576 AMBULATORY 24 HOUR ESOPHAGEAL pH MONITORING IN INFANTS AND CHILDREN. Robert A. Cannon. Dept. of Pediatrics, Univ. of Calif., Davis, CA. (Spon. by C.F. Abildgaard)

24 hour esophageal pH monitoring is currently considered to be the most sensitive diagnostic technique for gastroesophageal reflux (GER) in infants & children. Present instrument configurations limit this technique to hospitalized patients. Portable computer-controlled equipment which permits performance of ambulatory 24 hr. pH monitoring in adults & children has been developed.

Outpatient 24 hr. pH monitoring was performed in 24 children (ages 6 wks-14 yrs) for suspected GER. The pH electrode was placed in the distal esophagus 3-4 cm proximal to the lower esophageal sphincter. All patients received a regular diet or formula; acidic juices (pH less than 4.0) were avoided. 21 completed studies (18 hrs or longer) were scored using accepted criteria for hospitalized patients. 15/21 studies were considered +; 6/21 showed insignificant GER. The 24 hr. pH studies were compared to other outpatient diagnostic tests (UGI, Tc99m milk scan) in each case:

		UGI / scan -	UGI / scan +	UGI / scan not done
pH study	+	5 (24%)	5 (24%)	5 (24%)
	-	1 (4%)	3 (14%)	2 (9%)

All patients tolerated the procedure without complications, but premature electrode dislodgement was observed in 4 infants.

Conclusions: Outpatient 24 hr. esophageal pH monitoring may be safely performed in infants & children. In an unsupervised, ambulatory setting, this test appears to be a sensitive study for the diagnosis of significant GER.

577 DISORDERED ESOPHAGEAL, COLONIC, AND RECTAL MOTILITY IN INFANT BOTULISM. Robert A. Cannon. Department of Pediatrics, Univ. of Calif. Davis, CA (Spon. by Charles F. Abildgaard)

Impairment of both autonimic & voluntary neuromuscular transmission due to C. botulinum toxin in infants is recognized. Abnormalities of gastrointestinal motility in cases of infant botulism have been identified, but not fully defined. Four infants (ages: 5-9 mos.) with documented botulism (Type A:2, Type B:2) were evaluated for disordered esophageal, rectal, & colonic motility. Esophageal manometrics documented normal lower esophageal sphincter pressures ($\bar{x}$:24 mm Hg; N:20-35) and relaxation. Distal (smooth muscle) peristalsis was normal, but proximal (striated muscle) peristalsis was absent in all patients. In addition, upper esophageal sphincter achalasia was documented in each. The resolution of the proximal esophageal dismotility was associated with overall clinical improvement and return of skeletal muscle strength.

Rectal-colonic manometrics revealed low anal pressure profiles ($\bar{x}$:45 mm Hg; N:80-120) with normal internal sphincter relaxation; 2/4 patients exhibited delayed return of resting pressures. Colonic EMG slow waves were observed with a frequency of 3-4 cycles/minute. Colonic spike bursts were observed, but not correlated with intraluminal pressure changes during the acute stage.

Significant dismotility of the proximal esophagus is present during the acute phase of infant botulism and contributes to the dysphagia observed clinically. Disordered intraluminal colonic motility may account for the frequent observation of constipation, as rectal sphincter reflexes are preserved.

578 BARRETT'S EPITHELIUM RESULTING FROM CHRONIC GASTROESOPHAGEAL REFLUX (GER) IN CHILDREN. Robert A. Cannon & Kenneth L. Cox, & Kathleen D. Sanders. Dept. of Pediatrics, Univ. of CA, Davis, CA. (Spon. by CF Abildgaard)

Histologic changes seen on esophageal biopsies in children with GER may include normal squamous epithelium, changes in rete peg height & inflammatory infiltrates of PMN's or eosinophils. While severe GER in adults may be accompanied by replacement of normal esophageal epithelium with columnar epithelium (Barrett's epithelium), this complication is not appreciated in children.

4 children (ages 2-10 yrs) with severe GER complicating mental deficiency syndromes or multiple congenital abnormalities (VATER syndrome) were found to have Barrett's esophagus. Severe GER was documented in each : UGI (+4/4), Tc99m milk scan (+4/4), 24 hr. esophageal pH monitoring (+4/4). The endoscopic appearance of the mucosa was consistant with moderate esophagitis in 3/4, mild esophagitis in 1. Biopsies were obtained at least 3 cm proximal to the GE junction or at an area of demarcation between normal and abnormal mucosa. All patients had evidence of gastric columnar epithelium upon histological examination of the tissue; 3/4 showed fundal mucosa with chief cells, 1 showed junctional type mucosa. In addition, all patients had infiltrates of chronic inflammatory cells in the lamina propria. 3/4 patients underwent elective fundoplication.

Conclusion: Barrett's epithelium may be seen as a complication of GER in children. Because the natural history of Barrett's following correction of GER is unknown in children, careful surveillance is indicated due to the premalignant potential of these changes.

579 EFFECTS OF INCREASED CALCIUM AND PHOSPHORUS ON BONE MINERALIZATION IN PRETERM INFANTS. Gary M. Chan, Laurie Moyer, Jean Shino, and James W. Hanson (Spon. by M. Simmons). Dept. of Pediatrics, University of Utah Medical Center, Salt Lake City, Utah.

Formulas containing high calcium (Ca, 173-189mg/100 Kcal) and phosphorus (P) (93-94.5mg/100 Kcal) have resulted in bone mineralization approximating intrauterine rates. The purpose of this study was to evaluate the biochemical and bone mineralization effects of 3 formulas with lower Ca and P content and with different Ca:P ratio. Thirty preterm infants (BW<1500g) were randomly assigned to 1) Enfamil Premature Formula (EPF)(117mgCa and 58.5mg P/100 Kcal), 2) EPF + higher P (117mgCa, 82.0mg P/100 Kcal) or 3) EPF + higher Ca +P (140mgCa, 82.0mg P/100 Kcal) for first 4-6 weeks. All infants had serum protein, albumin, Ca, P, bicarbonate, 25-OH vitamin D, alkaline phosphatase levels, and bone mineral content (BMC, photon absorptiometry) determined every 2 weeks until 1800g. Birth weight and gestational ages were similar in all 3 groups ($\bar{X}$ = 1243-1345g, 30-31 weeks). There were no biochemical differences among the 3 groups. The BMC was similar in the 3 groups and approximated intrauterine rates. Thus, feeding low birth weight preterm infants with EPF appears to be sufficient for bone mineralization and changes in the Ca:P ratio did not change bone mineralization.

580 RETROPERITONEAL JEJUNOSTOMY. Jack H.T. Chang and Charles E. Mize, Depts. Surgery and Pediatrics, The University of Texas Health Science Center at Dallas, Southwestern Medical School, Dallas, Texas. (Sponsor: Joseph Warshaw)

The classic jejunostomy for enteral feedings has several major complications including intraperitoneal leakage and intestinal obstruction. In some children, severe adhesions from previous surgery makes the finding and isolation of the proximal jejunum both tedious and hazardous.

A jejunostomy may be easily placed into the retroperitoneal duodenojejunal flexure without entering the peritoneum. This is accomplished by a flank muscle splitting incision displacing the descending colon anteriorly and the kidney posteriorly. A Broviac catheter with a Dacron cuff is used as the conduit. The catheter is secured to the skin until fibrous adhesions have anchored the Dacron cuff.

Four retroperitoneal jejunostomy tubes have been placed. The first tube was inserted with an incomplete Dacron cuff and "accidently" extracted on the day after surgery. The second tube was placed for temporary nutritional support until definitive surgery was performed. The tube was in place for 3 months with the patient gaining 2.4 kg. The third and fourth tubes were placed for permanent nutritional support and have been in for 4 and 2.5 months. The patients have gained 1.3 and 3.0 kg, respectively. Both tubes have been transected through carelessness, but easily repaired using the Broviac repair kit.

● **581** INFLUENCE OF THE GLUCOSE (G) LOAD ON THE ENERGY METABOLISM (EM) OF PRETERM INFANTS ON FAT-FREE PARENTERAL NUTRITION (FFPN). Phillippe Chessex, Guy Putet, Gaston Verellen, Tibor Heim, John M. Smith, Paul R. Swyer, Robert M. Filler. Dept. Pediat., Med. Eng. and Surg., Univ. Toronto and Res. Inst. Hosp. For Sick Children, Toronto, Ont., Canada, M5G 1X8.

Several clinical conditions preclude the use of intravenous (i.v.) lipids thus, the preterm infant on i.v. alimentation is often restricted early in life, to preparations containing only amino acids (AA) and G as sources of energy. However, high i.v. G load may induce respiratory failure through increased carbon dioxide production ($\dot{V}CO_2$) and minute ventilation. To determine the partition of EM in preterm infants on FFPN we performed metabolic studies in 12 low birthweight (BWT) infants (BWT: 1532± 151;M±SE; Gest. age: 31.0±0.05 wk; age at study: 19.3±3.2 d;wt. at study: 1571±111 g). Nutritional balance and indirect calorimetry demonstrated that for a mean energy intake (EI)of 64.3 kcal /kg/d the metabolic rate (MR) was 48.3 kcal/kg/d (basal metabolic rate: 35 kcal/kg/d, energy cost of activity: 4.6 kcal/kg/d, energy cost of tissue synthesis: 9 kcal/kg/d,) leaving 16 kcal/kg /d for storage. Increased oxygen consumption, $\dot{V}CO_2$, respiratory quotient (RQ) and MR were measured with higher G intakes. From the tight linear correlation (r=0.92) between RQ and G intake, and the EM data one can conclude: 1) for G intake above 17.5 g/ kg/d, fat synthesis is more prominent than endogenous fat oxidation resulting in a net lipogenesis, 2) an EI exceeding 60-65 kcal/kg/d is required for the induction of growth on FFPN, 3)the G oxidation rate of 10.5 g/kg/d is much higher than found in adults,reflecting higher metabolic needs of the premature infant.