525 INCREASED DIETARY ZINC AND THE OUTCOME OF PREGNANCY IN MAGNESIUM (Mg) DEFICIENT RAT DAMS. Joan L. Caddell (Spon. by Patricia Monteleone), St. Louis U. Sch. Med. and Cardinal Glennon Hosp., Dept. Pediat-Adolesc. Med, St. Louis, MO

The dietary requirement for Mg and zinc (Zn) increase during gestation; both are essential for protein synthesis and growth. The nutrient requirement for gestation in laboratory rats are 0.04% for Mg and 12 mg/kg (ppm) for Zn (Nat. Res. Council, 1978). We fed day 2 pregnant Sprague-Dawley rat dams purified diets with 24% casein, 0.15% or 0.006% Mg, and three levels of Zn: approx. 10 X, 2 X, and 1.5 X the level of 12 ppm throughout gestation (N= 3 dams/group). All diets and tissues were analyzed using an atomic absorption spectrophotometer, US Bureau Stds. liver ref. was used.

DIETARY LEVELS Mg,%	Zn,ppm	BIRTH WT PUPS, g.	% WATER BIRTH*	ANALYSIS OF WHOLE DRY PUP MAGNESIUM (mg/kg)	ZINC
0.15	120	6.5±.08(38)	86.4±0.5	1627±43	150.9±2.6
0.006	120	5.5±.1 (32)	87.3±0.3	1001±12	157.3±2.9
0.006	29	5.2±.2 (19)	87.6±0.2	1111±12	147.5±2.8
0.006	19	5.2±.2 (9)	Three days postmature, stillborn. 1 dam		
Anal. var.		P<0.001	P<0.025	P<0.001	N.S.

*Rat pups /group analyzed: N=6-11. On day 2, the first group of rat pups had 83.4% water, compared with 86.7 % in the second, Mg-deficient group (P<0.001), and the Zn in Mg-fed first group was lower than in the Mg-deficient group (124.2±2.6 vs. 143.6±5.8; P<0.005). It is concluded that increased dietary Zn has an ameliorative effect on pregnancy in Mg deficient rat dams, and that the tissue content of water in the deficient pups is significantly increased. Support: Life Seekers and SLU Dept. Ped, CGMH.

526 DELAYED GASTRIC EMPTYING IN CHILDREN WITH GASTROESOPHAGEAL REFLUX (GER). Robert A. Cannon, Marilyn L. Swanson, Kenneth L. Cox, and Pieter A. DeVries, (Spon. by Raymond D. Adelman). University of California Davis Medical Center, Depts. of Pediatrics, Nuclear Medicine, and Surgery, Sacramento, California 95817.

The contribution of abnormal gastric motility to GER has not been established to date. 14 children (ages: 2 mo to 3 yr) with GER diagnosed by standard criteria (2 or more (+) studies: UGI, esophageal manometry, acid reflux studies, radionuclide reflux study or endoscopy) were evaluated for delayed gastric emptying using an isotope-labeled formula technique. Emptying curves and $T_{\frac{1}{2}}$ values were computed using Tc-99mSC in cow's milk or soy formula (0.67 cal/cc) administered as a single bolus of 300 cc/1.73m^2 in the supine position. Normal $T_{\frac{1}{2}}$ values were established in patients without GER. 9/14 patients with GER demonstrated significantly delayed gastric emptying:

	Normal	5/14 GER		9/14 GER
$\bar{X}$ $T_{\frac{1}{2}}$ (± SEM) (minutes)	30 (± 5)	33 (± 1) Range:27-35	P<0.01	85 (± 11) Range:45-140

The patients with delayed emptying had "flat" curves compared to biphasic curves in normals. Therapy with urecholine in selected patients had variable effects on emptying studies. 6/9 GER patients with delayed emptying required surgery due to failure of medical management; 1/5 GER patients with normal emptying required surgery.

Conclusion: Delayed gastric emptying appears to be a contributing factor to GER in children and may be associated with a poor response to medical therapy.

527 THE EFFECTS OF HUMAN MILK AND INFANT FORMULAS ON CIRCULATING HIGH DENSITY LIPOPROTEIN. Susan E. Carlson, Phillip W. DeVoe and Lewis A. Barness, University of South Florida College of Medicine, Dept. of Pediatrics, Tampa, FL.

Infant formulas, in contrast to human milk, contain up to 3 times as much polyunsaturated fat (PUFA) and about 10% as much cholesterol. Such formulas are known to reduce plasma cholesterol in comparison to human milk, but the reduction has been difficult to attribute specifically either to reduced dietary cholesterol or increased PUFA. Circulating lipoproteins were studied in infants (4-6 mos.) fed at least 90% of energy from human milk (12-15% PUFA), SMA (15% PUFA) or Enfamil (52% PUFA). Apoproteins A-I and A-II, the major proteins of high density lipoprotein (HDL), were quantitated by radialimmunodiffusion against rabbit antihuman serum. HDL and plasma cholesterol were analyzed by gas-liquid chromatography and LDL cholesterol was assumed to account for the remaining circulating cholesterol. Breast-fed and SMA-fed infants had identical amounts of both circulating HDL apoproteins and cholesterol, but LDL cholesterol was significantly lower in SMA-fed infants. Apoproteins A-I and A-II were lower in Enfamil- vs. SMA-fed infants by 25 and 20%, and HDL and LDL cholesterol by 35 and 18%, respectively. The data suggest that dietary cholesterol increases LDL cholesterol but not HDL cholesterol, and that PUFA most significantly decreases circulating HDL, although the reduction in total plasma cholesterol with Enfamil vs. SMA feeding was attributed equally to changes in HDL and LDL cholesterol concentration.

528 BONE MINERALIZATION IN BREAST-FED PREMATURE INFANTS. Gary Chan, Laurie Moyer and Catherine Rayburn. (Spon. by Lowell Glasgow), University of Utah, Department of Pediatrics, Salt Lake City, Utah.

Based on the calcium (Ca) and phosphate (P) requirements of premature infants, human milk (HM) may not provide for optimal bone mineralization. To determine the adequacy of HM in nursing premature infants we studied 11 breast-fed and 9 Similac^R (SIM) fed infants during the first 16 weeks of life. There were no differences between both groups in gestational age (33.7±0.5 (M±SE) for HM vs. 32.2±0.8 wks for SIM) or birth weight (1.98± .14 vs. 1.77±.16 kg). At 4-8 wks and 12-16 wks of age, bone mineral content (BMC) was measured by direct photon absorptiometry of the left wrist and blood drawn for serum total Ca, P, alkaline phosphatase (AP) and 25-hydroxyvitamin D (25-OH D) levels. At 4-8 wks, there were no differences between the HM or SIM groups in BMC ($\bar{X}$, 65 vs. 58 mg/cm), P ($\bar{X}$, 7.3 vs. 8.3 mg/dl), AP ($\bar{X}$, 163 vs. 156 IU/L; normal children 47-112 IU/L), 25-OH D ($\bar{X}$, 16 vs. 20 ng/ml; adult normal 10-40 ng/ml) or weight ($\bar{X}$, 2.60 vs. 2.84 kg). The HM group had a higher serum Ca level than SIM (10.75±.08 vs. 9.99±.21 mg/dl, p< .01). Again, at 12-16 wks, there were no differences in BMC ($\bar{X}$, 104 for HM vs. 88 mg/cm for SIM), Ca ($\bar{X}$, 10.75 vs. 10.66 mg/dl), AP ($\bar{X}$, 134 vs. 144 IU/L) or 25-OH D ($\bar{X}$, 16 vs. 20 ng/ml) or weight ($\bar{X}$, 4.26 kg for HM vs. 4.83 kg for SIM, p< .20). Our preliminary data suggest that human milk provides sufficient nutrients for bone mineralization in premature infants.

529 VITAMINS A, E, FAT AND CHOLESTEROL CONTENT OF PRETERM AND TERM HUMAN MILK. Gary Chan, Rita Thomas, Mary Parsons, Mary Demkowicz and Matthew Gervase. (Spon. by Lowell Glasgow), University of Utah, Department of Pediatrics, Salt Lake City, Utah.

We studied the vitamins A, E, fat (total lipid) and cholesterol content of milk from 8 preterm mothers (gest. 30-36 weeks) and 10 term (gest. 40 weeks) mothers. Expressed milk was collected on days 3, 9, 15, 21, 27 and 33 postpartum. To study the effects of maternal diet on its milk composition, a 48 hour dietary intake was recorded on days 3, 15, and 33. There were no differences in the vitamin A content between the preterm (PT) and term (T) milks; mean total for the study, 993±237 (M±SD) and 809±368 IU/dl respectively. The vitamin E content of PT and T milk was also not different; 0.95±0.36 IU/dl for PT and 1.4±0.5 IU/dl for T. However, PT milk had a lower mean fat content during the study than T milk (2.08±.81 vs. 3.28±1.33 gm/dl, p<.01). In both groups the fat content of the milk increased from day 3 to 33 (p<.001). There was no difference in cholesterol content of PT and T milk except on day 15 when preterm milk cholesterol was higher than T milk (7.84±3.5 mg/dl vs. 2.49±2.67 mg/dl, p<.02). The cholesterol content of the milk in both groups on day 33 was significantly higher than days 3, 9, 15 and 27. All mothers met or exceeded the recommended daily allowance of vitamins, fats and cholesterol during the study. No significant correlation was shown between maternal dietary ingestion and milk content. In conclusion, preterm milk is similar to term milk in vitamin A and E content, but has a lower fat and a higher cholesterol content during the first 33 days of lactation.

530 BREAST FEEDING, GROWTH AND MORBIDITY, R.K. Chandra. Memorial University of Newfoundland, Janeway Child Health Centre, Department of Pediatrics, St. John's Newfoundland, Canada.

The effect of exclusive breast feeding in the first few months of life on physical growth was studied prospectively in a group of 36 full-term healthy newborns. Growth failure was not observed in any infant until after the third month of life. The average growth curve for the entire group was between the 25th and 50th percentile at the end of the study period. However, altering of growth as judged by weight at or below the tenth percentile of standard for age was seen in three (8%) infants at the age of four months, five (13%) at five months, eight (22%) at six months, nine (25%) at seven months, and twelve (33%) at eight months. Morbidity experience showed a slight but statistically higher frequency of respiratory infections and otitis in those infants who had shown altered growth. Volume of milk intake was similar in the two groups. These observations suggest that a small proportion of exclusively breast-fed infants may not achieve adequate growth. In such infants, consideration should be given to supplementation after 4 months of age.