Title: ENHANCEMENT OF BACTERIAL ELIMINATION AND ATTENUATION OF HEMODYNAMIC DERANGEMENTS OF SEPSIS FROM TOTAL PARENTERAL NUTRITION WITH LIPID

Authors: S. Doty, M.D., D. J. Dehring, M.D., D. Krafft, B.S., D. Traber, Ph.D., D. Herndon, N.D.

Affiliations: University of Texas Medical Branch and Shriners Burns Institute, Galveston, Texas 77555

Introduction: Patients with sepsis or trauma often require total parenteral nutrition (TPN) and may develop infectious complications. The effects of a superimposed bacteremia on sheep maintained on TPN with or without the addition of lipid were studied. A septic sheep model has been developed in which an infusion of live *Pseudomonas aeruginosa* (5x10⁷ cells/min) is given for 1 hr. in a central vein. Pulmonary hypertension and a delayed (6-8 hr) hyperdynamic circulation occur. Quantitative cultures of the pulmonary artery (PA) and aortic (AO) blood demonstrate pulmonary intravascular clearance of bacteria.1 Bacteria are phagocytized in the neutrophils and pulmonary intravascular macrophages in the pulmonary capillaries of animal species susceptible to sepsis induced respiratory failure.2 The hypothesis for this study is that the lipid emulsion would impair the phagocytosis of bacteria and result in a more severe hemodynamic response to the sepsis and decreased bacterial clearance.

Methods: Sheep were prepared for chronic studies by placement of Swan-Ganz, left atrial, and femoral arterial catheters with a femoral venous catheter placed for TPN. Baseline data were collected seven days later and the animals began on TPN with caloric requirements based on oxygen consumption determined in sheep. The animals were infused with either a solution of D₃₄W with 8.5% amino acids (TPNO, n=5) or with 25% of their calories as a lipid emulsion with long chain fatty acids and 75% of their calories from the dextrose/amino acid solution (TPNL, n=6). On the fifth day of TPN 5x10⁷ live Ps. aeruginosa (Ps)/min were infused centrally for one hour. Hemodynamic measurements were collected for 24 hrs. Quantitative cultures of PA and AO blood were performed for 5 hrs, at which time gentamicin was given to prevent abscess formation. A control group (PSO, n=8) of sheep receiving Ps. alone without TPN was also studied.

Results: Pulmonary intravascular clearance of Ps. was equivalent in all groups. The baseline cultures of PA and AO catheters were sterile. The groups receiving TPN had stable hemodynamics before the bacterial infusion. In TPNL there was a significant reduction in the pulmonary bacteria measured in the PA blood. In TPNL the Ps. were also removed more efficiently from the circulation after stopping the Ps. infusion at 1 hr. The baseline neutrophil count, and subsequent neutropenia with Ps. infusion was equivalent in all 3 groups.

In PSO, cardiac index (CI) increased and mean arterial pressure (MAP) and systemic vascular resistance decreased significantly from 6-12 hrs. In TPNO, the increased CI and decreased MAP were delayed until 12 hrs, and in TPNL the hyperdynamic circulation began at 8 hrs.

Discussion: In this animal model, TPN with and without lipid was infused in a manner consistent with clinical practice. Contrary to expectations, the group receiving lipid removed bacteria much more efficiently than the other groups. In this model, TPN delayed the onset of the hemodynamic changes, which may delay the clinical recognition and treatment of sepsis. Further work is necessary to determine the mechanisms responsible for these effects. (This work is supported by HL 36288-01A1, SH 86-03-101).

References: