

THE SEVERITY OF ESSENTIAL FATTY ACID DEFICIENCY IN CYSTIC FIBROSIS IS RELATED TO STEATORRHEA RATHER THAN TO NUTRITIONAL STATUS.

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A high incidence of essential fatty acid deficiency (EFAD) has been reported in CF but the respective role of nutritional status and of fat malabsorption has not been established. EFA status was determined in 163 CF children. When compared with 44 age-matched controls, 47% were found to be deficient on the basis of an abnormal ratio of 20:3w9/20:4w6. In the second part of the study, 24-hr fat excretion was measured in 27 patients consuming 35-40% of their calories as fat and maintained on pancreatic enzymes (Pancrease). The group of 13 (aged 11±4 yr) excreting more than 13 g of fat (25.7±9.2 g) did not differ from the 14 (age 8.5±3.5 yr) with a lesser degree of steatorrhea (5.5±2.2 g) in terms of clinical and biochemical indices of malnutrition. However, values of FEF 25-75 were significantly lower ($P < 0.05$) in the group with severe steatorrhea. EFAD assessed by ratios of 20:3w9/20:4w6, of 16:1w7/18:2w6 as well as by the % of total fatty acids represented by the w7 family was more severe ($P < .05$) in the group with severe steatorrhea than in the other. This study suggests that the severity of EFAD is closely correlated with the degree of steatorrhea, rather than with nutritional status. In view of the role of EFA on immune function and membrane composition, priority to nutritional support programs should be maintained but closer attention should be given to ongoing fat malabsorption.

INTRAVENOUSLY ADMINISTERED ¹²⁵I-EGF IS SECRETED INTO BILE AND LUMEN OF SUCKLING RAT STOMACH AND INTESTINE

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Parenterally administered epidermal growth factor (EGF) produces trophic effects on various organs of suckling mammals. Present studies investigated distribution of intravenously administered rat EGF (rEGF) in liver and GI tract of 12-day-old suckling rats anesthetized with fentanyl (6 µl/rat). The bile duct was cannulated, and ¹²⁵I-rEGF (2-4 ng/rat) was administered via femoral vein. After 5, 30, 60 and 120 min, animals were killed and extracted radioactivity (RA) from tissue was characterized by immunocaffinity chromatography. The highest levels of RA were found in liver (46.1±3.0% of total); and 98% was immunoreactive (IR) at 5 min. Both total and IR-RA in liver decreased with time. Large amounts of administered RA were detected in bile at 60 min (2.2%) and 120 min (5.1%); more than 99% of the RA was IR. Concentrations of RA in bile were 15 X greater than that in blood. RA in wall and luminal flushings of stomach and small intestine increased with time. More than 95% of the RA extracted from wall and luminal flushings of small intestine was found to be IR. Cannulation of the bile duct caused a significant reduction in the levels of RA in luminal flushing of the small intestine; however, the percentage of IR was unaffected. IR in the wall and flushings of stomach was more than 60% at 30 min, decreasing to 7-9% at 60 and 120 min. These results suggest that IR EGF is secreted into the lumen via bile, as well as across the wall of the GI tract in suckling rats.

CARBOXY-TERMINAL PROCESSING OF MOUSE EPIDERMAL GROWTH FACTOR IN MOUSE GASTROINTESTINAL TRACT IN VIVO

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Breast-fed mammals consume epidermal growth factor (EGF) in milk. We characterized processing of mouse EGF (mEGF) in gastrointestinal (GI) tract of 14-day-old suckling (Su) anesthetized mice using reversed phase-HPLC. ¹²⁵I-mEGF (4-10 ng/mouse) in 50 µl of 0.05 M phosphate buffer + 0.1% BSA, pH 7.4 (intestine) or pH 5.5 (stomach) was introduced into ligated stomach, duodenum, jejunum, midjejunum or ileum. After 10 or 30 min, radioactivity in luminal flushings (LF) and wall of GI segments was extracted and analyzed by RP-HPLC. Standards (¹²⁵I-mEGF-1: 1 amino acid less at C-terminus; ¹²⁵I-mEGF-5: 5 amino acids less at C-terminus; and ¹²⁵I-mEGF-6: 6 amino acids less at C-terminus) were prepared by controlled proteolysis (Endocrinology 118:875). Formation by the tissues of C-terminally processed ¹²⁵I-mEGF was defined by coelution with standards. Isolated peaks were characterized by binding to anti EGF antibody and EGF-specific receptors. ¹²⁵I-mEGF was found to be intact in LF of stomach; in LF of duodenum it was partially degraded to ¹²⁵I-mEGF-1. In LF and wall of jejunum, midjejunum and ileum, ¹²⁵I-mEGF-1, ¹²⁵I-mEGF-5 and ¹²⁵I-mEGF-6 were detected. All peaks isolated from GI tissues were fully immunoreactive. Receptor binding of ¹²⁵I-mEGF-1 was significantly greater than that of intact ¹²⁵I-mEGF, whereas receptor bindings of ¹²⁵I-mEGF-5 and ¹²⁵I-mEGF-6 were significantly diminished. Thus luminally administered EGF undergoes C-terminal processing in the GI tract; type of biologically active fragments produced varies with segment.

EFFECTIVE BOWEL TRAINING IN ENCOPIRETIC CHILDREN. Allan J. Rosenberg, M.D., M.P.H., and Tanya Whitehead, R.A., The University of Kansas Medical Center, Kansas City, Kansas.

Eighteen encopretic children, 13 boys and 5 girls between the ages 5 and 13, enrolled in a biofeedback bowel training program. Fecal accidents ranged from one to three per day. Ten children were having no bowel movements in the toilet. An intra-anal perineometer was used to measure EMG contractions of the anal sphincter muscles. Biofeedback training utilized a visual display to teach relaxation and contraction of the anal sphincter. The patients were praised for appropriately turning the display lights on and off. Between training sessions, children practiced anal sphincter contractions and relaxations three times a day. Initial EMG contraction averaged 12 uv for all patients. Twelve of the 18 children could not completely relax the anal sphincter. Three children dropped out. Of the 15 children continuing in the program, there were 11 non-relaxers. After 6 months, 9 of 11 were able to completely relax the anal sphincter. Five were completely continent and 4 were having less than one accident per week. Three children who completely relaxed initially continued to relax; all became completely continent. Of the 3 not improved children, 2 were non-relaxers and did not learn to relax. There was no difference during training between groups for EMG contraction strength, averaging 13 uv in both the 12 improved and 3 not improved patients. Those encopretic children who learned to relax the anal canal had significant improvement in fecal continence. Effective bowel training in encopretic children was directly related to learning to relax the anal sphincter.

POST-TRANSLATIONAL MODIFICATION OF LACTASE-PHLORIZIN HYDROLASE DURING DEVELOPMENT. MA Dudley*, PJ Reeds, RJ Shulman, J Rosenberger, S Perkinson, BL Nichols.

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Lactase specific activity(SA) rises immediately after birth in the rat, reaches a peak at 9-12 d of age and declines to adult levels shortly after weaning. These studies were intended to determine the relationship of mature(L) to precursor(ProL) forms of lactase in suckling, weanling and adult Sprague-Dawley rats. Homogenized jejunal mucosa was used for measurement of enzyme SA (µmol/min/g protein) and for immunoisolation and purification of L and ProL. The relative quantities of each polypeptide were determined by densitometry. Samples were also treated with Endo H and Endo F. Enzyme SA and distribution are shown below.

Age(d)	n	Lactase (SA) *	Mature Lactase (140 kDa)	ProLactase (200 kDa)	ProLactase (220 kDa)
Suckling 10	14	124±5*	86±1.1*	1.7±0.4*	12±0.8
Suckling 16	8	78±4*	79±1.4**	4.9±0.2*	16±1.4
Weanling 22	7	53±4*	75±1.0	11±0.9*	15±1.7
Adults	25	37±2*	68±0.7*	19±0.6*	13±0.8

Mean±SEM; * $P < .05$ vs all others; ** $P < .05$ vs 10d weanlings and adults
All bands were sensitive to Endo F treatment, none to Endo H. These studies demonstrate that: 1) the decrease in lactase SA in adult rats is associated with an increase in the level of a 200 kDa protein, 2) these changes occur at weaning when lactase SA is decreasing and may be partially responsible for lower SA seen in older animals. We speculate that these age-related changes may result from an alteration in a post-translational event.

¹³C-LABELED RICE CEREAL ABSORBED BY INFANTS WITH ACUTE GASTROENTERITIS (AGE). Carlos H. Lifschitz, Benjamin Torun*, Francisco Chew*, Thomas W. Boutton# and Peter D. Klein. USDA/ARS Childr Nutr Res Ctr,

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Diluted cow milk (CM) is used in tropical countries for refeeding infants with AGE. Staple foods are used to provide calories during recovery from malnutrition. To determine if rice cereal could be used as a caloric supplement during AGE, we studied 8 male, CM-fed infants, age (x±SD) 95±23 d, range 69-131 d, admitted to hospital in Guatemala. After rehydration, rice cereal was added to CM diluted by 50% with water to restore caloric density to 0.65 kcal/ml. A 48-h stool collection and balance study were begun with the first feeding to which ¹³C-labeled rice cereal (5g) was added. Fecal ¹³C abundance, osmolality, N, and energy were determined. Infants were restudied 17d later. Differences between study periods were analyzed by paired t test. The absorption of rice cereal was not significantly impaired during AGE, compared with that during the recovery period, as indicated by the %¹³C malabsorbed (x±SD 11±8% vs 4±3%, p=0.08), the coefficient of energy absorption (84±9% vs 92±4%, P=0.099), total fecal output (dry weight), N, and fecal energy (152±86 vs 104±39 kcal). Appreciable fecal energy loss occurred in both study periods despite good absorption of cereal, suggesting incomplete recovery from AGE or small bowel bacterial overgrowth. Our data show good absorption of rice cereal used as an energy supplement during AGE.