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^{13}C-AMINOPYRINE AND ^{13}C-PHENYLALANINE BREATH TESTS AS A DYNAMIC MEASURE OF LIVER FUNCTION IN CHILDREN

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Dynamic liver function tests like the MEGX test and the ^{13}C-aminopyrine breath test (^{13}C-AP-BT) have been developed to provide a quantitative assessment of microsomal function. In chronic liver diseases the activity of phenylalanine hydroxylase is reduced. The aim of the present study was to compare the results of the ^{13}C-phenylalanine breath test (^{13}C-Phe-BT) with well established liver function tests (^{13}C-AP, MEGX) and routine laboratory data. In 17 patients (age: 5 months to 17 years) with chronic hepatic diseases ^{13}C-AP and ^{13}C-Phe breath tests were performed. After oral administration of 2 mg/kg bw ^{13}C-AP and 1.5 mg/kg bw ^{13}C-Phe, resp., the $^{13}CO_2$-exhalation was analysed using mass spectrometry and expressed as cumulative ^{13}C-elimination rate (^{13}C-E). In 14 of the patients the MEGX test was performed (1 mg/kg bw Lidocain i.v.). The results of these dynamic liver function tests were compared to amino transferases, GGT, PCHE, PTT, albumin, bilirubin and bile acids. The range of ^{13}C-E was 0 to 18.6 % for ^{13}C-AP (normal: > 9.2 %) and 0 to 14.3 % for ^{13}C-Phe (normal: > 10.8 %), resp.. ^{13}C-E of AP and Phe was significantly correlated (r=0.65; p< 0,01), although distinct differences were seen intraindividually. Only ^{13}C-E-AP was correlated with the MEGX test (r=0.55; p<0.05). The results of both breath tests correlated with the PTT (r=0.62 and 0.72, resp.; p<0.01). However, no correlation was found between the ^{13}C-E of both tests and the activities of amino transferases, GGT, PCHE, and the concentrations of bile acids, albumin, and bilirubin.
These preliminary results show a good correlation between the ^{13}C-AP breath test and the MEGX test, both reflecting microsomal liver function. Reduced ^{13}C-E-Phe indicates diminished activity of phenylalanine hydroxylase in liver diseases. However, marked intraindividual differences in the results of the breath tests were noted. Their prognostic significance has to be evaluated.

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FAT-FREE MASS (FFM) ESTIMATIONS IN INFANTS BY TOTAL BODY ELECTRICAL CONDUCTIVITY (TOBEC) AND 18-OXYGEN DILUTION.

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Infant FFM can be safely and rapidly measured with good reproducibility by TOBEC. However, calibration of instruments until now has been based on carcass analysis data from minipigs. No data have been published for human infants comparing FFM estimated by TOBEC (using the minipigs calibration) with FFM calculated from TBW measurements by 18-oxygen dilution. We performed this comparison by measuring FFM by both methods in 131 healthy full-term infants aged between 1 and 12 months (♂/♀ =0.98). After a predose baseline urine sample a preweighted oral dose of 18-O enriched water was administered and a post-dose sample on days 1 and 9 was collected. TBW was calculated by extrapolation to time zero.

Results:	Weight (kg)	TBW (L)	FFM by TOBEC	FFM by 18-O
mean (SD)	5.98 (1.79)	3.58 (0.90)	4.68 (1.16)	4.49 (1.16)
range	3.41-11.2	2.29-6.38	3.02-8.30	2.85-8.08

Regression analysis of FFM by TOBEC (X) against FFM by 18-O (Y) showed a straight linear relation: Y= -0.122 (±0.078) + 0.985(±0.016) X , r=0.98 , SEE=0.214 kg. No bias in the distribution of the residuals was seen.
Conclusions: 1] FFM values in healthy infants measured by TOBEC and 18-oxygen are highly and strictly linearly correlated. 2] Estimation of FFM in healthy infants by TOBEC results in slightly higher FFM values than by 18-O dilution. This systematic difference is constant during the first year of life. 3] Both methods can be used for accurate estimations of fat-free mass and body fat in infants between 1 and 12 months of age.

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NUTRITIONAL ASSESSMENT IN INFANTS BY TOBEC AND ANTHROPOMETRY

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Body composition (BC) data give important information on growth and nutritional status in infants. TOBEC is a recently developed, precise and reproducible technique for BC assessment. We compared anthropometric indices for nutritional assessment (upper-arm anthropometry, skinfolds (biceps, triceps, subscapular, suprailiac, quadriceps), Weststrate's method[1] and a modification on Dauncey's method[2]: i.e. skinfolds/2 and inclusion of quadriceps skinfold) with TOBEC in 435 healthy infants, aged 23-365 days (♀/♂=0.93). The partial correlation coefficient (r_p), controlled for the covariable age, was used as a measure for the predictive value. Results: TOBEC-derived body fat (BF-T) as percentage body weight was poorly correlated with all anthropometric indices (r_p<0.70). Upper-arm anthropometry was poorly correlated with BF-T (kg) and TOBEC-derived fat-free mass (FFM-T) (r_p<0.70). Results for other anthropometric indices:

	r_p with BF-T (kg)	r_p with FFM-T (kg)
Weststrate's[1] BF / FFM	0.84	0.90
Dauncey's[2] BF / FFM	0.75	0.90
Quetelet's index	0.76	< 0.70
weight	0.77	0.87
length	< 0.70	0.77
calf circumference	0.76	< 0.70

Conclusions: 1] The best correlation with BF-T (kg) and FFM-T (kg) was found with Weststrate's prediction equations[1] 2] Weight and calf circumference are the best single anthropometric measurements to predict BF-T 3]. Anthropometry is poorly correlated with percentage BF-T.

References: [1] Weststrate et al. Am.J.Clin.Nutr.50:1104-15,1989; [2]Dauncey et al, Arch.Dis.Child.52:223-227,1977

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EFFECT OF INCREASED BLOOD OXYGEN CONTENT ON CEREBRAL BLOOD VOLUME AS DETECTED BY NEAR-INFRARED SPECTROFOTOMETRY IN NEWBORNS. Nikolai C. Brun and Gorm Greisen. Dept. of Neonatology GN 5024, The National University Hospital, Rigshospitalet, Blegdamsvej 9, DK-2100 Copenhagen Ø, Denmark.

The cerebral vascular system in newborn infants is known to react to marked hyper- or hypoxaemia. Near-infrared spectrophotometry (NIRS) uses oxyhaemoglobin as a tracer for investigation of both cerebral blood flow(CBF) (a brief large oxygen transient) and cerebral blood volume(CBV) (a longer lasting smaller transient). This analysis investigates the cerebrovascular reactivity to increased blood oxygen content in the physiological range.
Material and methods: Twenty-two mechanically ventilated infants (25-42 weeks GA, mean postnatal age (PNA)=10 days) were exposed to a 0.1-0.15 increase in FiO2 lasting 2-5 minutes in 77 measurements of CBV and exposed to a FiO2 of 1.0 lasting 10-20 seconds in 142 measurements of CBF. The change in total cerebral haemoglobin concentration during the oxygen transients was recorded by NIRS and from this the change in cerebral blood volume was derived.
Results: The longer, small increase in FiO2 increased mean arterial saturation (SaO2) from 92.6% by 4.0%(SD=2.2) and CBV fell by 0.0045mL/100g/pct change in SaO2(SE=0.0016). The size of the change was characteristic for each infant(p=0.003) but was not related to GA, PNA, initial SaO2, arterio/alveolar-ratio, or initial CBV. The larger, but brief oxygen transient changed mean SaO2 more (p<0.0001) from 92.0% by 7.0%(SD=2.9), but did not alter CBV significantly.
Conclusion: An increase in blood oxygen content within the physiological range lasting a few minutes produced a decrease in CBV, probably due to cerebral vasoconstriction. A larger but briefer transient did not produce this response. Apart from their physiological interest, these findings are directly relevant for the interpretation of the currently used methods to determine CBF and CBV using NIRS.

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SHORTER GESTATIONAL AGE IS ASSOCIATED WITH SYSTEMIC ACTIVATION OF COMPLEMENT, LEUKOCYTES AND CLOTTING IN PRETERM VENTILATED RABBITS. Frank Brus, Wim van Oeveren, Alle Heykamp, Albert Okken, Sidarto Bambang Oetomo. Depts. of Pediatrics and Cardio-pulmonary Surgery, University Hospital, Groningen, The Netherlands.

Activation of plasma proteins and cells in the idiopathic respiratory distress syndrome may be influenced by gestational age.We measured in plasma complement hemolytic activity (CH50),and activation of leukocytes (beta-glucuronidase,BG) and clotting (fibrin monomers,FM) in preterm ventilated rabbits of 28d and 29d of gestational age.Dynamic lung compliance (Cdyn) and ventilatory efficiency index (VEI) served as lung function parameters.

	28 days (n=12)	29 days(n=25)
Cdyn (ml/cmH_2O*kg)	0.36 ± 0.03	0.48 ± 0.03**
VEI	0.09 ± 0.01	0.12 ± 0.01**
CH 50 (U/ml)	106 ± 21	188 ± 12**
beta-G (AU)	68 ± 6	43 ± 7*
FM (AU)	43 ± 10	30 ± 3*

**p< 0.01, *p< 0.05 28 vs. 29 days. Data shown as mean ± SEM

Conclusion: Decreased Cdyn and VEI in preterm ventilated rabbits of shorter gestational age are associated with increased systemic activation of complement,leukocytes, and clotting.This systemic activation process may contribute to further lung injury.

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COMPLEMENT ACTIVATION IN THE IDIOPATHIC RESPIRATORY DISTRESS SYNDROME (IRDS). Frank Brus, Wim van Oeveren, Albert Okken, Sidarto Bambang Oetomo. Depts. of Pediatrics and Cardiopulmonary Surgery, University Hospital Groningen, The Netherlands.

Complement activation in preterm infants with IRDS may be partly caused by platelet-activating factor (PAF). PAF and complement can activate leukocytes. We measured in plasma complement activation (C3a), PAF-inhibitory capacity (PAF-IC;low PAF-IC indicates PAF release), and leukocyte activation (elastase-proteinase inhibitor complex (E-PI) and tumor necrosis factor (TNF-α)) together with the leukocyte count on day 1,3 and 5 in preterm infants with IRDS and in healthy 1-day-old preterm infants (reference).

	reference (n=12)	IRDS (n=10)		
		day1	day 3	day 5
C3a (ng/ml)	278 ± 48	1388 ± 556**	1320 ± 365**	2085 ± 605**
Leukocytes(x 10^9/L)	8.2 ± 1.1	5.2 ± 0.6*	5.1 ± 0.9*	6.3 ± 0.8
E-PI (ng/ml)	138 ± 50	38 ± 19	43 ± 7	42 ± 9
TNF-alpha (pg/ml)	13.1 ± 1.6	8.2 ± 1.8	8.3 ± 2.2	10.0 ± 3.2
PAF-IC (%)	108 ± 59	22 ± 7*	56 ± 15*	61 ± 13

**p<0.01,*p<0.05 for IRDS vs reference. Data expressed as mean±SEM

Conclusion: The leukocyte count and plasma concentrations of E-PI and TNF-α are reduced in the IRDS infants. This may represent activation and sequestration of leukocytes in the lungs due to PAF and activated complement.