620 CHARACTERIZATION OF HUMAN FETAL INTESTINAL LYMPHOCYTES. Gary J. Russell, Atul K. Bhan, Harland S. Winter. Harvard Med. Sch., The Children's and Mass. Gen. Hospitals, Dept. of Pediatrics (Div. of Ped. GI and Nutrition) and Pathology, Boston,MA.

The characterization of human B and T cell subset development in the fetus has been limited mainly to thymus, liver, bone marrow and spleen. This study compares the lymphocyte subsets of human fetal intestine to that of the normal infant and adult. Monoclonal antibodies identifying T cells (Leu4+), helper/inducer (Leu3a+), cytotoxic/suppressor (Leu2a+), HLA-DR, and B cells were used with the immunoperoxidase technique to quantify cells in the thymus, spleen, liver, small bowel, cecum and colon of two 18-20 week fetuses and normal proximal jejunum of a six month old infant. RESULTS: Like adults, fetal thymus, spleen and intestinal lamina propria (LP) contain Leu3a+ and Leu2a+ lymphocytes, but in contrast to adults, rare intraepithelial lymphocytes (IEL) were noted in the fetus and infant. IgM+ and IgD+ B cells were present in the LP of the infant, but were mostly restricted to lymphoid aggregates in fetal intestine. HLA-DR antigen was absent from the mucosal epithelium of the fetus but present in the infant. CONCLUSIONS: T cells in the LP precede B cell development. Leu3a+ cells predominate in the LP, but Leu2a+ IEL, prevalent in adults, are conspicuously rare in the fetus and infant. HLA-DR is absent from the fetal epithelium, but present in the infant and adult. These findings are consistent with the hypothesis that the presence of IEL and expression of HLA-DR by intestinal epithelial cells is possibly related to exposure to luminal antigenic stimulation.

621 GROWTH AND PUBERTY IN A 36 YR. OLD MALE AFTER INTRAVENOUS ALIMENTATION. Claude Sansaricq, Selma E. Snyderman, Raphael David, Mamta Shaha and Theresa M. Pulmones. NYU Med. Ctr., Dept. of Pediatrics, NY, NY.

We are reporting the unusual case of a 36 yr. old man who at age 3½ yr. had an ileocecal intussusception which required massive resection of his small and part of his large bowel. At age 7 yr. he underwent a second resection of the gut, leaving only 30 cm. of proximal small intestine. Since then his growth remained extremely stunted. At age 18 yr. his height was 117 cm., and at 35 yr. it was 122 cm. (corresponding to a mean height of a 6 yr. old boy), while his bone age was 13 yr. (± 11 m.SD). A growth hormone deficiency was excluded. From age 10 yr. onward he developed tetany, secondary to hypocalcemia, hypomagnesemia, anemia due to intestinal blood loss, and vit. B12 deficiency. At age 35 yr. his serum Zn was low normal, but levels of Cu, Cr, Se and Mn were very low. After a period of rapid deterioration (weight loss, hypoproteinemia), the patient finally accepted home parenteral nutrition. This was continued for 15 months and resulted in a weight gain of 16 kg. and an increase in height of 8.5 cms. A small increment in serum somatomedin-C was observed (16 to 29 ng/ml). Concomitantly, he developed secondary sexual characteristics (Tanner III), with a surge in serum testosterone levels up to 926 ng/dl, from a low of 20 ng/dl (normal 300-900). Serum Ca and Mg levels were normal. We conclude that growth failure and delayed puberty, secondary to prolonged malnutrition, will respond to appropriate intravenous alimentation, even at an advanced age.

622 THE MEASUREMENT OF BODY VOLUME IN PRETERM INFANTS BY ACOUSTIC PLETHYSMOGRAPHY. Richard J. Schanler, Anne A. Adolph, Hwai-Ping Sheng, and Cutberto Garza. USDA/ARS Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, TX.

An accurate measurement of body volume is essential when body protein and fat are estimated by the densitometric method expanded to a four compartment system: total body water, protein, fat, and mineral. Total body fat and lean body mass comprise the usual two compartment system. The acoustic plethysmograph, based on the Helmholtz resonator principle, was tested with miniature pigs. Body volume was estimated with a reproducibility of 2.5% and no differences were noted between volumes estimated by that method and water displacement. That initial prototype was affected significantly by temperature; a 1° deviation at $35^{\circ}C$ resulted in a 2.5% change in body volume estimates. A constant temperature chamber has been designed. The body volume of 8 preterm infants (postnatal age and body weight ranges were 2.5 - 11 wks and 1423 - 2425 g, respectively) was measured. Ten measurements, each of 1 min duration, were obtained on each subject. The mean coefficient of variation of the measurements was 1.43 ± 0.55%. Body volumes and densities ranged from 1382 - 2450 cc and 0.97 - 1.067 g/cc (mean = 1.028 ± 0.024 g/cc), respectively. The reproducibility also was tested from measurements obtained on the same infants on two consecutive days. The mean difference between measurements was 0.7 ± 0.6%. This method is rapid, noninvasive, has a low coefficient of variation, and is ideal to measure the body volumes of infants.

623 BILIARY BILE ACID EXCRETION BY THE HUMAN FETUS DURING EARLY GESTATION Kenneth D.R. Setchell, Ranjana Dumaswala, Carla Colombo, Fabio Sereni; (Spons. by William F. Balistreri) Children's Hospital Medical Center, Department of Pediatric Gastroenterology and Nutrition, Cincinnati, Ohio, 45229; University of Milan, Department of Pediatrics and Obstetrics, Milan, Italy.

Previous studies of the bile acid composition of meconium and bile obtained in the first few days of life indicate that, compared to the adult, there are significant differences in the hepatic synthesis of bile acids. Analysis of human fetal gallbladder bile provides a more direct assessment of primary hepatic synthesis in utero, but only limited studies have been described. Using HPLC, GLC and mass spectrometry the bile acid composition was determined for fetal gallbladder bile obtained after legal abortion between the 14th and 20th weeks of gestation. Chenodeoxycholic and cholic acids were the major bile acids identified however the profiles were characterized by an array of metabolites not normally found in adult bile. Hyocholic acid levels often exceeded those of cholic acid indicating C-6 hydroxylation to be a major pathway for bile acid synthesis in early life. Bile acid concentrations were relatively low before week 17 of gestation but showed a significant surge thereafter, increasing by >10 fold by week 20. The ratio of chenodeoxycholic:cholic acid in bile was constant (0.85) over this period and much lower than for newborn bile and adult bile indicating an immaturity in hepatic 12α-hydroxylase in early development. These observations demonstrate that more than 50% of the bile acids are accounted for by atypical bile acids and that the profile resembles that found in adults with cholestasis. This may in part account for the physiologic cholestasis of the newborn.

▲624 ZINC AND COPPER BALANCE STUDIES IN INFANTS RECEIVING TOTAL PARENTERAL NUTRITION (TPN). Robert J. Shulman (Spon. by Buford L. Nichols). USDA/ARS Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, TX.

The adequacy of the recommended parenteral intakes of Zn and Cu was studied in 12 infants (X±SE: 3.3±1.4 mo, range 0.25-17 mo) who were NPO and who received TPN supplemented with Zn and Cu (100 µg/kg/d and 10 µg/kg/d, respectively) as recommended by AMA guidelines. Zn and Cu serum measurements and 24 hr balances were obtained at baseline, 1, and 2 wk. Results of the Zn and Cu determinations are shown.

	Baseline (n = 12)	1 week (n = 12)	2 weeks (n = 6)
Serum Zn (µg/dl)	56 ± 5*	65 ± 6	67 ± 5
Zn balance (µg/kg/d)	-0.05 ± 0.05 †	0.04 ± 0.02 †	0.03 ± 0.02
Serum Cu (µg/dl)	78 ± 11 ‡	101 ± 10 ‡	97 ± 16
Cu balance (µg/kg/d)	-0.01 ± 0.01 §	0.003 ± 0.003 §	0.005 ± 0.001

* X ± SE; † P < 0.068; ‡ P < 0.03; § P < 0.12.

(Normal serum Zn: 52-163 µg/dl; normal serum Cu: 65-145 µg/dl) Serum levels were low at baseline, 1 and 2 wk for Zn in 4/12, 3/12, and 0/6 infants and for Cu in 5/12, 3/12, and 1/6 infants, respectively. Balances were negative at baseline, 1 and 2 wk for Zn in 6/12, 2/12, and 1/6 infants and for Cu in 5/12, 1/12, and 0/6 infants, respectively. Only infants with intestinal drainage (i.e., nasogastric, ileostomy) were in negative balance at 1 and 2 wk. Conclusions: 1) These preliminary data suggest that the recommended parenteral Zn and Cu intakes are adequate for most infants. 2) Infants with intestinal drainage may require supplemental Zn and Cu. 3) Changes in Zn balances were not reflected in serum Zn levels.

†625 INFLUENZA VIRUS ALTERS HEPATIC MITOCHONDRIAL OXYGEN CONSUMPTION UTILIZING ELECTRON TRANSFERRING DYES IN A MOUSE MODEL OF REYE'S SYNDROME. C. Jeffrey Sippel, Ronald Cockrell, and Kathleen B. Schwarz (Spon. by T. Aceto, Jr.). St. Louis University Medical Center. Cardinal Glennon Children's Hospital, Departments of Pediatrics and Biochemistry, St. Louis, MO.

Influenza B virus given i.v. to mice results in leakage of hepatic mitochondrial (HM) enzymes into the cytoplasm (Biochem Med 28:109, 1982) suggesting that the virus may alter HM membrane permeability and function. Accordingly, studies of oxidative phosphorylation were performed in HM obtained from 4-6 week old male Balb C mice given 12,800 hemagglutination units of egg-grown Influenza B Lee/40 virus (V) or vehicle (C) i.v. and studied 36 hours later. When the substrates glutamate (G), succinate (S), and ascorbate (A) were utilized, States 3 and 4 oxygen consumption did not differ between V and C. However the ADP:O ratio for G was decreased in V (2.88) vs. C 3.01-p<0.023), perhaps secondary to viral activation of endogenous ATPase with resultant recycling of ADP. TMPD (tetramethylenephenylene diamine) and PMS (phenazine methosulfate) are electron transferring cationic and anionic dyes respectively. Mitochondria with decreased fixed negative charge are more permeable to anions. PMS supported respiration (2.85 ng atoms O/min/mg protein) in V vs. 0.0 for C-p<0.004. In contrast TMPD sustained greater O_2 consumption in C (14.17 ng atoms O/min/mg protein) than in V-9.80) when employed alone (p<0.056) or with antimycin A + glutamate (11.62 for C vs. 5.45 for V) (p<0.011). The above data suggest that Influenza virus may alter HM permeability and fixed negative charge but does not impair respiratory function.