normal mechanism of absorption of both physiologic and pharmacologic doses of folate compounds and suggest also a defective metabolism of folate in the tissues.

Studies on the dietary regulation of jejunal pyruvate kinase and sucrase activities. REUBEN S. DUBOIS, RONALD W. GOTLIN, and DENIS O. RODGERSON (Intr. by Donough O'Brien). *Univ. of Colorado, Denver, Colo.*

The dietary regulation of jejunal glycolytic and disaccharidase enzyme activities is well documented, however failure of adaptation has been described (Gastroenterology 58:990 1970). The mechanism of these adaptive changes is not known. This report describes 2 females aged 9 and 11 years with exogenous obesity. Both had 5 hour oral glucose tolerance tests (OGTT) with serial measurement of blood glucose, insulin and serum inorganic phosphorus (SIP). There was an inappropriate insulin-glucose ratio (I/G), mean 1.4, range 0.6 to 1.8 (normal controls, mean 0.4, range 0.2 to 0.7) and a lack of fall in SIP during the OGTT, suggesting that the insulin was biologically abnormal (Clin. Res. 19:201 1971). Jejunal biopsies were performed after 48 hours of fasting and again after 96 hours of a high carbohydrate (CHO) diet. The activities of jejunal pyruvate kinase (PK) lactase and sucrase(S) were assayed. The PK activities (U/g wet wt.) and the sucrase-lactase ratio (S/L) with fasting were 34.6 and 1.81 in one and 39.6 and 2.54 in the other subject, while with feeding were 36.2, 1.63, 40.4 and 2.38 respectively. Both patients were re-studied 2 months after the institution of a low simple CHO diet. At this time I/G and SIP fall during the OGTT were normal. The PK activities with fasting and feeding were 27.2 and 51.8 in one and 42.2 and 53.1 in the other, while the S/L with fasting and feeding were 1.73, 2.79, and 1.88, 2.41 respectively. These data suggest that the dietary regulation of PK and S is mediated through insulin and the lack of adaptation in obesity may be due to the presence of biologically abnormal insulin.

Carbohydrate dependent protein synthesis and enzyme activity in the jejunum. RICHARD J. GRAND. *Children's Hosp. Med. Ctr., Boston, Mass.* (Intr. by Park S. Gerald).

The mechanism by which dietary carbohydrate (CH) regulates jejunal disaccharidase activity has not been elucidated. Studies were undertaken to determine whether adaptive changes in disaccharidase levels were accompanied by variations in protein synthesis; and if so, whether they were related to cell migration and RNA synthesis. 200 g rats were fed a CH-free diet (with isocaloric protein replacement) for 7 days and then fed a diet rich in either sucrose (68% cal) or starch (51% cal). Incorporation of ^{14}C amino acids into total mucosal and brush border (BB) proteins (TCA insoluble) was measured. Both sucrose and starch stimulated an increase of 30% in the labeling of total mucosal proteins and greater than 100% rise in that of BB proteins. Simultaneously, there was 100% rise in sucrase and lactase activity and a 60% increase in maltase activity in crude jejunal homogenate and BB. When actinomycin-D was injected IP 6 hrs prior to feeding sucrose, RNA synthesis measured 24 hrs later was reduced 50%, and cell migration was arrested. Although neither basal rates of total mucosal protein synthesis nor the increases stimulated by CH feeding were inhibited, ^{14}C labeling of the BB was reduced. Sucrase, lactase and maltase levels in the crude homogenates rose 75–100%, but these activities in the BB did not increase in actinomycin-D treated animals. The data suggest that dietary CH controls disaccharidase activity by changes in protein synthesis independent of RNA synthesis and cell migration, and support the concept that there is an RNA-dependent step required for the transfer of newly formed disaccharidases from sites of synthesis to the BB.

Nutritional adaptation: Effect of dietary carbohydrate on intestinal disaccharidase activity in the infant rat. E. LEBENTHAL, N. KRETCHMER and P. SUNSHINE. *Stanford Univ., Stanford, Calif.*

The activities of intestinal sucrase and isomaltase are not detectable in rats prior to 15–16 days of age, but corticosteroids as well as feeding heterologous protein precociously induce the activities of the α-glucosidases. We studied the ability of the intestine of infant rats to adapt to alteration in the carbohydrate content of their diets by evaluating changes in activity of disaccharidases and in histological maturation of intestinal mucosa. Ten day old rats were removed from their mothers, warmed in an incubator, and fed by constant infusion through gastrostomies. The basic diet was a soya preparation to which various sugars were added. When the diet contained 2% sucrose, diarrhea ensued for 48 hours, but subsided when intestinal sucrase and isomaltase appeared precociously. In animals fed sucrose, the activities of sucrase and isomaltase were markedly increased as compared to animals on carbohydrate free diets. (Sucrase 2.41 $\pm$ .23 vs 0.6 $\pm$ .13, isomaltase 3.43 $\pm$ .42 vs 0.78 $\pm$ 18.) Maltase activity was doubled, while lactase was unaltered. The mitotic index of crypt cells, and depth of crypts, and incorporation of ^{3}H-thymidine into DNA were increased. In adrenalectomized rats, activities of sucrose and isomaltase were not detected nor induced by sucrose. These animals had continuous diarrhea. Steroids given to adrenalectomized rats caused appearance of the enzymes; but if cortisone and sucrose were given together, there was synergism evidenced by a marked increase in activities. In contrast to observations in adult animals, the effect of sucrose on α-glucosidases in developing animals demands the participation of the adrenal gland.

Absorption of lactose by various Nigerian ethnic groups. OLIKOYE RANSOME-KUTI, NORMAN KRETCHMER, RUTH HURWITZ, CLAIBOURNE DUNGY, and WOLE ALAKIJA. *Univ. of Lagos, Lagos, Nigeria, and Stanford Univ., Palo Alto, Calif.*

Reports have emanated from a number of regions in the world indicating that various ethnic groups are intolerant to lactose in milk. We accomplished lactose tolerance tests on four major tribal groups in Nigeria: Yoruba, Ibo, Fulani, and Hausa. The Yoruba and Ibo live in an area where there never was cattle-raising and, until recently, no milk was taken after weaning. The Hausa and Fulani live in the north of Nigeria where cattle-raising and ingestion of milk and milk-products are traditional. The data indicate that 99% of the Yoruba and 96% of the Ibo after the age of 1½ to 3 years malabsorb lactose, whereas only 64% of the Hausa and Fulani show malabsorption. But nomadic Fulani, who are migratory cattlemen, show only 20% malabsorption. We also found that when white Semites were compared with Anglo-Saxons, the Semites were incapable of absorbing lactose in contrast to the Anglo-Saxons. Individuals with lactose malabsorption showed no difficulty in their ability to hydrolyze sucrose. Since no other mammal, so far examined, is able to hydrolyze lactose efficiently after weaning, we contend that malabsorption of lactose after two years of age is genetically normal in man and that the individuals who are capable of

hydrolyzing lactose in adult life are carrying a mutation derived from natural selection. In regions where malabsorption in adults is prevalent, lactose-free milk should be given to children so as to avoid diarrhea related to lactose intolerance.

A metabolic and anatomic study of a case of Noonan's syndrome with intestinal lymphangiectasia. H. LAWRENCE VALLET, PHILIP G. HOLTZAPPLE, WALTER R. EBERLEIN, WILLIAM C. YAKOVAC, THOMAS MOSHANG, JR., and ALFRED M. BONGIOVANNI. *Univ. of Pennsylvania Sch. of Med., The Children's Hosp., Philadelphia, Pa.*

Major cardiovascular anomalies and cutaneous lymphatic defects have been described in both Noonan's and Turner's syndrome.

A 6½ year old male presented with anasarca, chylous pleural effusions, cutaneous lymphatic leakage, ascites and hypoproteinemia. Studies revealed findings consistent with the diagnosis of intestinal lymphangiectasia and a major thoracic lymphatic vessel leak. Investigations included X-ray studies of small bowel, Cr^{51}-chloride turnover, stool fat analysis, small bowel biopsy, and effusion studies for electrolytes, cells, lipoprotein electrophoresis and chylomicron analysis. Low lymphocyte counts and immunoglobulins were also found.

Medium chain triglycerides and a low fat diet corrected the protein loss but a seemingly mild pre-existing cardiac lesion worsened, and dictated the need for corrective pulmonary valve surgery. He died following this procedure.

Post mortem studies revealed severe defects in most of the mesenchymal components of cardiovascular organogenesis. Large lympho-venous shunts were present in the lung, liver and pancreas.

The lymphatic defects in these patients may not be as benign as once believed, and may be a major cause of failure to thrive.

Transmissible gastroenteritis in piglets (TGE). A model for study of acute viral diarrhea. MARY KELLY, DANIEL G. BUTLER, and J. RICHARD HAMILTON, *Research Inst., Hosp. for Sick Children, Univ. of Toronto, Toronto, Ont., Can.*

We studied a specific viral gastroenteritis (TGE) in piglets in order to explore the pathogenesis of acute infectious diarrhea. We compared 23–26 day old piglets infected orally with TGE virus, with pair fed non-infected litter mates. Infected pigs lost weight; fecal weight, Na^+, K^+ and Cl^- excretion increased significantly; fat excretion did not increase. Serum concentrations of Na^+, K^+ and Cl^-, Mg^{++} and Ca^{++} did not differ between groups. After 40 hours the pigs were killed. Although a mucosal lesion characterized by diffuse villous and epithelial cell damage occurred in some infected pigs, the groups did not differ significantly with respect to actual villous dimensions. In infected pigs the following changes in specific enzyme activity occurred: Na^+-K^+-ATPase and Mg^{++}-ATPase decreased significantly in proximal jejunum only; alkaline phosphatase decreased in proximal and mid-jejunum; sucrase decreased in mid-jejunum and ileum. There was no change in activity of any of these enzymes in proximal or distal colon. Mucosal protein content was the same in both groups. Our results suggest a relationship between proximal intestinal Na^+-K^+-ATPase activity and the diarrhea of acute viral enteritis.

Group	Stool Wt. (g/24 hr)	Stool Na (mEq/24 hr)	Enzyme activity—proximal jejunal mucosa (mean units/g. protein)			
	M. S.E.	M. S.E.	Na^+-K^+-ATPase	Mg^{++}-ATPase	Alk. Phos.	Sucrase
Control	36.3±9.4	0.9±0.6	1.35×10^3	1.09×10^3	8.43×10^3	0.74
Infected	261.5±74.4	22.0±6.1	0.92×10^3	0.74×10^3	3.61×10^3	0.38
P	<.05	<.01	<.01	<.05	<.01	>.05

Hereditary pancreatitis (HP) without amino-aciduria: Two new kindred. ALLEN LAPEY, JOHN KATTWINKEL, PAUL A. DI SANT' AGNESE, and LEONARD LASTER. *NIH, Bethesda, Md.*

HP, an autosomal dominant disorder with incomplete penetrance has been reported in 13 families and is characterized by chronic relapsing pancreatitis leading to pancreatic insufficiency, pancreatic calcifications, and at times diabetes. In 3 of the original families lysine-cystine amino-aciduria was present in some members regardless of pancreatic involvement.

Our West Va. kindred (total 55 members) had 8 definite and 12 suspected cases of pancreatitis, mean age of onset 5 yrs.: 7 of 8 definite cases had pancreatic lithiasis, in 3 instances before 13 yrs. of age. Our Tenn. kindred (total 110 members) had 9 definite and 12 suspect cases, mean age of onset 14 years, with 6 of 9 definite cases presenting calcifications. There was striking variation in age of onset from 18 mos. to 35 yrs. Steatorrhea and pancreatic deficiency tended to be a late complication but they were found as early as 20 yrs. of age. There was no good clue as to what brought on acute attacks.

In both kindred fecal fat, pancreatic enzymes, and serum amylase and lipase were assessed. Serum lipids and parathyroid function by calcium infusion were normal. All urinary amino acids were determined in 7 patients and 9 relatives and were normal in all instances.

HP is a generally unrecognized cause of pancreatitis in childhood and important in the differential diagnosis of recurrent abdominal pain and pancreatic lithiasis (e.g., from cystic fibrosis). It is speculated that two different genetic types of HP exist with and without amino-aciduria.

Recurrent pleural effusion: A complication of pancreatitis in childhood. FREDERIC B. KOPEL, IRWIN GRIBETZ and HAROLD GROTSKY. (Intr. by Alex J. Steigman). *The Mount Sinai Sch. of Med., New York, N. Y.*

While pleural effusion as a complication of pancreatitis has been described in adults, this entity has not been noted, in the English literature, in children. We have recently uncovered chronic pancreatitis as the cause of recurrent pleural effusions in an 8-year-old Puerto Rican male whose presenting complaint at another hospital was recurrent substernal and epigastic pain radiating to the left shoulder. Exhaustive investigation, including cultures of the pleural fluid, skin tests for typical and atypical mycobacteria and fungi, lupus preparations, bronchography and thoracotomy with pleural biopsy, failed to reveal the cause of the recurrent pleural effusions. Substernal pain recurred, and the initial complaint of epigastric pain was only then appreciated. Pleural fluid showed an amylase concentration of more than 1000 Somogyi units/100 ml at a time when the serum amylase content was 335 units/100 ml (normal = 30–180 units). Pancreatic stimulation with secretin (Boots) 1 unit/kg resulted in a 1 hour output of 25 ml or 1.4 ml/kg (normal = 2 ml/kg), and a maximal