596 LEVELS OF COPPER AND CERULOPLASMIN IN INFANTS FED TWO DIFFERENT FORMULAS. Mary A. McCaffree, Wai Y. Chan, Paul Costiloe, Owen M. Rennert. Department of Pediatrics, University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma.

The serum levels of copper (Cu) and ceruloplasmin (Ce) of low-birth-weight infants (n=6) fed enriched formula (E) containing 0.2mg of copper/dl were compared to the levels in low-birth-weight infants (n=6) fed control formula (C) containing 0.06mg of copper/dl for a period of 29 days and were compared to the infants' postnatal and gestational age. At day 15 Cu levels in E and C infants were comparable while Ce levels were higher in E than C patients. Copper levels in an E twin were significantly higher than the C twinmate throughout the study period (days 1-29). Levels of ceruloplasmin remained elevated in the E twin following the termination of the study (day 29) when routine formula was fed to both infants. These data suggested that E formula enhances serum ceruloplasmin low-birth-weight infants compared to control formula. Supported in part by a University of Oklahoma Health Sciences Center grant award and through research support through Ross Laboratories, Columbus, Ohio.

597 COPPER AND MANGANESE LEVELS IN INFANTS FOLLOWING EXCHANGE TRANSFUSION. Mary A. McCaffree, Wai Y. Chan Tawfik Z. Ramadan, Max Perlman, Paul Costiloe, Owen M. Rennert. Department of Pediatrics, University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma.

Levels of copper (Cu) (N=17) and manganese (Mn) (N=12) were evaluated in infants before and following a double volume exchange transfusion and compared to levels of these elements in donor blood. The change in serum copper levels following exchange transfusion was significant (P=0.037).

	Cu ug/ml pre	post	donor
mean	0.489	0.726	1.229
standard deviation	± 0.315	± 0.501	± 0.807
range	0.15 - 1.50	0.08 - 2.0	0.3 - 3.38
	Mn ng/ml pre	**post**	**donor**
mean	3.25	4.14	5.28
standard deviation	± 1.79	± 2.37	± 3.25
range	0.52 - 6.02	1.58 - 9.26	0.83 - 12.2

Exchange transfusion did not significantly alter manganese levels. Following an exchange transfusion, serum Cu levels are significantly elevated while serum manganese levels remain unchanged. This study supported in part by a University of Oklahoma Health Sciences Center Small Grant Award.

598 FOOD PROTEIN-INDUCED ENTEROCOLITIS: DETECTION OF ORALLY INGESTED ANTIGEN IN SERUM AND URINE. Philip J. McDonald, Geraldine K. Powell, Randall M. Goldblum, University of Texas Medical Branch Hospitals, Department of Pediatrics, Galveston, Texas.

Enhanced macromolecular absorption of food antigens has been suspected in a variety of clinical disorders, but a method for evaluating this in humans has not been established. We developed an ELISA assay to detect ovalbumin in urine and serum. A solid phase sandwich assay using commercial anti-ovalbumin antibodies (ãOA) detected as little as 10 ng/ml of ovalbumin. Urine did not interfere with the assay but serum containing ãOA reduced assay sensitivity up to 97%. However, serum inhibition did not occur if ãOA were not detected in baseline serum. We evaluated ovalbumin absorption in infants <1 year of age undergoing diagnostic food challenges to soy and cow milk protein one month after recovery from enterocolitis. Serum was obtained at 1-hour post ingestion of a standardized oral dose of egg white (.6 gm protein/kg) and urine collected for 12 hours. Ovalbumin was detected in the serum in 14 of 15 infants and in the urine in 8 of 10 infants. The mean serum 1-hour concentration was 105 ng/ml (range 0 to 218, n=15). The mean 12-hour urinary excretion was 5.0×10^{-4} percent of ingested dose (range 0-2100, n=6). No correlation between ovalbumin absorption and age, total serum immunoglobulins or clinical response to challenge could be demonstrated. Thus by evaluating both serum and urine after a standardized egg white ingestion, we were able to detect absorption of ovalbumin antigen in all infants. This should allow quantitative studies to evaluate the clinical importance of macromolecular protein absorption.

599 FOOD PROTEIN-INDUCED ENTEROCOLITIS: ALTERED ANTIBODY RESPONSE TO ORAL ANTIGEN CHALLENGE, Philip J. McDonald, Geraldine K. Powell, Randall M. Goldblum, Greggory J. Van Sickle, University of Texas Medical Branch Hospitals, Department of Pediatrics, Galveston, Texas.

The etiology of food protein-induced enterocolitis is unknown, but immunologic mechanisms have been suspected. Class specific serum soy antibody response was determined (by ELISA) in 11 infants age 3 to 7 months with a history of enterocolitis, who were undergoing a diagnostic food challenge at least 1 month after recovery. Infants received a single oral dose of antigen (0.6 gm/kg) and challenges were evaluated as previously described (J Ped 93:533). The mean baseline(B) and 6 week followup(F) antibodies to the whole soy protein are shown below, expressed as a percentage of a standard reference pool.

CHALLENGE	ã Soy IgG		ã Soy IgM		ã Soy IgA	
RESPONSE	B	F	B	F	B	F
POS (7)	3127	4747	79	48	234	1060
NEG (4)	92	356	20	45	23	130

Infants with POS response had significantly higher baseline and followup IgG and IgA antibodies ($p<.01$, ANOVA on log transformed data). IgM antibodies fell in 6 of 7 infants with POS response but rose in those with NEG response ($p<.002$). The two groups did not differ with respect to age, time since last exposure to soy, or serum immunoglobulin levels. Differences in class specific antibody responses in the two groups suggests either enhanced mucosal penetration of antigen or differences in regulation of immune responses in soy-induced enterocolitis patients.

● **600** BILE SALT STIMULATED LIPASE IN PRETERM HUMAN MILK, ITS ROLE IN NEONATAL FAT DIGESTION. Nitin R. Mehta, Jay B. Jones and Margit Hamosh (Spon. by P.L. Calcagno). Georgetown University Medical Center, Washington, D.C.

Term human milk contains a lipase which hydrolyzes milk lipid in the infant's intestine after activation by bile salts. Since this lipase (BSSL) could play an important role in fat digestion in preterm infants (by compensating for low pancreatic lipase), we have measured its activity-(hydrolysis of tri-^{3}H olein, expressed as µmol free fatty acid (FFA) released/ml milk/min)-in milk collected for 3 months from 47 women who delivered after 26-36 wks of pregnancy (P). Since this lipase also has bile salt stimulated esterase (BSSE) activity, we have compared the ontogeny of BSSL and BSSE-hydrolysis of p-nitrophenyl acetate. The data show:

		BSSL (µmol/ml milk/min)			BSSE (µmol/ml milk/min)		
P. wks	N	0.2 wk	3 wk	12 wks	0.2 wk	3 wks	12 wks
25-30	19	22.5	29.5	22	61	50	41
31-36	28	21	27	31	44	50	35
37-40	6	32	29	33	45	29	23

1. BSSL activity did not change with length of gestation or lactation, suggesting that the fat in preterm milk can be extensively hydrolyzed by its endogenous BSSL. 2. BSSE activity was higher in preterm milk and colostrum and decreased thereafter suggesting that esterolytic activity develops earlier than lipolytic activity. 3. Storage at 4° leads to progressive loss for its bile salt requirement, suggesting that BSSE might be associated with breast milk jaundice. (NIH grants HD10823 and AM26641)

601 MID-PREGNANCY NUTRITION AS A PREDICTOR OF BIRTH WEIGHT. Jack Metcoff, Paul Costiloe, Warren Crosby, Seshachalam Dutta, Harold Sandstead, & C.E. Bodwell. University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma & Human Nutrition Lab, Grand Forks, ND and Protein Nutriiton Lab, Beltsville, MD, USDA/SEA.

Among 1100 mother-baby pairs studied prospectively, certain patterns of nutrient levels in maternal plasma & bioactivities in her leukocytes at midpregnancy were associated with delivery of small or large babies some 18 to 20 weeks later. The relation of bioactivities in rapidly replicating cells, like leukocytes, to nutrient levels in the surrounding plasma was complex; e.g.: protein synthesis or activities of glycolytic enzymes may be modulated by factorial interactions between plasma levels of trace minerals & certain amino acids. Using multiple regression analysis to incorporate these data & to statistically control for non-nutritional factors which modulate fetal growth, in 215 uncomplicated pregnancies, we find that 8 maternal clinical characteristics, 6 plasma nutrient levels & the aminogram, with 5 leukocyte bioactivities, all measured once at midpregnancy, can account for 65% of the variance in birth weight; the nutrition-related variables contributing 20%. The prediction equation derived from these measures can specifically identify mothers who will not have small babies, (96%) but is somewhat less sensitive (65%) for detection at midpregnancy of those who will. The results show that maternal nutrition modulates fetal growth & contributes significantly to the prediction of birth weight in our sample of pregnant women.