

513 SERUM RETINOL AND RETINYL ESTERS IN PREMATURE INFANTS RECEIVING PARENTERAL ALIMENTATION. Edward L. Bartlett, Jr., M. Jane Oesterling, Carmelita Kintinar, Elizabeth Frauenhoffer

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High doses of Vitamin A given during parenteral alimentation (PA), even if reduced by adsorption to plastic tubing, could cause toxicity if the retinyl ester (RtE) overwhelms the capacity of the storage mechanism. To check for significant serum RtE characteristic of Vitamin A toxicity, 9 infants were sampled while on peripheral PA for 1 to 31 days. On the day of sample, the mean daily Vitamin A dose per kg body wt: 3677 I.U. (S.D. 1750) or 1103 ug (S.D. 525). Mean gestational age: 30.2 wks (S.D. 1.1), birth weight: 1222 g (S.D. 264), day of age for sample ranged from 5 to 37 days and a total of 13 samples were collected. Serum RtE levels were uniformly low, i.e. 2.1 µg% or less. Serum Retinol before PA in 5 infants was 6.4 µg% (S.D. 3.8) and rose to 12.7 µg% (S.D. 5.3) during PA.

Further work needs to be done to identify the optimal Vitamin A dose, but it is reassuring to know that the current dose does not appear to be excessive.

514 ABNORMAL ANAL SPHINCTER RESPONSE IN CHILDREN WITH CHRONIC CONSTIPATION. V.A. Loening-Baucke and M.K. Younoszai. The University of Iowa Hospitals and Clinics, Department of Pediatrics, Iowa City.

The continuous high tone of the internal anal sphincter relaxes on rectal distension (rectosphincteric reflex, RSR). This is an important factor in allowing outward passage of rectal contents. We compared anal tone and RSR in 70 chronically constipated (Pts) and 18 healthy (C) 4-12 year old children. Anal tone was measured using a strain gauge (Honeywell MP-3 esophageal pressure transducer). The rectum was distended by injecting air into a 2.5x3 cm balloon placed in the rectum. Spontaneous variations in tone were recorded as pressure waves in the anal region in almost all individuals. Anal resting tone (ART) (mm Hg) was defined as the low points of these waves. ART varied along the length of the anal canal (LAC) and was highest at 1-1.5 cm from the anal verge. This region was used to study the presence of RSR and the amplitude of RSR relaxation (mm Hg) to 30 cc and 60 cc rectal distension. The lowest volume of air to cause RSR (≥ 5 mm Hg), the RSR threshold (RSRT), and the LAC (cm) (where tone was higher than in the rectum) were also determined. ART and RSR amplitude were significantly lower ($p < 0.05$) in Pts than in C, while the RSRT and LAC were comparable. These findings (mean \pm S.D.) suggest that patients with chronic constipation have a weaker and less responsive internal anal sphincter than normal.

	ART	RSR Amplitude	RSRT	LAC
Pts	39 \pm 12 (30 cc)	21 \pm 10; (60 cc)	33 \pm 12	14 \pm 6
C	51 \pm 10 (30 cc)	41 \pm 12; (60 cc)	53 \pm 14	13 \pm 4
				3.3 \pm 0.8
				3.2 \pm 0.5

515 SERUM BILE ACIDS REFLECT THE DEVELOPMENT OF THE ENTEROHEPATIC CIRCULATION IN RATS. William M. Belknap, William F. Balistreri and Frederick J. Suchy. Children's Hospital Research Foundation, Cincinnati, Ohio.

We have shown that serum bile acid concentrations are elevated during early life in humans reflecting physiologic immaturity of the enterohepatic circulation. To further define the ontogeny of bile acid metabolism in mammals, we sought maturational changes in the serum values of total cholesteryl conjugates via a sensitive, specific radioimmunoassay in fetal, suckling, and mature Sprague-Dawley rats. Results: Fetal (21st day) bile acid levels were low (1.42 \pm 0.23 µM; $\bar{x} \pm$ SEM) probably due to minimal enterohepatic cycling in utero. With initial suckling, levels rose rapidly (9.27 \pm 1.57* on day 1), remained elevated on day 4 (9.63 \pm 0.73*), and fell briefly but significantly on day 7 (6.36 \pm 0.68, $p < 0.001$ vs day 4). Subsequent elevations were attained stepwise throughout the suckling phase (day 10=7.24 \pm 0.57*; day 14=10.47 \pm 1.70*, day 21=16.81 \pm 1.93*). Following weaning there was a dramatic peak on day 28 (21.76 \pm 1.53*); values then fell (5.57 \pm 0.68 on day 42) to achieve adult normals by 56 days. Conclusion: Serum bile acid levels reflect sequential developmental maturation of the enterohepatic circulation in the rat. These changes corroborate previous data citing underdeveloped bile canaliculi morphology at birth, maturation of intestinal reabsorption, increasing postnatal pool size before day 56, and persistently impaired hepatic function during normal development. Further studies are warranted to define modulating influences responsible for perinatal physiological and possibly pathophysiological changes in hepatic and intestinal bile acid transport. * $p < 0.001$ vs adult (3.97 \pm 0.55 @ 56 day)

516 COMPARISON OF INTRAESOPHAGEAL pH MONITORING DURING SLEEP IN ASTHMATICS AND NORMAL ADULTS. William E. Berquist, Mark Kadden, Nargis Rowshan, Gary S. Rachel-efsky. UCLA Medical Center, Department of Pediatrics Los Angeles

Various studies have shown that from 43-67% of asthmatics with recurrent pneumonia and/or atelectasis have gastroesophageal reflux (GER) which may contribute to their symptoms through aspiration or neural reflex mechanisms. Using an intraesophageal pH monitor 4-5 cm above the lower esophageal sphincter measured by manometry we quantitatively evaluated GER by pH $<$ 4.0 during sleep when aspiration most likely can occur and when patients' activities are uniform. We compared 8 normal adult volunteers (N) with mean age of 33 \pm 10.9 years to 17 chronic asthmatics (A) age 13.6 \pm 6.8 years & off theophylline for 24 hours prior to the study. Subjects in A required daily bronchodilators and did not have recurrent pneumonias. Mean monitoring time per subject in N was 9.9 \pm 2.1 hours compared to 9.3 \pm 1.7 hours in A. We found that 50% (4 of 8) of subjects in N had no GER episodes compared to 18% (3 of 17) of subjects in A ($p = .16$). The rate of GER in A (n=14) was 1.03 \pm .73 episodes hr $^{-1}$ compared to .41 \pm .29 in N (n=4) with $p = .026$. Additionally the mean duration per episode was greater in A (n=14) with 5.21 \pm 4.35 minutes episode $^{-1}$ compared to 1.31 \pm .91 in N (n=4) with $p = .0076$. We conclude that not only does GER occur more often in A during sleep but episodes of GER are more frequent and prolonged than found physiologically in N.

517 BRADYCARDIA, COMPLETE HEART BLOCK AND ARTERIAL LESIONS IN CHRONIC IDIOPATHIC INTESTINAL PSEUDO OBSTRUCTION (IIPO). Dominique Bouglé, Claude C. Roy, Jean-C. Combes, Fernand Philippon, Andrée Weber and Claude L. Morin. University of Montreal, Hôpital Ste-Justine, Dept. of Pediatrics and Pathology, Montreal.

Over a period of 10 years, 7 patients with IIPO were seen, 3 in the same sibship. Five patients have died. The onset of symptoms occurred between the ages of 5 and 16 and was characterized by abdominal distension, diarrhea, vomiting, and failure to thrive. Esophageal and small bowel involvement was documented radiologically and manometrically. In 5, small bowel histology showed a normal mucosa, hypertrophy of the myenteric plexus and fibrosis of the inner muscular coat as well as of the subserosa. It appeared to progress with time and was associated with patchy fibrosis of the intima and media of arteries. Bradycardia (50-60/min) unresponsive to exercise was documented in 4. In 2, it was associated with a complete heart block which necessitated the implantation of a pacemaker in one case and contributed to the death of the other. Extensive extraintestinal arterial changes were noted in these 2 patients. Examination of the heart disclosed auricular and myocardial fibrosis. The sino-auricular node appeared to be replaced by adipose and fibrous tissue. Fibrosis of the intima and media of the coronary arteries was also found. This study attracts attention to cardiovascular manifestations and pathological changes not yet described in IIPO. They seem different from those identified in cases of systemic sclerosis without scleroderma.

518 MINERAL INTAKE IN RICKETS OF VERY LOW BIRTH WEIGHT INFANTS: RETROSPECTIVE AND PROSPECTIVE DETERMINATION OF CRITICAL INTAKES DURING GROWTH. E.D. Brewer, C.S. Winslow, L. Dell, S.B. Conley, F.H. Morris. Univ. of Texas Medical School at Houston and Hermann Hospital, Dept. Peds., Houston, TX.

To test whether insufficient calcium (Ca), phosphorus (P) or vitamin D (D) to support mineralization was delivered to rapidly growing VLBW (<1200g) preterm (<30wks) infants, we retrospectively determined the intakes for weight increments ($\Delta X/\Delta Wt$) of Ca, P and D for 7 infants with rickets (R) and 7 matched controls (CON). Significant differences were found between R and CON for mineral intake, but not D:

	$\Delta Ca/\Delta Wt$	$\Delta P/\Delta Wt$	$\Delta D/\Delta Wt$
CON	4.73 mg/g	3.83 mg/g	11 U/g
R	2.02 mg/g*	1.53 mg/g*	9 U/g

(* $p < 0.001$, R vs CON)

The above values represent slopes of linear regressions which have defined outer confidence limits (CL) for intakes of Ca and P. Subsequently, to test the predictive accuracy of these slopes and CL, we prospectively followed 11 VLBW infants for $\Delta Ca/\Delta Wt$, $\Delta P/\Delta Wt$ and $\Delta D/\Delta Wt$. Only 1/11 developed rickets; in this baby $\Delta Ca/\Delta Wt$ was 2.68, significantly <CON ($p < 0.001$) and only slightly, but significantly >R ($p < 0.001$) for the retrospective analysis. Another 1/11 had $\Delta P/\Delta Wt$ 2.82, which was >R but <CON; he did not get rickets. In 4/11, $\Delta Ca/\Delta Wt$ (3.82-4.46) and $\Delta P/\Delta Wt$ (1.73-3.41) were <CON but >R; none developed rickets. $\Delta D/\Delta Wt$ was >CON in 11/11. Growth rates did not differ from R or CON. These data suggest that >3.82 mg Ca/g wt gain and >1.73 mg P/g wt gain, when provided primarily IV with adequate D, are sufficient to prevent rickets in growing VLBW infants. In 3 R patients under treatment, healing was diagnosed when mineral intakes reached or exceeded these values.