714 INTESTINAL PROTEIN AND BLOOD LOSS IN INFANTS FED BREAST MILK, FORMULA, OR WHOLE COW'S MILK. Daniel W. Thomas, Kathryn M. McGilligan, and Lawrence D. Eisenberg (Spons. by Robert M. McAllister), University of Southern California School of Medicine, Childrens Hospital of Los Angeles, Department of Pediatrics, Los Angeles, California.

"The appropriate age at which unheated, whole cow's milk (WCM) can be safely introduced into the infant diet is unknown and remains an area of controversy" (AAP Committee on Nutrition, 1983). Previous studies suggest that WCM is associated with an induced enteropathy in some infants, especially those under 6 months of age. However, the prevalence of intestinal damage which might result from WCM feedings has not been established in older infants. To examine this issue, we compared enteric protein and blood excretion in 332 healthy 6-12 month old infants fed breast milk (B), formula (F), or WCM in addition to solids. Fecal alpha-1-antitrypsin (FA1AT), a marker for enteric protein loss, and fecal hemoglobin (FH) concentrations were measured in random samples by radial immunodiffusion. Mean FA1AT (mg/g dry stool) ± SD are presented below:

Age(mos.)	B (n)	F (n)	WCM (n)	ANOVA
6-8	1.4±0.9(30)	1.2±0.7(64)	0.9±0.6(11)	.2>p>.1
8-10	1.6±1.3(34)	1.1±0.7(49)	0.7±0.5(23)	p<.01
10-12	1.5±1.0(33)	1.0±0.7(39)	0.5±0.5(49)	p<.001

All above values are within the normal range (Gastroenterology 80:776, 1981). FA1AT did not change with age. Only 6 infants had measurable FH loss (>3 mg/g dry stool). Diet was not a factor in FH loss.

Although the biological significance of the differences observed in FA1AT excretion is conjectural, we conclude that subclinical intestinal damage is infrequent in WCM-fed healthy infants over 6 months of age.

● 715 EFFECT OF MATURATION ON GASTROINTESTINAL ABSORPTION OF EPIDERMAL GROWTH FACTOR IN RATS. W. Thornburg, B. Magun, L. Matrisian, O. Koldovský. University of Arizona College of Medicine, Departments of Pediatrics, Anatomy, and Physiology, Tucson, Arizona.

Orally administered epidermal growth factor (EGF) is absorbed intact in suckling rats (Am J Physiol 246:1984). The present study analyzes the effect of maturation. Weanling (29-day-old) and suckling rats (14-day-old) were fed ^{125}I-EGF. After 30 min, radioactivity from stomach wall (SW), small intestinal wall (SIW) and liver (L) was extracted and analyzed by Sephadex G-25 for intact EGF. Data from two litters represent mean ± SEM (N = 4) of the proportion (%) of intact EGF (IN) in samples; and % of administered radioactivity recovered as intact EGF (REC).

	SW	SIW	L
Suckling IN	60.8 ± 4.2	63.7 ± 4.9	18.0 ± 5.7
REC	5.7 ± 0.75	3.9 ± 0.2	0.06 ± 0.02
Weanling IN	39.5 ± 2.6*	26.7 ± 4.6*	9.5 ± 1.2
REC	2.9 ± 0.73*	0.6 ± 0.1*	0.09 ± 0.05

*Significantly different from suckling values.

During weaning, the proportion of IN EGF isolated from stomach and intestine is decreased. Similar results were obtained for intestine in cortisone treated (5 mg/100 g B.W. daily-5 days) sucklings. The amount of IN EGF (after oral administration) found in the gastrointestinal tract of weanling rats is reduced when compared to sucklings; in the liver the differences were not significant. Conclusion: The processing of EGF by the gastrointestinal tract changes qualitatively and quantitatively during maturation.

716 ABSORPTION AND RETENTION OF COPPER, ZINC, CALCIUM, AND PHOSPHOROUS IN PREMATURE INFANTS. Eileen E. Tyrala, Judy Donlon, Temple University School of Medicine, St. Christopher's Hospital for Children, Department of Pediatrics, Philadelphia, Pennsylvania (Spons. by I. Rezvani)

72 hour balance studies to determine absorption and retention of copper, zinc, calcium, and phosphorous were done in 2 groups of well, growing, premature infants who were fed one of 2 formulas: Similac Special Care (SSC) with standard concentrations of Cu, (2.1mg/L), Zn, Ca, and PO4 or Clinical Product (CP) identical to SSC, except for a reduced concentration of copper (.8mg/L). Mean gestational age and birth weight of SSC group (GA=30.0 wks., BW=1279gms.) were not significantly different from the CP group (GA=31.2 wks., BW=1478gms.). Weight and post conceptional age (PCA) at time of study were not significantly different between the two groups. (SSC=1522gms. & 34.4 weeks PCA, CP=1576gms. & 33.7 weeks PCA).

Absorption (% and mg/kg/day)

	Ca	PO4	Cu	Zn
SSC	43 (108)	57 (67)	14 (.041)	32 (.72)
CP	58 (138)	57 (44)	12 (.015)	33 (.69)

Although it did not achieve statistical significance, (p=.09) absorption of calcium tended to be slightly higher in the CP group (low Cu); % and absolute absorption of PO4, Cu, and Zn were the same in both groups. The higher copper intake in the SSC group did not increase mean copper absorption. Infants from both groups were in negative copper balance. Zinc balance in all infants was positive and ranged from +9% to +59%. Inutero accretion rates for zinc (>.5mg/kg/d) were achieved in 7 out of 10 infants.

717 SERIAL SERUM COPPER AND CERULOPLASMIN CONCENTRATIONS IN COPPER AND NON-COPPER SUPPLEMENTED PARENTERALLY ALIMENTED INFANTS. Eileen E. Tyrala, Linda Friehling, Jeanne I. Manser, Nghia Tran. Temple University School of Medicine, St. Christopher's Hospital for Children, Department of Pediatrics, Philadelphia, Pennsylvania (Spons. by I. Rezvani)

Serial serum copper and ceruloplasmin concentrations were monitored in 2 groups of parenterally alimented premature infants. Group I (n=10, mean BW=1317gms., mean GA=30.9 weeks) did not receive copper supplementation. Group II (n=8, mean BW=1415gms., mean GA=30.5 weeks) received 100µg/kg/day of supplemental Cu as Cu chloride. Group III (n=48, mean BW=1217gms., mean GA=30 weeks) were growing premature infants receiving ≥150ml/kg of standard premature infant formula by 2 weeks of age.

Copper (µg/dl) / Ceruloplasmin (mg/dl)

	Week 2	3	4	5
Gp. I (non Cu)	38 / 10.4	54 / 14.8	53 / 14.3	53 / 13.4
Gp. II (Cu)	49 / 11.6	58 / 13.3	66 / 16.7	58 / 12.6
Gp. III	28 / 8.3	*26 / 8.2	*31 / 9.3	*30 / 4.1

Serum Cu and cerulo concentrations: 1. were significantly lower in Gp. III as compared to Gps. I & II during the 3rd, 4th, and 5th weeks of study; 2. were not significantly different between Gps. I & II throughout the 5 week study period. Concl: Serum Cu and cerulo concentrations do not reflect intake and cannot be used to assess sufficiency in the parenterally alimented infant.

718 FATTY ACID PROFILE OF RBC MEMBRANE PHOSPHOLIPIDS: EFECTS OF DIET AND POSTNATAL AGE. R. Uauy, M. T. Saitúa, X. Cassorla, C. Duque and A. Gil (Spon. by J. B. Warshaw). INTA, U. of Chile and UNIASA, Granada, Spain.

To evaluate the effect of diet and postnatal age on composition of Pethanolamine (PE) and Pcholine (PE), we divided 60 term neonates in 3 equal groups. They were fed exclusively from birth breast milk (BM), milk formula (MF) or MF supplemented with nucleotides (NMF) in similar concentration to that of BM. Groups were paired by sex, weight and gestation, blood samples were taken at birth, < 1d, 7d, 4 and 8 wks. Phospholipids were fractionated by TLC, fatty acid (FA) methylesters quantitated by GC expressing them as % of total > C_{14}. Results for PC show an increase in saturated FA with postnatal age due to a rise in palmitate. An increase in 22:5n6 was noted. For PE an increase in PUFA n3 and n6 was found and a decrease in oleate/linoleate; 22:6n3 rose in all groups. Diet effects for PC were: the % saturated FA was highest in MF and lowest in BM; 20:2n6 and 20:4n6 were lower in MF compared to BM, NMF showed intermediate values; n6/n3 was lowest in MF and similar for BM and NMF; 16+16:1/18:2 and 18:1/18:2 were significantly higher in BM or NMF as compared to MF. Postnatal age increases PUFA in PE but decreases PUFA in PC of RBC membranes. Breast milk and nucleotide supplemented formula showed higher conversion of linoleic acid into long chain PUFA. Nucleotides may play a role in long chain PUFA synthesis.

● 719 THE INTESTINAL UPTAKE OF PROTEASES AND NEONATAL HEPATITIS. John N. Udall, Kurt J. Bloch, Anna P. Newman, Marvin Dixon, W. Allan Walker, Harvard Medical School, MGH/CHMC, Depts. of Pediatrics and Medicine, Boston, MA.

Trypsin and other intestinal proteases may be taken up in increased amounts early in life and contribute to hepatic inflammation. To test this hypothesis, we gavaged newborn (n=9) and 4 week-old weaned rabbits (n=10) with 200 mg bovine trypsin/100 gm body weight. Four hrs later, serum tryptic activity, as determined by a functional assay, was significantly increased in newborn ($p<0.001$) but not weaned animals. A radioimmunoassay was used to detect immunoreactive-trypsin (i-trypsin) in serum samples. The concentrations of i-trypsin in the serum of newborn and weaned animals 4 hrs after gavage were 603 ± 97 ng/ml and 40 ± 13 ng/ml respectively ($p<0.001$). Serum i-trypsin in blood of weaned animals obtained at timed intervals up to 16 hrs after the trypsin feeding did not exceed the 40 ng/ml value. Sephadex G-200 gel filtration was performed on the serum samples. Tryptic activity was detected only in the excluded volume (trypsin bound to α_2-macroglobulin), and i-trypsin was detected only in the included volume (trypsin bound to α_1-antitrypsin); no free trypsin was detected. In vitro experiments demonstrated that large amounts of trypsin were required to overwhelm the normal serum inhibitors. In small-for-gestational age infants, however, there may be complete or partial deficiencies of serum inhibitors. In these infants, trypsin and other proteases may be taken up from the intestinal lumen into blood, circulate to the liver and induce hepatitis.