● 667

L-CARNITINE ON FAT UTILIZATION IN INFANTS. Richard A. Helms, Peter F. Whitington, Elena M. Catarau, Peggy R. Borum. Universities of Tennessee and Florida, Departments of Clinical Pharmacy, Pediatrics and Human Nutrition, Memphis, TN and Gainesville, FL.

L-carnitine (LC), which is essential for fat utilization, acts by facilitating long chain fatty acid transport into the mitochondrial matrix where B-oxidation occurs. The purpose of this prospective study was to determine if LC supplementation given to carnitine deficient infants would results in improved utilization of exogenously administered IV fat. Seventeen infants (gestational age 35.8±3.7 wks, postnatal age 13.6±7.3 wks, weight 3.3±1.0 kg) requiring a minimum of 7 days of parenteral nutrition (PN) and able to tolerate small quantities of enteral feedings were randomized into treatment and control groups. All infants had received nutritional support devoid of LC. Plasma carnitine (PC) levels did not vary significantly between groups in the pre-study period (control: 10.0±6.3 nM/ml; treatment: 9.4±6.0 nM/ml). Infants received 7 days of continuous nasogastric or gastric tube LC (50uM/k/d) or placebo. Fat was withheld and glucose reduced to 10% for 16 hrs prior to the delivery of a 0.5 gm/k Intralipid^{R} bolus administered over 2 hrs. LC supplementation continued until termination of the fat bolus. Serial blood samples for triglycerides (TGY), free fatty acids (FFA), acetoacetate (AA), B-hydroxybutyrate (BOB) and PC were observed at 0 (start of lipid infusion), 2,4,6 and 8 hrs. Infants receiving carnitine had significantly greater ($p<0.05$) concentrations of BOB, total ketones (BOB plus AA), and PC at times 0,2,4,6 and 8 hrs when compared to controls. Significantly lower ($p<0.05$) FFA/BOB ratios were observed in the treatment group at 2 and 4 hours indicating improved ketogenesis. No significant differences were found between groups for TGY or FFA at any observation period. This study demonstrated improved fatty acid oxidation as evidenced by increased ketogenesis with LC supplementation in carnitine deficient infants.

668

EFFECTS OF A SOY-BASED FORMULA ON IRON NUTRITION STATUS IN INFANTS. E. Hertrampf, M. Cayazzo, M. Olivares, A. Stekel. Instituto de Nutricion y Tecnologia de los Alimentos (INTA), Universidad de Chile, Santiago, Chile. (Spon. by G.M. Owen.)

It has been reported that soy inhibits absorption of non-heme food iron and fortification iron. 50 healthy term infants, weaned spontaneously before 2 mos. of age, received a soy formula (Prosobee-Supro 710) (Fe: 12 mg/l; ascorbic acid: 54 mg/l) ad libitum until age 9 mos (group A). For control, 47 infants received a cow milk formula fortified with ferrous sulfate (Fe: 15 mg/l; ascorbic acid: 100 mg/l) (group B) and 55 infants received unfortified cow milk (group C). All infants received solid foods (vegetables and meat) starting at age 4 mos. Hemoglobin concentration (Hgb), mean corpuscular volume (MCV), transferrin saturation (Sat), free erythrocyte protoporphyrin (FEP) and serum ferritin (SF), determined at age 9 mos. are summarized below.

Group	Hgb (g/dl)	MCV (fl)	Sat (%)	FEP (ug/dl)	SF* (ug/l)
B	12.64(0.85)	72.1(3.4)	14.6(6.4)	99(25)	14.9(8.2-26.7)
p	<.05	NS	NS	NS	NS
A	12.3(0.77)	73.5(5.6)	16.2(7.1)	95(30)	15.6(7.2-33.8)
p	<.05	<.001	<.01	<.001	<.01
C	11.88(1.15)	69.3(5.8)	12.3(7.0)	129(68)	10.1(5.4-18.8)

*(Geometric mean and limits of 1 SD)

It is concluded that Prosobee is essentially as effective as fortified milk-based formula in preventing iron deficiency in infants.

● 669

THE ROLE OF GLUCOCORTICOIDS IN THE POSTNATAL DEVELOPMENT OF ILEAL ACTIVE BILE SALT TRANSPORT. James E. Heubi, and Terrald D. Gunn, Children's Hospital Research Foundation, Department of Pediatrics, Cincinnati, Ohio.

The postnatal development of ileal active taurocholate (TC) transport occurs between 14 and 21 days of age and parallels the rise in jejunal sucrase activity. Glucocorticoids affect the development of sucrase activity, but their effect on ileal TC transport is unclear. The aim of the present study was to determine the role of glucocorticoids on the development of ileal active TC transport. Villus TC uptake was measured in ileal segments and kinetic characteristics calculated including Km (mM) and Vapp (nmol/mg dry wt/min) and sucrase (μmol/gm protein/min) was measured in midjejunal homogenates from 4 groups of Sprague-Dawley rats: (1) 14-day old treated with corticosterone (5 mg/100 gm BW) on days 10-13 (CTX), (2) 14-day old sham-treated (S1), (3) 21-day old adrenalectomized on day 14 (ADX), and (4) 21-day old shams (S2). Sucrase activity was significantly increased ($p < .001$) in CTX vs. S1 (30.1 ± 4.4 vs. 5.9 ± .6, mean ± SE); however, ileal TC uptake remained passive in CTX but was consistently higher at all study concentrations compared to S1, suggesting that glucocorticoids increased ileal permeability to TC. Adrenalectomy significantly reduced ($p < .001$) sucrase activity (16.5 ± 1.7 for ADX vs. 94.5 ± 8.3 for S2), but did not prevent development of ileal active TC transport. The Km for ileal TC transport was comparable in ADX (1.33 ± .54) and S1 (.49 ± .05), and the Vapp was comparable in ADX (11.78 ± 2.06) and S2 (14.65 ± .52). Conclusion: Glucocorticoids affect the postnatal development of both sucrase and ileal active TC transport differently but, in both, the role is "permissive" rather than obligatory.

● 670

PHARMACOLOGIC AND MECHANICAL PROPERTIES OF COLON IN A MODEL OF HIRSCHPRUNG'S DISEASE. Craig Hillemeier, Don Singer, Mark Evens, Piero Biancani.(Spon. Georges Peter) Brown University and Rhode Island Hospital, Depts of Pediatrics, and Internal Medicine. Providence, RI.

In the mouse the Ls trait is an autosomal recessive allele, that when present in the homozygous Ls/Ls condition, causes a segment of distal colonic aganglionosis resulting in obstruction similar to Hirschsprung's disease. Circular muscle rings from the aganglionic (AGC) and the ganglionic colon (GC) of Ls/Ls mice and from corresponding segments of control mice, were tested in vitro. 1) Electrical field stimulation caused neurally mediated relaxation followed by contraction in GC of both Ls/Ls and control mice while the AGC of Ls/Ls mouse did not respond. 2) AGC responded to direct acting myogenic agents and, in some instances, at lower doses than the GC. AGC was supersensitive to Vasoactive Intestinal Peptide (VIP) and bethanechol but not to Isoproterenol and ATP. 3) The maximal active force generated by the colon from the Ls/Ls mouse was significantly greater in rings from both the GC and AGC than in control mice. 4) Circular muscle thickness and stress, i.e. maximal active force normalized for the amount of muscle present, were greater in both the GC and AGC of Ls/Ls mouse than in control mice. 5) Isolated muscle cells, obtained by in vitro digestion with collagenase and examined with phase contrast microscopy, were significantly longer in GC of Ls/Ls mouse than in the corresponding segment of control colon (119.9 vs. 83.1 μm).

We conclude: the colon in this Hirschprung model generates greater forces because of greater circular muscle thickness and stress. These changes may be a reflection of the greater cell size. Increased sensitivity to bethanechol and VIP may represent "denervation" supersensitivity and support the hypothesis that VIP may be an endogenous neurotransmitter responsible for inhibition of normal colon.

671

VITAMIN D SUPPLEMENTATION AND METABOLISM IN PREMATURE INFANTS FED MINERAL SUPPLEMENTED FORMULAE. Laura S Hillman, Marilyn M Erickson, Sharon J Salmons. Wash U Med School, Children's Hospital, Dept of Pediatrics, St. Louis.

48 infants 1192±191 g (mean±SD) birthweight and 29.6±1.5 weeks gestation were fed formulae containing 940-1125 mg/L Ca and 470-660 mg/L P plus either 400 IU ergocalciferol (D_2), 800 IU D_2 or 2 μg 25-hydroxycholecalciferol (25-OHD_3). Serum, urine, photon absorptiometry and wrist radiographs were obtained serially. Serum and urine calcium and radiographically evaluated mineralization did not differ between groups and were increased over similarly supplemented infants fed standard formula (J Pediatr, In press). Bone mineral content (BMC) also did not differ (see table) and significant increase in BMC (*$P<.05$)(or radiographic normalization) was not seen until postconceptional term (9 or 12 weeks). Subsets of infants on 800 IU D_2 or 2 μg 25-OHD_3 both had high-normal serum 1,25$(OH)_2$D (49±10 pg/ml, n=14). Infants on D_2 had a higher serum vitamin D (6-11 vs 2-4 ng/ml) and infants on 25-OHD_3 had higher serum 25-OHD (34-80 vs 18-27 ng/ml). These values resemble data using standard formula (Pediatr Res 17:291A, 1983). Thus, in infants fed mineral supplemented formulae, improvement in mineral availability plus maturational limits appear to mask the benefit of 800 IU D_2 over 400 IU D_2 or 2 μg 25-OHD_3 previously seen in infants fed standard formula.

BMC of Humerus (g/cm) by Postnatal Age (Weeks)

Supplement	(n)	2W	4W	6W	9W	12W
400 IU D_2	(23)	.09±.02	.10±.02	.12±.03	.17±.03*	.14±.02
800 IU D_2	(18)	.09±.01	.11±.03	.10±.02	.13±.03*	.17±.03
2μg 25-OHD_3	(7)	.08±.02	.10±.03	.13±.04	.18±.03*	.19±.03

672

EFFECT OF HIGH MINERAL AND PROTEIN INTAKE ON MINERAL HOMEOSTASIS AND AMINOACIDURIA IN VERY LOW BIRTHWEIGHT INFANTS (VLBW). Laura S Hillman, Sharon J Salmons, Marilyn M Erickson, James W Hansen, Richard E Hillman. Wash U Med School, Children's Hospital, Dept of Pediatrics, St. Louis.

To improve bone mineralization, VLBW infants(<1500g) have been fed a high-protein/high-mineral formula (E)(3.0g protein/100Kcal, 950mg/L Ca, 480mg/L P) rather than a standard formula (S)(2.2g protein/100Kcal, 510mg/L Ca, 390mg/L P). Higher urine Ca/urinary creatinine (UCa/UCr) and frequent generalized aminoaciduria (GAA) have been noted. To separate the effects of protein and mineral intake two identical high mineral formulae with lower protein levels (B=2.7g, C=2.2g/100Kcal) were studied. UCa/UCr and % infants with GAA were greater on E, B, or C than S. On C UCa/UCr and UMg/UCr were increased and serum Ca (SCa) decreased compared to E. Serum albumin was lower on B and C than either E or S although protein content of B and C are ≥ S. PTH, BUN, HCO_3^- were normal and bone mineral content (BMC) and growth rates (GR) did not differ. A higher protein intake may minimize urinary calcium by increasing mineral accretion or by decreasing mineral absorption. Conversely, increased mineral content may increase protein utilization or decrease protein absorption.

MEAN VALUES AT 4 WEEKS OF AGE (P<.05 different from S(†) or E(*)

	n	BW g	GR g/day	SCa mg/dl	SP mg/dl	Alb g/dl	UCa/UCr	UMg/UCr	UP/UCr	% c GAA	BMC g/cm
S	13	1245	28.0	9.4	7.0	3.3	.16*	.13	2.6*	38	---
E	23	1193	28.1	9.6	7.1	3.4	.31†	.14	0.8†	63†	.10
B	7	1366*	34.3*†	9.1	6.5	3.0*†	.35†	.17	1.0†	83†	.10
C	8	1279	29.2	8.9*†	6.7	3.0*†	.49*†	.19*†	1.0†	75†	.11