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**METABOLIC AND ENERGY BALANCE IN SMALL (SGA) AND APPROPRIATE (AGA) FOR GESTATIONAL AGE VERY LOW BIRTH WEIGHT INFANTS FED FORTIFIED HUMAN MILK (HM).**

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In litterature, there are discrepancies about nutrient and energy metabolism in SGA premature infants ; that could be related to differences in type of intrauterine growth retardation. This study compares results of anthropometric data, 3-day nutritional balance and indirect calorimetry measurements performed in 8 AGA and 8 symmetrically growth retardated infants, at the same post-natal age. Infants were fed pooled HM protein and energy supplemented (HM fortifier : Eoprotin®, Milupa).

| | Birth Weight *g* | Birth Gest. Age *weeks* | Energy intake *kcal/kg.d* | Nitrogen intake *mg/kg.d* | Nitrogen Absorb. *%* | Fat Absorb. *%* | Weight gain *g/kg.d* | Protein retained *g/kg.d* | Fat retained *g/kg.d* |
|---|---|---|---|---|---|---|---|---|---|
| AGA | 1293±107 | 29.8±1.4 | 119±9 | 541±64 | 84±3 | 79±15 | 17.9±3.2 | 2.2±0.3 | 3.9±0.8 |
| SGA | 1111±230 | 32.7±2.9* | 121±9 | 534±46 | 83±4 | 87±5 | 20.7±4.6 | 2.2±0.3 | 4.1±1.2 |

Mean ± 1 SD (*) p<0,05

Volume of milk intake, amounts of nitrogen and energy intake were similar in both groups. There was no significant difference in protein and energy absorption, but SGA infants tended to present a better fat absorption, likely because they were 3 weeks older. Weight gain and it's composition were similar in both groups, with approximately 20% of fat (non-protein energy deposition). In conclusion, there was no significant difference in response to diet between AGA and SGA VLBW infants. Nutritional needs seem to be similar in AGA and SGA infants, as long as growth retardation is symmetrical. This may be different when asymmetrically growth retardated infants are concerned.

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**VALIDATION OF DUAL X-RAY ABSORPTIOMETRY (DXA) FOR WHOLE BODY COMPOSITION ASSESMENT IN SUBJECTS WEIGHING LESS THAN 6000 GRAMS.**

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Accuracy and precision of DXA (Hologic QDR 2000, Pediatric Software 5.64, 1992) for analysis of body weight (BW), bone mineral content (BMC) and fat content (FC) in small subjects, was assessed by scanning 13 piglets (1470 to 5500 grams) in triplicate. In 3 of them, FC was increased with porcine lard added around the abdomen; 17 additional measurements were performed. DXA estimates of BW, BMC, and FC were compared respectively with BW measured by electonic scale and with chemical analysis of whole carcass performed after homogeneization. FC was determined by gravimetric method after fat extraction with Folch and Weibull methods, and BMC was determined by measuring total calcium content with atomic absorptiometry, considering 40% of calcium in hydroxyapatite. Reproductibility estimated by mean coefficient of variation for all DXA measures corresponds to 0,09% for BW, 1,99% for BMC and 5,29% for FC. DXA measures were significantly correlated with true BW ($r^2$=1), chemical calcium ($r^2$=0,98) and fat ($r^2$=0,99), but BMC was underestimated (-13%) and FC was overestimated (+15%) by DXA. From these results, conversion equations were applied for BMC and FC. Accuracy and precision correespond to -1,4±4,4% for BMC, +4,6±11,1% for FC between 250 and 600 g and -1,5±4,5% over 600 g of FC. Therefore, DXA may be a useful reliable method to determine whole-body composition in term and preterm infants.

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HEAVY METALS (Pb,Cd,Ni) CONCENTRATION IN THE HAIR OF MOTHERS OF PRETERM AND SMALL FOR GESTATIONAL AGE (SGA) INFANTS

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To test null hypothesis (Ho):prenatal exposure to heavy metals does not increase the risk of prematurity and the delivery of small for gestational (SGA) infants, a case-controly study was carried out in Southern Poland. Material: From July 1992 through June 1993 all cases of SGA (<10 perc.) (N=74) and preterm (<37 wks) newborns (N=104) were ascertained prospectively in 4 regions (Kraków, Zakopane, Limanowa, Rabka). For each case at least one control infant (>10 perc. and >37 wks) matched by sex and birth-date was selected (N=211). Case and control mothers' pubic and head hair were collected. Methods: Pb, Ni and Cd were determined in hair samples by atomic absorption spectrometry (Perkin Elmer).
Results: Case control analysis (ANOVA) of Pb, Ni and Cd revealed that Cd content was significantly increased in the head hair of mothers of SGA infants (F=7.49 p=0.007). Also mothers of preterm newborns showed significantly higher Pb concentration in pubic hair in comparison to the controls (F=4.67 p=0.03). No significant case/control difference was observed for Ni. Conclusion: Increased Cd and Pb content in maternal hair reflects higher exposure to these metals, which may be related to higher risk of preterm and SGA infants delivery.

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PCBS, PCDDS AND PCDFS IN HUMAN MILK: DOES A SHORT TERM-CHANGE IN MATERNAL DIET INFLUENCE THEIR CONCENTRATION?

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INTRODUCTION: Polychlorinated Biphenyls (PCBs), Dibenzodioxins (PCDDs) and -Furans (PCDFs) are found mainly in animal fat and in human milk.
OBJECTIVES: To elucidate the influence of a short-term change in maternal diet in the PCB, PCDD and PCDF content of human milk.
STUDY GROUP: 6 breastfeeding mothers of healthy, term, single infants 3-10 months old. Diet: 24-hours fasting and weekly change of a weighed recorded diet containing high ("HIGH") or extremely low ("LOW") fat, cross-over design. Samples: 1 human milk sample before the study ("start-up"), 1 sample after fasting ("fasting") and 1 sample at the end of every diet week ("HIGH" and "LOW") in pre-washed bottles (WHO protocoll), stored at -20° until analysis.
METHODS: Lipid extraction using polyethylene film dialysis and silica column, HPLC- separation of the congeners, analysis on High- resolution gas chromatograph (HP-5898) and a high- resolution- mass spectrometer (VG-70-250S).
STATISTICAL ANALYSIS: Latin- square test.
RESULTS: Mean animal fat intake of the mothers during "LOW" weeks 9.13 (9.65)g/day vs 108.04 (56.46)g/day during "HIGH" weeks.(p<0.01)

Human milk PCBs, PCDDs and PCDFs in pg/g milk fat (means,SD):

| | start-up | fasting | LOW | HIGH |
|---|---|---|---|---|
| Total ITEQ | 23.6 (4.5) | 22.7 (3.3) | 20.9 (3.3) | 24.7 (10.0) |
| 2.3.7.8PCDD | 1.6 (0.8) | 1.7 (0.8) | 1.2 (0.3) | 1.6 (0.6) |
| Nordic | 11.5 (2.2) | 11.2 (2.5) | 11.4 (6.8) | 10.3 (2.4) |

Latin- square analysis: PCBs, PCDDs,PCDFs: No influence of dietary changes.
CONCLUSION: No dietary changes for breastfeeding mothers.

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FINE MOTOR SKILLS IN CHILDREN WITH EARLY TREATED PHENYLKETONURIA (PKU) AND HEALTHY CONTROLS.

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Late onset neurological symptoms involving the motor system have been reported in adult patients with early treated phenylketonuria (Thompson et al 1990, Lancet). Impairment of fine motor skills is known to be a valid indicator of mild forms of brain damage in children. We investigated 20 children (10 f, 10 m, age 13.1 (12-14)) with early treated PKU still under diet and 20 controls, matched for age, sex and social status of the family. We employed a test battery (Motorische Leistungsserie, Schoppe), which requires different dimensions of fine motor abilities. The subtests are (1) steadiness (keeping a stable position), (2) line following (slow directed movements), (3) metal sticks (pegboard with long or short sticks), (4) aiming (fast aiming movements), (5) tapping, (6) pursuit rotor (visual-motor integration). We found significantly impaired fine motor skills in PKU patients compared to controls in all tested variables. The results for dominant and nondominant hand were comparable. Performance in subtests 1 and 2 (measuring stillness of hand, esp. tremor) was significantly correlated to the actual blood level of phenylalanine (796 (67 - 1489) uMol/l phenylalanine; test 1: PCC 0.48, p<0.05; test 2: PCC 0.61, p<0.005). The assessment of fine motor skills with automatic registration techniques seems to be an appropriate approach to detect mild forms of dysfunction in the motor system. By longitudinal examinations it will be possible to decide wether impaired fine motor skills in PKU are markers of a mild, but stable impairment of brain function (as for example a subnormal IQ) or an early indicator of a further deteriorating neurological syndrome. (Grant by DFG 196/3-1 and German Fed. Dept. of Research and Technology FKZ 706568/0).

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CEREBRAL PHENYLALANINE (PHE) CONCENTRATIONS IN PATIENTS WITH PHENYLKETONURIA (PKU) DETERMINED IN VIVO BY $^1$H MAGNETIC RESONANCE SPECTROSCOPY (MRS).

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In an animal model of hyperphenylalaninemia PHE was measurable by MRS in the brain *in vivo*. Blood and brain concentrations were not correlated (Avison et al 1990, Pediatr Res). We measured brain PHE in 4 early treated adult PKU patients (type I) during an oral load with l-PHE using localized MRS (1.5 T, standard head or surface coil, double echo localisation sequence, TE 20 ms). The PHE peak was identified at 7.4 ppm. in all patients calculating difference spectra (baseline spectra of 8 healthy subjects). PHE quantification was accomplished using the unsuppressed water signal as internal standard (Kreis et al 1993, J Magn Reson B). Blood PHE steaply increased from 981 (696 - 1158) uMol/l preload to maximum within 2 h after load. After 5 h (1713 (1423-1913) uMol/l) PHE was stable, after 20 h (1581 (1440 - 1653) uMol/l PHE levels slowly decreased. Increase of brain PHE (preload 230 (80 - 340 uMol/l) was much slower and less steap and continued from 5 h (290 (260 - 330) uMol/l) to 20 h (340 (240 - 490 uMol) postload. Individual blood/brain ratios varied from 2.73 - 5.43. Using MRS to measure PHE in the brain (and thus in the affected compartment) and its dynamics of influx through the blood-brain barrier it should become possible to determine the interindividually different risk in developing brain damage on a more valid basis.(Grant DFG Pi196/3-1).