Arginine supplementation enhances peritoneal macrophage phagocytic activity in rats with gut-derived sepsis

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Abstract

BACKGROUND: Previous reports have shown that arginine (Arg) enhances phagocytic activity of macrophages and is required for macrophage-mediated toxicity toward tumor cells. Few studies have addressed the importance of Arg supplementation on macrophage and neutrophil function after infection and sepsis. This study examined the effect of Arg-supplemented diets before and Arg-enriched total parenteral nutrition (TPN) after sepsis or both on the phagocytic activity of peritoneal macrophages and blood polymorphonuclear cells in rats with gut-derived sepsis. METHODS: Male Wistar rats were assigned to 4 groups. Groups 1 and 2 were fed a semipurified diet, while groups 3 and 4 had part of the casein replaced with 2% of total calories as Arg. After the experimental diets were administered for 10 days, sepsis was induced by cecal ligation and puncture (CLP); at the same time, an internal jugular vein was cannulated. All rats were maintained on TPN for 3 days. Groups 1 and 3 were infused with conventional TPN, while groups 2 and 4 were supplemented with Arg, replacing 10% of total amino acids in the TPN solution. Survival rates were recorded for 3 days after CLP, and all surviving rats were killed 3 days after CLP to examine their immune responses. RESULTS: Aerobic and anaerobic bacteria colony counts in peritoneal lavage fluid were significantly reduced, and the phagocytic activity of peritoneal macrophages was enhanced in groups 3 and 4 but not in the other 2 groups. There were no significant differences in the phagocytic activities of blood polymorphonuclear cells and survival rates among the 4 groups. CONCLUSIONS: Enteral Arg supplementation before sepsis significantly enhanced peritoneal macrophage phagocytic activity and reduced total bacterial counts in peritoneal lavage fluid. Arg administered before and after CLP seemed to have a synergistic effect on enhancing phagocytic activity and on bacterial clearance. However, IV Arg administration after CLP had no favorable effects on phagocytic activity or survival rates in rats with gut-derived sepsis.