

WATER TURNOVER OF HEALTHY CHILDREN

65 Christoph Fusch*, Barbara Scharrer[§], Eva Hungerland[§], Hans Moeller[§] (spn. by N. Herschkowitz*), University Childrens Hospitals of CH-3010 Bern* and D-7400 Tübingen[§].

Purpose and methods: Recommendations of fluid requirements of healthy children given by pediatric textbooks have been theoretically derived, but not experimentally confirmed by direct measurements. In this study, water turnover was measured in 171 healthy children (88 f, 83 m, 1.5 mths-15 yrs) living in their normal milieu using the established technique of deuteriumoxide dilution: oral application 2ml D₂O/kg body weight, analysis of urine D₂O content by IR-spectroscopy¹⁾. **Results:** Measured and Recommended²⁾ values per body weight and day [ml H₂O/kg/d] are shown in the following table:

Age n	1.5-3 9	3-6 20	6-9 14	9-12 [mo] 14	1-3 19	3-6 29	6-9 32	9-12 19	12-15 [y] 15
M: $\bar{x} \pm s$	160 ± 34	119 ± 19	114 ± 29	97 ± 29	64 ± 21	63 ± 17	54 ± 13	46 ± 9	40 ± 7
R: range	130-180	130-180	120-145	120-145	115-125	100-110	90-100	70-85	50-60

Discussion: These are the first measured data of water turnover during childhood. After correcting the influence of oxidation water, we conclude that spontaneous daily fluid intake during the first year of life is in the lower range of the recommendations. For older children, however, the recommendations exceed the measured values by the factor 1.2 to 2. **References:** ¹⁾ J Clin Chem Clin Biochem 1988, 25: 715; ²⁾ Deutsche Gesellschaft für Ernährung 1989, Umschau Verlag, Frankfurt, FRG.

66

DOES RADIANT HEAT INCREASE THE WATER LOSS FROM THE SKIN OF NEWBORN INFANTS?

Sveinn Kjartansson, Saadet Arsan, Karen Hammarlund, Gunnar Sjörs and Gunnar Sedin. Department of Pediatrics, University Hospital, Uppsala, Sweden.

To investigate whether radiant heat increases insensible water loss, the evaporation rate from the skin (ER) was measured in term and preterm infants, both during incubator care (A and B) and when nursed under a radiant heater (C). Relative humidity in the incubator was 50 % (A) and for the preterm infants measurements were also made at a lower level of humidity (B).

Results:

Gest age weeks	n	ER, g/m ² h			Vapour pressure, kPa		
		A	B	C	A	B	C
37-41	12	3.3	-	4.3	2.4	-	0.7
30-34	8	7.8	9.0	8.8	2.7	1.5	1.2
25-29	8	23.1	24.5	26.8	2.8	1.9	1.3

The ER was higher when the infants were nursed under the radiant heater than during care in an incubator with humidified air, but the increase in ER was not greater than expected at that lower level of humidity. We conclude that the water loss from the skin depends on the ambient vapour pressure, both when infants are nursed in incubators and under radiant heaters.

67

USE OF POCKET COMPUTER BY PATIENTS WITH METABOLIC DISORDERS TO ADJUST THEIR DAILY NUTRITIONAL INTAKE.

Martin Gander, Walter Gander, Baudouin François* ETHZ IWR, CH 8092 ZÜRICH, Switzerland and *Dr L. Willems Institute, B 3590 Diepenbeek, Belgium

After 5 years of age, one of the major problems to continue a special diet by patient with metabolic disorders is the anorexia. A likely cause is an imbalance due to the scarcity of choice in foodstuff available. A previous study using a computer program on Commodore 64 showed that the nutrient requirements were not always met in these patients despite adequate recommendation by the nutritionist. We recently developed a new version of the program adapted on a ATARI Portfolio*. This system, in addition to its small size allowing a use on the spot, presents the following advantages: large memory capacity for more than 1000 foodstuffs and 60 nutrients, MS DOS compatible allowing data exchange with the computer system of the nutritionist. The first results obtained in 5 patients with phenylketonuria suggest that the caloric intake remain limited in the diet given at home. A proper diet management of a child with metabolic disorders should be made easier by use of home computer to help the child and his family in planning menus according to the results of the blood test and the recommendation of the physician.

68

ENDOTHELIAL CELLS (EC) TOLERATE PROLONGED HYPOXIA AND GLUCOSE DEPRIVATION.

T.Kristiina Aalto and Kari O. Raivio. Children's Hospital, University of Helsinki, SF-00290 Helsinki, Finland.

ECs play a key role in organ damage after ischemia-reperfusion and oxygen toxicity. In vitro models have been described in which short-term exposure of ECs to hypoxia followed by hyperoxia causes cell damage. We cultured human ECs from umbilical veins, prelabeled them with ¹⁴C-adenine, and followed nucleotide catabolism as a sensitive indicator of cell damage during exposure to normoxia (N), 95% N₂ + 5% CO₂ (HYPO), or 95% O₂ + 5% CO₂ (HYPER), with either 0 or 5.5 mM glucose (G) in the medium. Up to 6h, adenine nucleotide turnover and hypoxanthine accumulation in the medium were similar under all incubation conditions. After 16h, cellular nucleotide levels, in comparison with N+G (=100±9%), were: N-G 140±17%, HYPO+G 37±9%, HYPO-G 58±2%, HYPER+G 16±7%, and HYPER-G 114±35%. When 16h of HYPO was followed by 8h of HYPER, depletion was total and cell death ensued in the presence and absence of G. We conclude that ECs tolerate both HYPO and G deprivation for several hours, and surprisingly they are more sensitive to both HYPO and HYPER in the presence than in the absence of G.

69

MEASURED AND CALCULATED METABOLIC RATE IN OBESE AND NONOBESE ADOLESCENTS

Dénes Molnár- Department of Pediatrics, University of Pécs, H-7623 Pécs, Hungary

To evaluate the validity of the currently available regression equations for the calculation of resting metabolic rate (RMR), we compared the measured RMR with those calculated from 4 equations in obese (O) (26 boys, 20 girls; age mean±SE: 13.3±0.3 yrs; weight: 72.6±5.1 kg; height: 162±1.5 cm; body fat: 38.1±0.5%) and nonobese (C) (21 boys, 19 girls; age: 12.8±0.3 yrs; weight: 41.5±1.5 kg; height: 153±1.9 cm; body fat: 19.3±0.9%) adolescents. RMR was measured after an overnight fast by means of open circuit indirect calorimeter. The measured RMR (0:1682±45.4, C:1186±32.3 kcal/day) were significantly (p < 0.01) lower than those calculated from the Harris-Benedict equation (0:1882±48.6, C:1302±24.3 kcal/day), Mayo nomogram (0:2047±42.2, C:1446±31 kcal/day) and the equation of FAO/WHO/UNU (0:1920±60, C:1285±41.9 kcal/day). The most accurate estimate of RMR was given by the Cunningham equation (0:1685±40.2, C:1226±24.2 kcal/day). The above results confirm the urgent need of new standards for estimation of energy requirements.

Dietz WH, et al: J Pediatr 118: 146-9, 1991.

70

SHOULD SEMI-SKIMMED MILK BE RECOMMENDED FOR PRE-SCHOOL CHILDREN?

Jessica A Payne (spn. Neil McIntosh), Department of Child Life & Health, University of Edinburgh EH9 1UW Scotland, U.K.

In the U.K. caution is advised in giving semi-skimmed milk to pre-school children due to concern that low fat intakes may impair energy intake and growth. This study compares energy intake and growth in 120 children aged 2-4 years from Edinburgh, who had been taking either full-fat (4% fat) or semi-skimmed (2% fat) milk during the previous year. Nutrient intakes were assessed by the 7-day weighed method.

GROUP	Full-fat		Semi-skimmed	
	Mean	(SD)	Mean	(SD)
Number	95		25	
Age (months)	38	(10.5)	41.5	(11.0)
Energy intake (kJ/d)	4666	(875)	4948	(848)
% Energy from fat	36.4	(4.6)	32.0	(4.8)
% Energy from starch	20.2	(4.7)	23.8	(3.9)
Height (cm)	96.3	(7.5)	99.3	(7.5)
Weight (kg)	15.2	(2.4)	16.2	(2.5)
NS = not significant	** = p 0.001 (independent t-tests)			

Conclusion: use of semi skimmed milk does not impair energy intake or growth in pre-school children from Edinburgh, as energy intake is maintained by a higher intake of carbohydrate.