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ZINC ABSORPTION IN AND DURING RECOVERY FROM SEVERE MALNUTRITION IN CHILDHOOD. Barbara E Golden & Michael HN Golden (spn. by Prof J Golding) Tropical Metabolism Research Unit, University of the West Indies, Kingston, Jamaica. Present address: Dept Child Health, University of Aberdeen, Aberdeen.

Severely malnourished Jamaican children have evidence of both malabsorption and zinc (Zn) deficiency, especially when they are oedematous. However, on high energy feeds, they are able to gain weight at greatly accelerated rates. By labelling their feeds with the stable isotope, ^{70}Zn, and measuring their intake and faecal output of total and isotopic Zn over 3 days, we calculated total absorption, net absorption and, by difference, endogenous loss of Zn in groups of children, 8 to 19 months old, with marasmus (n = 4), with oedematous malnutrition (n = 3), during rapid weight gain following severe malnutrition (n = 11) and after their recovery to reference weight-for-length ('controls', n = 8).
Results are expressed as percentages of Zn intake, group means ± SEM. In the Jamaican 'controls', total absorption Zn (25 ± 2%) and net absorption Zn (19 ± 3%) were similar to values in healthy U.S. children of similar age. However, compared with the controls, total absorption Zn was lower in the children with oedematous malnutrition (12 ± 4%) while in both the marasmic and oedematous children, endogenous loss was higher (24 ± 3 vs 9 ± 2% in the controls): two of the 3 oedematous children had negative net absorption Zn. During rapid weight gain, net absorption Zn (27 ± 2%) was higher than in the controls and correlated positively with their rate of weight gain (r = 0.74, $p < 0.01$): their endogenous loss was low (5 ± 2%).
The results suggest that Zn malabsorption occurs particularly in oedematous malnutrition but resolves rapidly during recovery.

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EVALUATION OF THE BODY COMPOSITION AND THE BONE MINERAL CONTENT BY DUAL X RAY ABSORPTIOMETRY. A. LAPILLONNE*, B.L.SALLE*, P.BRAILLON§, M.CHIAMBON*. Department of Neonatology* and Rhumatology§ Hôpital Edouard Herriot, LYON, FRANCE

An Hologic QDR 1000 W system equiped with a special pediatric scanning program was used to evaluate total bone mineral content (BMCt), lean body mass and fat content. 65 infants were studied, gestational age ranged from 36 to 40 weeks : 28 were appropriate for gestational age (AGA), 24 were small for gestational age (SGA) and 13 were infants of diabetic mothers (IDM). Mean birth weight (BW) ± SD was 3116 ± 557, 2015 ± 184 and 3601 ± 535 grams ; mean length ± SD was 49.2 ± 2.5, 44.8 ± 1.9 and 49.8 ± 2.9 cm respectively. The scan was performed during the first day of life. BMCt (grams of hydroxyapatite), lean body mass (grams), fat content (grams), % BMCt, % fat and % lean mass were (results were expressed as mean ± SD) :

	AGA (n=28)	SGA (n=24)	IDM (n=13)
BMCt, (grams)	45.9 ± 18.1	24.9 ± 9 •••	68.3 ± 21.7••
Fat, (grams)	457 ± 148	281 ± 47 •••	804 ± 244 •••
Lean, (grams)	2481 ± 401	1658 ± 170 •••	2545 ± 444
% BMCt	1.5 ± 0.4	1.2 ± 0.5 •	1.9 ± 0.6 ••
% Fat	15.0 ± 2.7	14.3 ± 2.1	22.7 ± 4.9 •••
% Lean	83.4 ± 2.8	80.8 ± 17.6	73.1 ± 9 •••

• $p < 0.05$ •• $p < 0.001$ ••• $p < 0.0001$. AGA vs SGA, AGA vs IDM.

In this gestational age range (36-40 weeks), 1) BMCt in AGA group differed from both SGA and IDM categories ; BMCt was better correlated with birthweight than with gestational age. 2) Body composition in % of BW did not differ significantly between SGA and AGA infants. 3) In IDM infants, fat content increased and thus explained the heavy birthweight.

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THE SERUM TRANSFERRIN RECEPTOR AS INDICATOR OF IRON DEFICIENCY IN INFANTS

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Objective: Serum transferrin receptor is now well established in adults as index of iron status. It increases with tissue iron need and is more sensitive than other parameters to mild iron deficiency. The purpose of this study was to test its value in infants, a population especially susceptible to iron deficiency.
Methods and setting: We measured hemoglobin, serum ferritin (RIAgnost, Behring) and the serum transferrin receptor (CLINIGEN EIA, Amgen Diagnostics) in 71 healthy infants at 12 months of age from 5 centers of the Euro-Growth Study (Vienna, Salzburg, Budapest, Bilbao, Porto, Dublin).
Results: Intra- and interassay variances of the transferrin receptor (TfR) measurements were 3.5% and 7.75%, respectively. Infants with hemoglobin (Hb) levels < 11 g/dl, indicating anemia, had significantly higher TfR values than infants with Hb values >11g/dl (3,46±0.99 vs 2.66±1.04 µg/ml; $p<0.05$, Wilcoxon rank test). In infants with Hb >11 g/dl and s-ferritin <12, between 12-20, and >20 ng/ml, TfR values were 3.04±1.13*, 2.54±0.93 and 2.18±0.64* µg/ml, respectively (*$p<0.05$, Duncans Multiple Range test). Regression analysis did not reveal a negative correlation between TfR and either Hb or s-ferritin.
Conclusions: Serum transferrin receptor is significantly increased in infants with iron deficiency anemia. In infants with no anemia (Hb > 11 g/dl) but low iron stores (s-ferritin < 20) elevated transferrin receptor values already indicate iron deficient erythropoeisis. Although our data are limited the combination of serum ferritin and serum transferrin receptor appears promising as a screening tool for mild iron deficiency in infants.

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FIRST TRIMESTER PHENYLKETONURIA (PKU) DIETARY CONTROL AND NEURODEVELOPMENTAL OUTCOME IN INFANTS. Ann Lorek, Jenny Baudin, Jan Townsend, Maggie Lilburn, Ann Stewart and David Brenton. Depts of Paediatrics and Medicine, University College London Medical School, London, UK.

To avoid fetal damage in women with PKU, strict preconception and pregnancy control of blood phenylalanine concentrations (PHE) have been recommended (1). To find out if these recommendations prevented neurological damage we studied the neurodevelopmental outcome of 24 infants from 23 pregnancies in which strict dietary control was introduced prior to conception. 18 had reached 1 year. Measures of outcome were related to mean PHE, and to number of days PHE exceeded 300 µmol/l in the first trimester. They included head circumference (OFC) and neurological examination at term and 1 year and developmental quotient (Griffiths GQ) at 1 year. The OFC standard deviation scores (SDS) at term and 1 year in infants of mothers with mean PHE ≥300 (305-496) µmol/l were significantly smaller than those with mean PHE of <300 (139-281) µmol/l ($p<0.05$). Within the group with mean PHE <300 µmol/l, OFC SDS was lower in those whose PHE exceeded 300 µmol/l for more than 10 days ($p<0.05$). 17 of the 24 infants examined at term, and 13 of the 18 at 1 year, had abnormal neurological signs. The mean GQ of these 18 infants was 109±13 and did not differ according to PHE. We conclude that a) mean PHE of <300 µmol/l in the first trimester improves head growth especially when control is strict b) strict control at this recommended level did not prevent signs of neurological impairment.
1. MRC Working Party on PKU. Arch Dis Child 1993;68:426-427.

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PROTEIN METABOLISM IN VENTILATED PRETERM INFANTS ON THE FIRST DAY OF LIFE.

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Protein kinetics were measured to examine the effect of immediate commencement of amino acid (AA) administration following birth. Eight infants (birth wt 1.5±0.3 kg) received exclusively 6.6±1.4 g glucose/kg/d (26 kcal/kg/d) and seven infants (bw 1.4±0.4 kg) received 5.9±2.0 g glucose/kg/d and 1.2±0.1 g AA/kg/d (28 kcal/kg/d). All infants were ventilated and studied at the first day of life. A primed continuous infusion of $NaH^{13}CO_3$ was followed by a primed continuous infusion of [1-^{13}C]leucine. Isotopic enrichment of expired CO_2 was measured by IRMS and dilution of ^{13}C-KIC was measured by GCMS. Nitrogen excretion was measured in urine. The results (mean±SD, † sign.diff. at $p \leq 0.01$):

	N-balance	Turnover	Oxidation	Synthesis	Breakdown	Balance
	mg/kg/d	µmol leucine/kg/hr				
glucose	-110 ± 47	201 ± 20	41 ± 13	160 ± 20	186 ± 20	-27 ± 13
glu + AA	+45 ±98†	219 ± 33	48 ± 16	171 ± 35	171 ± 35	+4 ± 17†

Conclusions: 1. Amino acid administration does not significantly alter leucine oxidation on the first day of life. 2. Even at a very low energy intake, amino acid administration of 1.2 g/kg/d prevents both negative leucine and nitrogen balances. Based upon protein balances, it seems that the administration of amino acids on the first day of life is benificial for preterm infants .

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MIXED MCT/LCT LIPID EMULSION USE IN SICK VLBW INFANTS

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Undernutrition is common in sick VLBW infants requiring parenteral nutrition (PN). Lipid-free PN leads to poor energy intake but lipid has been associated with increased incidences of infection and BPD. Medium chain triglycerides (MCT) are metabolised faster than long chain (LCT). We therefore designed a new PN regimen, with use of a 50% MCT emulsion from day 2 and in greater amounts, and compared this to a conventional PN regimen with 100% LCT emulsion. Sick VLBW infants were randomised to this new PN regimen (MCT) or control (LCT) groups: Lipofundin MCT/LCT (B Braun) was used in the MCT group (n=64) and Intralipid (Kabi Vitrum) in the LCT group (n=61). The MCT group had a mean BW of 925 g compared to 933 g in the LCT group. Mean energy intakes whilst receiving PN were greater ($p < 0.001$) in the MCT group at days 7,14,21,28,35 and 42. The incidences of BPD were 29% in the MCT group and 29% in the LCT group (ns), with infection rates of 63% and 74% respectively (ns). There were no significant increases in incidences of hyperlipidaemia or hyperketonaemia in the MCT group. We conclude that liberal MCT emulsion usage lessens undernutrition without adverse clinical or metabolic sequelae in sick preterms.