%) with concomitant increases in the net rates of hepatic release of glutamate (by 105%), glutathione (by 87.5%), glucose (by 70.1%) and urea (by 100.4%). 4. Sepsis increased the activities of liver carbamoylphosphate synthase (by 16.4%), ornithine transcarbamylase (by 29.8%), argininosuccinate synthase (by 28.1%) and arginase (by 33.8%). 5. Septic rats exhibited marked increases in hepatic protein (by 46.0%), RNA (by 43.4%) and DNA (by 37.7%) contents. These changes were accompanied by marked increases in the activity of thymidine kinase (by 35.9%).