732 THE EFFECTS OF TEMPERATURE, TUBING AND TIME ON BACTERIAL CONTAMINATION OF BREAST MILK INFUSIONS. Linda L. Wright, Suzanne Ullsperger, Mary C. McKenna. (Spon. by Allen Schwartz). Dept. of Peds., Univ. of Md. Sch. of Med., Baltimore, Md.

Because all breast milk is contaminated, it is important to minimize the risk of bacterial growth in breast milk infusions to immunocompromised newborns. This study tested bacterial growth by serial dilutions and plate counts in breast milk as a function of (1) refrigeration to 24 hrs, (2) tubing contamination, (3) infusion time at room temperature. Thawed breast milk was infused at 1-2 cc/hr through iv tubing for a total of 12 hrs. The breast milk was refrigerated until use in a continuous 12-hr infusion or three serial four-hr infusions which were cultured at time 0, 4, 8, 12, 24 hrs. Differential growth during sequential four-hr infusions reflected tubing contamination, which was compared to bacterial growth during a 12-hr room-temperature infusion to determine bacterial growth independent of tubing contamination. There was no increase in bacterial growth during 24 hrs of refrigeration or during a four-hr room-temperature infusion (N=12). The mean increase in bacterial growth due to tube contamination during hrs 4-8 was 0.5 log, during hrs 8-12 was 1.5 log (N=4). The mean increase in bacterial growth, independent of tube contamination during hrs 0-8 was 0.5 log, during hrs 0-12 was 0.5 log (N=4). Our data suggest that there is no increase in bacterial growth in breast milk during four-hr infusions at room temperature or 24 hrs of refrigeration; because tube contamination and bacterial growth appear after four hrs at room temperature, breast milk and tubing should be changed every four hrs.

733 BETA-HYDROXYBUTYRATE CONCENTRATIONS IN PLASMA OF PRETERM INFANTS FED FORMULAS WITH AND WITHOUT MEDIUM CHAIN TRIGLYCERIDES. Paul Y.K. Wu, Savitri Rambhatla, Nancy Auestad, John Edmond, Thomas Picone, John Benson. Univ. of So. Calif. Sch. of Med., Dept. of Peds. and UCLA Sch. of Med., Dept. of Biol. Chem., Los Angeles, Ross Labs, Med. Div, Columbus.

The ketone bodies, beta-hydroxybutyrate (BOHB) and acetoacetate, are substrates readily available for respiration and lipogenesis, particularly in the developing central nervous system. Ketone body concentrations in blood increase in the 3rd trimester of pregnancy. Measurements of umbilical arterio-venous concentration differences suggest that they are transferred from placenta to fetus. In order to determine whether the fat content in formulas may influence ketone body level in blood, we measured the concentration of BOHB in plasma from 11 preterm infants (gestational age 34±0.9 wks). At the time of entrance to the study, the infants were receiving 110 cal/kg/day. They were fed 3 different formulas sequentially in the order: PM 60/40, Similac Special Care and Similac 20. Each formula was fed for 4 days and blood samples were obtained 2 hours after the last feeding on the morning of the 4th day. Similac Special Care contains medium chain triglyceride (MCT) a known ketogenic fat; PM 60/40 and Similac 20 do not. The concentrations of BOHB in plasma from preterm infants on formulas were: PM 60/40, 0.60±0.01 mM; Similac Special Care, 0.14±0.03 mM; Similac 20, 0.05±0.01 mM. Conclusion: Preterm infants fed formula containing MCT have higher plasma concentrations of BOHB. Since ketone body uptake by brain has been shown to be directly proportional to plasma level the difference could be important for brain development.

734 REGIONAL CIRCULATORY RESPONSES IN 2-4 WEEK-OLD PIGLETS:EFFECTS OF FEEDING AND HEMORRHAGE(H). Alice C. Yao, Phyllis M. Gootman, Patricia E. Pierce, Steven M. DiRusso, Downstate Medical Center, SUNY, Depts. of Ped. & Physiol., Bklyn, NY

Responses of the superior mesenteric(Mes), femoral(Fem) and renal(Ren) arterial blood flows(F) to feeding(Group I, n=20) and to feeding after a 15% blood volume H,(Group II, n=10) were examined in lightly anesthetized, artificially ventilated piglets. F were registered with electromagnetic probes pre- and postprandially for 2 hrs. EKG, heart rate and aortic pressure were continuously monitored. Regional vascular resistances(R) were calculated. Commercially formulated milk, 26 ml/kg, were given by gavage. Significant fall in pulse pressure(PP) occurred to H. After attaining a steady state following H, feeding protocol was carried out. Significant results (Mean±SE) are:

Postprandial Maximum Regional Circulatory Changes(4%, $p < .05$)

Group	Mes F	Mes R	Fem F	Fem R
I	+29.9±10.7	-15.4±7.8(NS)	-24.8±7.2	+39.3±17.9
II	+44.2±14.3	-31.5±8.9	+43.7±15.6	-28.6±6.9

Significant changes in Group I started 15-30 min after feeding and at 45 min for Group II, both lasted the remainder of observation period. RenF and RenR changes were inconsistent. Group I responses indicate that regional F redistribution occurred with feeding favoring the Mes circulation. Following H, feeding increased MesF, FemF, PP and decreased FemR, MesR. These results suggest that piglets 2-4 wks of age are capable of overriding circulatory response to H during feeding. (Supported by NIH HL20864)

† **735** SERUM FIBRONECTIN: AN INDICATOR OF NUTRITIONAL STATUS. M.C. Yoder, D.C. Anderson, S.D. Douglas, R.A. Polin. Dept. of Peds., Univ. of PA Sch. Med., & Children's Hosp. of Phila., PA.; & Dept. of Peds., Baylor College of Medicine, Houston, TX

Few techniques exist to evaluate nutritional status in infants and children. We determined serum fibronectin, prealbumin, and albumin values in 27 malnourished children (ages 1 mo - 2½ yr) to assess serum fibronectin as a biochemical marker of nutritional state. Height, weight, estimated weight for age/height for age, head circumference to midhumeral circumference ratio, and skinfold thickness measurements were obtained on admission to the study and serially. Patients' nutritional status was categorized as severe or mild-moderately malnourished or "nutritionally restored" by anthropometry;

	Severe (S)	Mild-Moderate (M)	Restored (R)
Prealbumin (mg/dl)	6.8 ± 2.8	17.9 ± 5.5*	23.3 ± 5.9**
Albumin (gm/dl)	2.4 ± 0.8	3.1 ± 0.6	3.8 ± 0.4
Fibronectin (mcg/ml)	99.1 ± 39.2	210.5 ± 70.1***	283.9 ± 66.3**

*$p < .02$ S vs M, **$p < .001$ S vs R, ***$p < .001$ S vs M.

Prealbumin and serum fibronectin were significantly decreased in patients with severe malnutrition compared to mild-moderate malnutrition or "nutritionally restored" patients. There was no sigificant difference in prealbumin and serum fibronectin concentrations in study patients with mild-moderate malnutrition compared to "nutritionally restored" patients (prealbumin $p = .24$, fibronectin $p = .06$). Albumin concentrations were higher in the better nourished patient group, however, no significant increases were seen. Serum fibronectin significantly correlated ($R = 0.64$, $p < .01$) with prealbumin (all groups compared concomitantly). Serum fibronectin may be a sensitive indicator of nutritional adequacy.

● **736** Breast Milk Protection Against Enterocolitis Moritz M. Ziegler, M.D., Colin MacNeill and Maria Rupnick, B.S.

A neonatal rat model of necrotizing enterocolitis was produced by feeding pregnant mothers a 2.5% protein diet and by stressing her newborns with 3 days of hypoxia ($FIO2 < 5\%$) and hypothermia (4°C). The resultant malnourished pups (birth weight 5.7 gm vs 7.8 gm, daily weight gain 1.5% vs 12.5%, total protein 2.9 gm% vs 3.9gm%, albumin 1.5 gm% vs 1.9 gm%, $p < .05$) following stress developed histologically confirmed enterocolitis (24 of 95 pups, 26%), despite feeding from their own mother. When these animals were foster nursed by a normally nourished mother, there was a dramatic diminution in the incidence of enterocolitis (4 of 44, 9.0%). Breast milk was analyzed from malnourished and normal mothers and found to be significantly deficient in protein (7.27 gm% vs 8.72 gm%, $p < .05$) and total mononuclear cells (1.4×10^6 cells/cc vs 3.2×10^6 cells/cc, $p < .05$). Subsequently, foster nursing was done between AgB incompatible Lewis and Brown Norway strains, and in both pup-maternal strain combinations, foster nursing to normally nourished mothers afforded protection against enterocolitis. Furthermore, subsequent breast milk donor strain skin grafts onto recipient pups failed to demonstrate either tolerance or sensitization to donor strain antigen (median survival time 9.0 days). These data suggest that although maternal nutritional status may play a significant role in protecting the malnourished rat pup from developing enterocolitis, it is unlikely that the cellular component of this milk is immunologically active.

GENETICS

● **737** ELECTRON-TRANSFERRING FLAVOPROTEIN (ETF) ACTIVITY IS DEFICIENT IN GLUTARIC ACIDURIA TYPE II (GA-II) AND ETHYLMALONIC-ADIPIC ACIDURIA (EMA) FIBROBLASTS. B. A. Amendt and W. J. Rhead (Spon. by J. Robillard), University of Iowa, Department of Pediatrics, Iowa City, Iowa 52242.

GA-II and a mild variant, EMA, result from impaired mitochondrial dehydrogenation of multiple acyl-CoA's, due to deficient ETF or ETF dehydrogenase (DH) activity, which transfer electrons from the acyl-CoA DH (ADH) to coenzyme Q. In two GA-II, one female and one male, and in 3 EMA/mild GA-II patients, medium chain ADH (MCADH) activities in GA-II and EMA fibroblast mitochondrial supernatants (MS), measured by a dye assay, were 55% ($p<0.05$) and 77% of control; with a ^{3}H-release assay, MCADH activities in GA-II and EMA MS were 80% and 92% of control. In GA-II and EMA whole fibroblast supernatants, short chain ADH, MCADH, and isovaleryl-CoA DH activities ranged from 76% to 103% of control ($p>0.1$). With a dye reduction method in which MS ETF transfers electrons from 39 pmoles pure pig liver MCADH to an acceptor dye, ETF activity in GA-II was 29% ($p<0.05$; N=10) and in EMA 62% of control ($p<0.05$; N=14). When assayed with 165 pmoles MCADH, ETF activities in control MS increased three-fold and in GA-II and EMA MS were 8% ($p<0.01$) and 36% of control ($p<0.05$). Since flavin adenine dinucleotide (20uM) increased ETF activity in GA-II and EMA to only 15% and 51% of control, FAD binding to ETF is probably not defective in GA-II and EMA. Antimycin-A increased electron flux to the acceptor dye and control ETF activity 40%, but ETF activities in GA-II and EMA MS were still 15% and 46% of control. These cases of GA-II and EMA appear due to severe and mild ETF deficiencies, respectively.