

**7** Glucose absorption in subjects with environmental enteropathy (E.E.)-J.Espinoza, I.Loís, I.Pacheco, M.Ara ya, O.Brunser. Inta. Universidad de Chile.

Previous studies characterized some of the mild morphologic and functional changes of the intestinal mucosa in apparently healthy young Chileans belonging to the lowest socioeconomic strata. Absorption of glucose was studied by the marker-perfusion technique in 6 subjects. Infusion rate was 9.5 ml/min. The proximal sampling orifice was located under fluoroscopy at the ligament of Treitz and the distal sampling orifice was 30 cm aborally. Solutions with 18, 36, 75, 100 or 150 mM of glucose, 5mM of K and 1% PEG 4000 as marker, were perfused in random order. Sodium and chloride were added to adjust osmolality to 300.

Glucose perfused (mM)	18	36	75	100	150
Glucose absorbed (Um/cm/hr)(Mean)	153	390	806	1020	1005

These values can be plotted in a sigmoid-shaped curve and best represented by Hill's equation.  $K$  (or  $S_{0.5}$ ) is 41.7 mM. This is lower than reported values for individuals living in well-sanitized environments. Electrolytes and water were absorbed independently from glucose. Environmental enteropathy induces mild, non specific changes of small intestinal morphology and xylose, nitrogen and lipid absorption, as well as, glucose transport.

Supported by Nutrition Foundation and United Nations University

**8** Gastric emptying in preterm babies fed human milk and infant milk formulae. Abeya Gilardon, E.O.; Spinelli, S.; Tabosnanska, J. y O'Donnell, A.M.. CESNI. Hospital Materno Infantil Ramón Sardá. Buenos Aires. Argentina.

Gastric emptying rate of pooled human mature milk (HM) and 4 infant milk formulae was evaluated in 8 preterm babies (birthweight: 1320-1760 g; age at the beginning of the study: 5-29 days). Residual gastric volume was measured at 30' intervals for 120' by a modification of J. George's method (Gut 9:237, 1968). Feeds were HM (61 Kcal/dl and 1.9 g protein/dl); Bonalac (72 and 1.8); F3242 (81 and 2.4); Nan (61 and 1.5) and S26 (63 and 1.4). Osmolarities ranged between 284 and 314 mOsm/kg. Infants were fed 18-22 ml of each formula in a sequential fashion. All five feeds were assayed in each baby.

Time of half gastric emptying were: HM: 25' + 5' (geometric mean and standard deviation); Bonalac: 42' + 25'; F3242: 54' + 32'; Nan: 38' + 19' and S26: 53' + 27'. Significant differences were found only between HM and the others ( $p < 0.001$ ). Gastric emptying rate was faster with HM than with formulae ( $p < 0.01$ ) and no statistical differences were found among formulae.

It is concluded that gastric emptying rate in preterm babies is faster with HM than with any other infant milk formula tested.

**9** IRON BIOAVAILABILITY IN A COMMON CHILEAN DIET. Amar, M., Grebe, G., Hertrampf, E., Pizarro, F. and Stekel, A. Institute of Nutrition and Food Technology, Univ. of Chile and Dept. of Haematology, Catholic University, Santiago, Chile.

Iron bioavailability of a diet is affected by several factors which do not allow a prediction of the amount of iron absorbed. We studied the iron bioavailability of a common Chilean diet. The diet contained 1750,6 cal, 2,3 mg heme-iron and 11,2 mg non heme-iron. Iron bioavailability was measured with an extrinsic tag. The study was done in 10 males and 20 females, all adults. Tag was incorporated in the bread. The first day each subject received breakfast with 4uCi of  $^{55}\text{Fe}$ . The second day the same subject received lunch with 1,2uCi of  $^{59}\text{Fe}$ . On day 15, a peripheral blood sample was obtained and the circulating radioactivity was determined by the Eakins and Brown method. On the same 15th day, the subject received dinner containing 1,2uCi of  $^{59}\text{Fe}$  and on day 16 an aqueous solution of ferrous ascorbate tagged with 4uCi of  $^{55}\text{Fe}$ . On day 30 the increase in circulating radioactivity was measured. The geometric means of iron absorption were 1,85% for breakfast, 3,98% for lunch, 1,79% for dinner and 23,25% for the reference solution. As per Layrisse, the amount of heme iron absorbed was 0,465 mg and the non heme 0,277 mg, which are less than allowances. We will comment these results in the context of iron deficiency prevalence in Chile.

**10** SERUM AND ERYTHROCYTE FOLATE IN INFANCY: EFFECT OF IRON NUTRITIONAL STATUS AND DURATION OF BREAST FEEDING. Olivares, M., Anderson, M., Llaguno, S., Stekel, A. INTA, Universidad de Chile, Santiago.

Term infants, followed longitudinally were examined at 3 (n = 193), 9 (n = 239) and 15 (n = 217) months of age for levels of serum and red cell folate, hemoglobin, serum iron, total iron binding capacity, free erythrocyte protoporphyrin and serum ferritin. Mean erythrocyte folate levels were consistently higher in iron deficient infants. No differences were noted in serum folate levels. These results suggest, assuming similar intake of folate, that folate stores depend on the sufficiency of iron nutrition. Iron deficient erythropoiesis determines less utilization of folate stores. The length of duration of breast feeding was correlated with higher serum and red cell folates. The prevalence of folate deficiency in the group as a whole was low. Red cell folate levels below 160 ng/ml were found in 4.4% of the infants at 3 months of age, 7.5% at 9 months and 2.9% at 15 months. Low serum folates ( $< 3$  ng/ml) existed in 0.5% of the cases at 3 months, 1.7% at 9 months and 0.5% at 15 months of age.

**11** CONTROLLED TRIAL OF COPPER SUPPLEMENTATION DURING THE RECOVERY OF MARASMUS. Castillo D.C., Fisberg M., Egaña J.I. y Uauy R. INTA-CHILE.

To evaluate Cu nutritional status and the effect of a Cu supplement during recuperation, 26 marasmic infants were selected on admission to the nutrition recovery center, excluding those with secondary malnutrition. Half received an 80uCu/kg/day Cu supplement (S) as sulphate the remaining a placebo (P). They were paired by birth weight, age and sex. Anthropometric indices, CBC, ceruloplasmine and plasma Cu were measured on admission and at monthly intervals. They were fed ad-lib milk based diets adding CHO and fat to provide 150Kcal/kg/day and 4.5g Protein/kg/day. Vitamin and Iron supplements were given. The mean  $\pm$  S.D. Cu levels on admission were 121  $\pm$  28ug/dl for S and 132  $\pm$  37 for P. We found an increase in plasma Cu to 159 and 171 in group S at 30 and 60 days and after day 30 a decrease in group P. Low plasma Cu and clinical signs of deficit were found in 25% of group P. These were removed from the study and given Cu. One third of group P had low ceruloplasmine but none in group S. Preliminary data analysis shows decrease weight gain in group P associated to increased infectious morbidity. We conclude that a significant proportion of marasmic infants fed a milk based diet present during recovery signs of Cu deficiency. Supplementation at levels recommended for normals can prevent clinical and biochemical signs of deficit.

**12** COPPER DEFICIENCY. ORIGIN OF ANEMIA AND NEUTROPENIA IN MAN. Ernesto Ríos, Jorge Alvear, Sandra Llaguno, INTA, University of Chile, Santiago.

Five infants, 6 to 14 month old, undernourished of III degree were prospectively studied. All received hypercaloric milk formulas as exclusive diet. At 0-30-60-90 days the following test were done: ceruloplasmin, CBC, serum iron, TIBC, transferrin saturation, FEP, serum ferritin, red blood cell folates. Sequential CBC were also taken. At the beginning of the study bone marrow aspirate, serum protein and long bone x rays were done. In all the patients a copper deficiency was found, they were treated for 90 days as follows: copper sulphate 2.5 mg a day for 30 days, continuing with 1 mg a day till the end of the study. From the 30th day in addition  $\text{Fe}^{++}$  2.5 mg a day was given for 60 days. From the 60th day, 1 mg of folic acid was added.

Results: A group of 3 infants had a severe copper deficiency with ceruloplasmin 0 mg%, neutropenia  $< 500 \times \text{mm}^3$  and microcytic hypochromic anemia. The other group of 2 infants presented moderate copper deficiency with ceruloplasmin 0 mg%, neutropenia  $> 1000$  and without anemia. During the treatment in both groups a fast recovery of ceruloplasmin and neutrophils were observed. In the first group a constant hematocrit increase was founded with important changes in iron nutrition parameters and folates. In the second group no hematocrit variations was obtained during the exclusive copper therapy and minor variations in iron metabolism and folates were observed.