625 ROLE OF ENTERAL NUTRIENTS IN INTESTINAL MATURATION. Ricardo O. Castillo, Arlyn Pittler, Fran Costa. (Spon. by Norman Kretchmer). Univ. of Calif., Dept. of Nutritional Sciences, Univ. of Calif., Dept. of Peds., Berkeley and San Francisco.

Dramatic maturational changes in gastrointestinal function occur in rats during the 3rd week of life. Because the role of enteral nutrients in these changes in unclear, we investigated the effects of enteral and parenteral feedings in 14-15 day-old rats that were equipped with either intravenous (IV) or intragastric (IG) cannulas and provided identical amounts of nutrients. A comparison (C) group consisting of age and litter-matched animals allowed to wean normally were used. At 21 days, we measured intestinal length, mucosal weight, disaccharidase activities, DNA and protein content. Intestinal length varied significantly among the 3 groups C>IG>IV ($p<.05$) while total mucosal weight was comparable in C and IG, but significantly less in IV ($p<.05$). Total mucosal lactase activity, DNA and protein content did not differ among the 3 groups while total sucrase and maltase activities were highest in IG ($p<.05$) but comparable in C and IV. Ileal lactase-specific activity (S.A.) was .82±.43 UE/mg DNA in IV compared with .47±.24 for both C and IG ($p<.05$). Jejunal sucrase S.A. in IG was twice that of the other 2 groups ($p<.05$) while jejunal maltase S.A. was elevated in both IG and IV compared with C ($p<.05$). Conslusions: 1) Intestinal maturation is altered by the presence and composition of enteral nutrients during a critical period in GI development. 2) The effect of the altered maturation differs between the 3 disaccharidases suggesting independent developmental mechanisms.

† **626** GROWTH AND BONE MINERAL STATUS OF TERM INFANTS FED 2 DIFFERENT SOY FORMULAS. Gary M.Chan, Linda Leeper, Linda Book. University of Utah, Department of Pediatrics, Salt Lake City, Utah.

Soy based formulas (SBF) have been known to cause rickets in preterm infants. Its effects on term infants have not been published. We studied 40 term healthy infants who received either a SBF containing either a single carbohydrate (S) (glucose polymer) or dual carbohydrate (D) source (glucose polymer + sucrose). An additional 10 term breast fed (BF) infants were also followed. Subjects were studied at 2 wks, 2, 4, 6, 9, and 12 months of age for anthropometry, biochemical indices and bone density (bone mineral content/bone width, photon absorptiometry). There were no differences among the 3 groups in weight, length or head circumference gains during the study. Serum calcium, phosphorus, magnesium, zinc, copper, 25-OH vitamin D, and alkaline phosphatase were also similar among the 3 groups during the study. At 2 wks, 2 months, and 4 months of age, the BF group had a greater bone density than the two SBF groups. (2 wks: BF = 0.185±0.036 vs 0.169±0.039(S), 0.169±0.017(D); 2 months: BF = 0.179±0.040 vs 0.133±0.045(S), 0.1521O.034(D); 4 months: BF = 0.183±0.048, 0.125±0.038(S), 0.144±0.038(D), Kruskall Wallis, $p<.001$). After 4 months of age, there were no differences among the 3 groups in bone density. In conclusion, we have found the soy based formulas with either a single or dual carbohydrate source may cause bone demineralization during the first 4 months of life in term infants.

627 THE EFFECT OF DIFFERENT CALCIUM AND PHOSPHORUS CONTENT ON GROWTH AND BONE MINERALIZATION IN PRETERM INFANTS. Gary M. Chan and Laurie M. Mileur, University of Utah, Department of Pediatrics, Salt Lake City, Utah.

The effects of high calcium (Ca) and/or high phosphorus (P) intakes and different Ca:P ratio on postnatal bone mineralization in preterm infants have not been studied. We studied 30 preterm, appropriate for size infants who randomly received one of 3 formulas: 1) a formula containing 117 mg Ca, 59 mg P per 100 Kcal (Ca:P ratio 2:1), or 2) the same formula with higher P (82 mg/100 Kcal), (Ca:P ratio 1.4:1) or 3) the same formula with higher Ca (140 mg) and P (82 mg/100 Kcal) (Ca:P ratio 1.7). All infants received similar daily caloric intakes during our 4-6 week study period. At the start of the study, birthweight, gestation, postnatal age were similar in all 3 groups. To determine the "in utero" bone mineral content (BMC), an additional 20 appropriate for size infants from 28-41 wks gestation were measured by photon absorptiometry within 3 days of birth. The BMC of the formula fed groups was determined at least twice. To compare the BMC rate of the formula feedings to the in utero rate, a logarithmic change per week was calculated for each subject. Only the formula with higher P content (117 mg Ca, 82 mg P/100 Kcal, Ca:P ratio 1.4) resulted in lower rate of BMC ($p<0.001$), while the other 2 formulas had similar BMC rate to the in utero rate. Weight/length gains, serum Ca, P, 25-OH vitamin D, and albumin were similar among the 3 groups. We conclude that the Ca and P content of formula is important in preterm bone mineralization and that a Ca:P ratio of at least 1.7 may be critical in formulas with high Ca.

628 SEQUESTRATION OF IRON IN MONONUCLEAR CELLS IN SKELETAL MUSCLES OF PATIENTS WITH MYOSITIS Jen-Yih Chu, Janet Li, Daphne deMello, Gordon Gale and Dennis O'Connor, St. Louis University School of Medicine, Cardinal Glennon Children's Hospital, Department of Pediatrics and Pathology, St. Louis, MO.

Vitamin E deficiency in rabbits causes iron deficient erythropoiesis, severe myopathy and abnormal sequestration of iron in skeletal muscle. We have demonstrated that iron is sequestered as ferritin in macrophages. Our further study also demonstrated that iron is also sequestered as ferritin in macrophages in skeletal muscle of experimental ischemic myopathy. Human muscles were evaluated in this study for possible sequestration of ferritin in infiltrating macrophages. The muscle biopsy specimens were rapidly frozen in isopentane cooled to -160° C with liquid nitrogen and stored at -70° C. Sections of 6µm thickness were cut in cryostat. Localization of ferritin was studied by an immunoperoxidase method. Rabbit anti-ferritin antibody conjugated with peroxidase (Accurate Chemical and Scientific Co.) was used to bind the tissue ferritin and consequently produced a red brownish end product from 3-amino-9-ethyl-carbazole. We observed no ferritin in muscle cells but abundant staining of ferritin in mononuclear cells infiltrating muscle of myositis patients. Normal muscle stains minimally, usually at perivascular areas. This study suggested that similar iron sequestration as ferritin in macrophages probably also exists in the muscles of patients with myositis as in the rabbits. (Supported in part by a grant from Fleur de Lis Fund and Donald Ogle Fund)

● **629** CHANGES IN PHOSPHOLIPIDS OF MICROVILLUS MEMBRANE IN NEWBORNS: POSSIBLE CAUSE OF MUCOSAL BARRIER DYSFUNCTION. Shu-heh W. Chu and W. Allan Walker, Harvard Medical School, Massachusetts General Hospital/Children's Hospital, Dept. Pediatrics and Medicine, Boston, MA. 02114

Investigation of the mucosal barrier has shown that increased membrane fluidity, membrane permeability and macromolecular transport are characteristics of the immature microvillus membrane of the newborn intestine. Since phospholipids (PL) may have a great influence on membrane function, analysis of PL was carried out in microvillus membrane (MVM) of newborn and adult rat small intestine. MVM was prepared from the proximal half of the small intestine by the $MgCl_2$ precipitation method. PL were separated by two-dimensional thin-layer chromatography. The major PL found in the newborn MVM were phosphatidylcholine (PC) and phosphatidylethanolamine. Other detectable PL were phosphatidylinositol (PI), phosphatidylserine, sphingomyelin, phosphatidic acid, lysophosphatidylcholine, lysophosphatidylethanolamine, diphosphatidylglycerol and phosphatidylglycerol. The proportion of PC was much higher in the newborn MVM than the adult (44.4 vs 36.4%), whereas the proportion of PI was lower (3.6 vs 7.4%). In addition, the total phospholipid content of MVM was increased in the newborn as compared to the adult (317 vs 195 mg/mg protein), although no difference was found in the molar ratio of cholesterol to phospholipid between these two MVM preparations. This study suggests that quantitative and qualitative changes in MVM phospholipids may, in part, contribute to the maturation of mucosal barrier function of intestinal surface.

630 FECAL CARBOHYDRATE ANALYSIS BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY. Joseph H. Clark and Joseph F. Fitzgerald. Indiana University School of Medicine, Indiana University Hospitals, Department of Pediatrics, Indianapolis, Indiana.

Various techniques which assess carbohydrate (CHO) absorption are available. Determinations of stool pH and reducing substances are nonspecific, and oral CHO tolerance tests assume that gastric emptying and monosaccharide transport are normal. Breath hydrogen analysis quantitates intestinal bacterial degradation of unabsorbed CHO. We have developed a high performance liquid chromatographic (HPLC) technique to qualitate and quantitate unabsorbed CHO in feces. Individual dietary monosaccharides and disaccharides can be identified. We can detect <1 mg CHO/g fresh stool. Mean recovery rates for fructose, glucose, galactose, sucrose and lactose were greater than 85% over a range of 15-70 mg CHO/g spiked stool. Only maltose demonstrated fecal degradation with 34% recovered as maltose and 50% as glucose. Four "normal" newborns less than two weeks of age had no detectable CHO in their stools. Twelve infants <1 year old with watery, acidic stools were evaluated; 7 had unabsorbed fecal CHO up to 173 mg/g stool. Six of the 12 were evaluated with CHO tolerance tests during convalescence; 3 patients with normal tolerance tests had no fecal CHO while the other 3 had flat tolerance tests and up to 15 mg CHO/g stool during the test. HPLC stool analysis identifies a variety of digestion/absorption defects. A single stool specimen is required and qualitative information is available in one hour.