733 REDUCTION OF SERUM IONIZED CALCIUM (iC) AND ELEVATION OF SERUM PHOSPHORUS IN COW MILK FORMULA FED INFANTS COMPARED TO BREAST FED INFANTS IN THE FIRST SIX MONTHS OF LIFE. Bonny Specker, Philip Lichtenstein, Charles Gormley, Reginald C. Tsang, U. Cincinnati

Cow milk may result in neonatal hypocalcemic tetany in term infants at one wk of age. Current US cow milk formulas are modified to have lower P contents and should minimize adverse effects on Ca metabolism. However these formulas still contain more P (33-40 mg/dl) vs breast milk (13 mg/dl) and there are no studies on iCa and P in formula vs breast fed infants in the first 6 mos of age. We hypothesized that the higher intake of P in formula vs breast$_4$fed infants results in greater serum P but lower iCa. In a 2^4 factorial design cross-sectional study controlled for sex, race, season and diet, we evaluated serum Ca, iCa and P by diet (formula vs breast) in 119 normal, term infants <6 mo of age. No differences in serum Ca, iCa or P by season, race or sex were found. Total serum Ca did not differ between breast- and bottle-fed with means (±sem) of 9.75 (0.09) and 9.73 (0.06) mg/dl. However, iCa (Radiometer electrode, N adults 4.8-5.2 mg/dl, CV 1.1-2.6%) was lower in bottle- (5.27± 0.02 mg/dl) vs breast-fed infants (5.38±0.03) (p=0.005). Serum P was higher (6.98±0.08) for bottle- vs 6.44 (±0.10) in breast-fed (p<0.001). There were no correlations of C-terminal or intact PTH by radioimmunoassay with iCa or P. Thus, serum iCa is lower and P is higher in formula- vs breast-fed infants. We speculate that the lower Ca:P ratio in cow milk formula (1.3:1) compared to that of breast milk (2:1) may be responsible for these observed differences.

734 EVALUATION OF POLY R-478, A NEW POLYMERIC FOOD DYE, AS A NON-ABSORBABLE MARKER (NAM). G.E. Stahl, J.C. Fayer, J.B. Watkins. Divisions of Neonatology and Gastroenterology, Dept. Pediatrics, Univ. PA Sch. Med., Philadelphia, PA.

Poly R-478 (Dynapol Corp, Palo Alto, CA) is one of a new family of polymeric food dyes which have been shown to be highly water soluble, non-toxic and non-absorbable (J Cosmet Toxicol 19:687,1981). To evaluate Poly R-478 as a NAM for absorption studies, it was compared to PEG-4000 in a protocol for the measurement of bile salt absorption (Ped Res 18: 213A, 1984). Male rats (n=15; age 40 ± 5 days; wt 154 ± 33 g -mean ± SD) were anesthetized, bile ducts were cannulated and the jejunum (J) catheterized. To compare the distribution of the NAMs, a group of rats (n=7) had 1 ml of a solution containing 1 to 10 mM taurocholate (TC), ^{3}H-TC, and both ^{14}C-PEG and Poly R-478 instilled into the J. To measure TC absorption, a second group (n=8) received solutions containing TC, ^{3}H-TC and Poly R-478. At the end of the study, J and ileum were divided into 8 segments, homogenized, and digested in 1M KOH. The absorbance of Poly R-478 at 515 nm was found to be linear from .0002% to .02g%. The Poly R-478 concentration in each segment was measured by spectrophotometry at 515 nm and was used to calculate TC absorption.

Poly R-478 recovery was 96.3 ± 9.7%. The distributions of Poly R-478 and ^{14}C-PEG were significantly correlated (r=.91, p<.001). The TC absorption rate was linearly related to the TC concentration (y=.54x+.20, r=.98, p<.001) and was identical to data calculated using PEG-4000.

Poly R-478 is an effective NAM whose advantages include solubility in water, stability, easy and precise concentration determinations and non-radioactivity, allowing the simultaneous use of multiple radio-labeled substrates. The extensive use of this dye family in the food industry attests to its applicability to human and animal absorption studies.

735 LIPOPROTEIN-CHOLESTEROL LEVELS IN YOUNG RATS FED DIETS EITHER SUPPLEMENTED OR DEFICIENT IN SELENIUM AND/OR VITAMIN E. William L. Stone (Spon. by Festus O. Adibonogo). Meharry Medical College, Department of Pediatrics, Nashville, TN 37208.

Dietary deficiences of antioxidant nutrients (vitamin E and selenium) were found to have major effects on rat plasma lipoprotein-cholesterol levels. Weanling Fischer-344 rats were fed a cholesterol free basal diet deficient in both vitamin E and selenium (B diet) or supplemented with either vitamin E (B+E diet) or selenium (B+Se diet) or both these micronutrients (B+E+Se diet). After 13 weeks, the rats fed diets deficient in selenium (B+E or B diets) developed elevated LDL-cholesterol (13±1 mg/dl plasma) compared with values for age-matched rats (7±1 mg/dl plasma) fed the selenium supplemented diets (B+Se or B+E+Se). VLDL-cholesterol levels (3.3±0.4 mg/dl) in rats fed the B diet deficient in both vitamin E and selenium were significantly higher than values (0.6±0.2 mg/dl) for any of the other dietary groups. HDL-cholesterol levels were not significantly different in the various dietary groups. In a second experiment, diets identical to those in the first experiment were used but were supplemented with 1% cholesterol. The addition of dietary cholesterol caused a marked increase in serum lipoprotein-cholesterol levels in all dietary groups. LDL-cholesterol was again selectively increased (37±6) in rats fed the selenium deficient diets (B+cho+E or B+cho) compared to values for age matched rats (22±7) fed the selenium supplemented diets (B+cho+Se or B+cho+E+Se). As in the first experiment, VLDL-cholesterol was increase only in rat fed the diet deficient in both vitamin E and selenium (B+cho diet). Dietary selenium deficiency in young rats, independent of vitamin E status, appears to increase LDL-cholesterol levels. In humans and many animal models, LDL-cholesterol levels are a positive risk factor for atherosclerosis. (Supported by Grant RR-08037-13 from DRR and NHLBI and by an Investigatorship from the Tennessee Affiliate of the AHA).

736 INCREASED CALCIUM SUPPLEMENTATION IN NEONATES RECEIVING TOTAL PARENTERAL NUTRITION RESULTS IN IMPROVED CALCIUM RETENTION. Nirupama R. Subramanian, Russell J. Merritt, Mary H. Cheng, David Warburton. USC School of Medicine, Childrens Hospital of Los Angeles, Divs. of Neonatology and Pediatric Pulmonology, Gastroenterology and Clinical Laboratory, Los Angeles.

Most neonates on total parenteral nutrition (TPN) receive insufficient calcium for normal bone growth and hypercalciuria has been reported. To determine whether supplemental calcium would be retained, we compared the effects of two calcium intakes on short term calcium balance in 6 neonates of gestational age 42±3 weeks (x̄±SD): a standard TPN solution was given for 1 week followed by a high calcium TPN solution for 1 week; 24 hour urine collections were made at the end of each week; no diuretics were given. Serum calcium levels were normal during the study. Calcium balance data are shown below:

	Ca Intake mg/kg/day	Ca Excretion mg/kg/day	Ca Retention mg/kg/day	% Retention
STD TPN	25.7±12.5	9.9±3.4	15.9±9.2	59±8
HIGH Ca	69.7±11.0	15.2±5.4	54.6±12.5	78±8
	p < 0.001	p > 0.05	p< 0.001	p < 0.02

Phosphorus concentration was the same in both of the TPN solutions and no difference in phosphorus excretion was observed. We conclude that with a 2.5 fold increase in calcium intake, there was a 3.4 fold increase in calcium retention. Increased calcium supplementation improves calcium balance in neonates receiving TPN.

737 EFFECT OF INTRALUMINAL GLUCOSE (G) AND MANNITOL (M) ON THE PASSIVE ABSORPTION OF BILE SALTS (BS) G.E. Stahl, J.C. Fayer, J.B. Watkins. Divs. of Neonatol. & Gastro., Dept. Pediatrics, Univ. PA Sch. Med., Philadelphia, PA

We have demonstrated significant passive absorption of BS in proximal small intestine of the young rat (Ped Res 18:213A,1984). To evaluate the impact of carbohydrate absorption on the passive absorption of BS, young male rats were studied (n=15; age 38.6 ± 1.2 d; wt 142.2 ± 5.5 g - mean ± SEM). Each rat was anesthetized, the bile duct was cannulated and the (J) jejunum catheterized. G rats (n=8) had 1 ml of solution containing 0.25 to 10 mM taurocholate (TC), ^{3}H-TC, Poly R-478 (non-absorbable marker), and 20mM d-glucose instilled into the J. M rats (n=7) received TC, tracers and 20mM d-mannitol. Bile was collected for 90 min. post-injection and counted. J and ileum were then divided into 8 segments, homogenized, and counted. Poly R-478 concentration per segment was used to calculate TC absorption. Data from previous rats given only TC (T) was compared to G and M data.

Poly R-478 recovery was 92.2 ± 2.1% and >92% of the marker was found in the proximal J (segs 1-3). The maximum rate of TC absorption (G-r=.98, p<.001(**); M-r=.96,**), the total TC absorbed (G-r=.95,**; M-r=.99,**) and the TC recovered in bile (G-r=.89,p<.01(*); M-r=.81, p<.05) correlated significantly with the administered TC dose in both G and M groups.

G/M Absorb (% admin)	Max TC Abs Rate (nM/cm/min/uM admin)	Total TC Absorbed (uM/uM admin)	TC Recovered-Bile (uM/uM admin)
T	.545 ± .04	.236 ± .02	.101 ± .01 NS
G 96.2 ± 0.9 **	.536 ± .05 NS	.310 ± .04 **	.112 ± .03 *
M 7.9 ± 1.7	.078 ± .01 **	.145 ± .01 **	.037 ± .01 *

Passive TC absorption from proximal intestine in the presence of glucose is similar to that of TC alone - no consistent solute drag effect was seen. Decreased BS absorption in the presence of mannitol suggests that BS loss in malabsorptive diseases may relate to decreased passive BS absorption.

● **738** EFFECTS OF HYPOXEMIA ON POSTPRANDIAL GI BLOOD FLOW AND OXYGEN CONSUMPTION IN NEWBORN PIGLETS. Joanne S. Szabo, Steven Mayfield, William Oh, Barbara S. Stonestreet. Brown U, Dept.Ped, Women & Infants Hosp, Prov, RI.

The normal postprandial response in newborn piglets is characterized by increased gastrointestinal(GI)blood flow ($\dot{Q}$GI),O_2 delivery (DO_2GI), O_2 extraction (O_2ExGI) and O_2 consumption ($\dot{V}O_2$GI). Hypoxemia may modify these physiological changes. To test this hypothesis, nine 2-4 day old piglets were made hypoxemic (PaO_2: 26-28 torr for 45 min.)& fed with 30ml/kg of pig milk (Group I). 6 piglets were made hypoxemic but not fed (Group II) and 4 were fed but not hypoxemic (Group III). $\dot{Q}$GI ($ml \cdot min^{-1} \cdot 100g^{-1}$,microsphere method),$DO_2$GI($ml\ O_2 \cdot min^{-1} \cdot 100g^{-1}$), O_2ExGI(%),and $\dot{V}O_2$GI($ml\ O_2 \cdot min^{-1} \cdot 100g^{-1}$) during baseline (B), and hypoxemic (H) and/or fed (F, 30-min postprandial) periods were: (M±SEM)

	Group I		Group II		Group III	
	B	H+F	B	H	B	F
$\dot{Q}$GI	114±12	75±32	123±6	93±20	124±11	213±36+
DO_2GI	11.6±1.5	3.0±1.6*	11.3±0.7	3.7±1.0*	12.4±1.1	20.0±2.1*+
O_2ExGI	22±2	61±5*	22±2	40±7*+	22±6	22±2+
$\dot{V}O_2$GI	2.3±0.5	2.5±1.3	2.4±0.2	1.3±0.3	2.7±0.7	4.3±0.5

*p<0.05 vs B, +p<0.05 vs Grp. I for same study period

The normal increase in $\dot{V}O_2$GI to meet the postprandial metabolic demands was not observed in Group I, because the increase in O_2ExGI produced by feeding did not fully compensate for the decrease in $\dot{Q}$GI and DO_2GI produced by hypoxemia. We conclude that hypoxemia blunts the normal postprandial hyperemia and the extent to which blunted GIO_2 uptake satisfies the postprandial O_2 demand remains to be determined.