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BLOOD-BRAIN BARRIER PERMEABILITY (BBBR) IN "HEALTHY" INFECTED AND STRESSED NEONATES

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The BBBP was studied in 76 full term neonates tapped for work-up for meningitis and divided in 4 groups according to pertinent clinical and laboratory findings. A.38"healthy"neonates without sepsis or meningitis and subsequent uneventfull clinical course B.10 with bacterial meningitis C.15 with asseptic meningitis and D.13 stressed neonates without meningitis but with severe diseases(septicemia,perinatal asphyxia etc).BBBP was assessed by CSF/serum albumin ratio($X10^{-3}$)and the results(mean±SD)are summarized:

Group A	Group B	Group C	Group D
8.5(±3.1)	39.7(±17.5)	10.0(±2.7)	26.9(±9.5)

BBBP in group B was higher than in group A($p<0.001$)and C($p<0.001$) Group D had a higher BBBP than groups A($p<0.001$)and C($p<0.001$). These results indicate that a)neonates with asseptic meningitis have a BBBP similar to that of "healthy"ones. b) stressed and neonates with bacterial meningitis have a high BBBP. The above suggest that a)BBBP can differentiate asseptic from bacterial meningitis and b) the high BBBP in stressed neonates should be considered in jaundiced and in neonates receiving drugs.

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THE WHOLE BODY TURNOVER RATES OF rRNA AND tRNA ARE CORRELATED WITH THE BASAL METABOLIC RATE IN MAMMALS OF DIFFERENT SIZE

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We have developed a noninvasive method to determine whole body turnover rates of tRNA, rRNA and mRNA in mammals by measuring specific, quantitatively excreted modified RNA catabolites (nucleosides, nucleobases) in urine by HPLC. An investigation of the turnover rates of rRNA and tRNA in pigs, human adults, preterm infants, sheep, goats, rats, hamsters, mice ranging in mean body weight from 126 kg (pigs) to 0.028 kg (mice) reveals that the rRNA and tRNA turnover rates per unit body weight correlate with the basal metabolic rates (BMR) per unit body weight (calculated by the formula: BMR (kJ x d^{-1}) = 240 x kg body $weight^{0.74}$). The correlation coefficient between the BMR of the 7 species and the rRNA turnover rates is 0.995; that between the BMR of 6 species (mice excluded) and the tRNA turnover rates is 0.998. We believe that our method for determining the whole body turnover rates of different RNA classes will be useful to assess the metabolic state in mammals. This method could turn out to be useful for early diagnosis and thus for the prevention of metabolic stress (e.g. caused by food deficiency and/or infections) as well as for monitoring therapeutic success.

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Ultrasound detected lesions in very preterm infants with symmetrical and asymmetrical neuromotor impairments at one year.

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Epidemiological evidence[1] suggests that the aetiology of symmetrical (Sy) and asymmetrical (Asy) neuromotor impairments may differ. We have investigated 85 infants born at less than 33 weeks gestation whose brains were examined using ultrasound sector scanning in the neonatal period and then had neuromotor impairments identified at one year. In 38 infants the impairment was Sy, in 27 Asy and in 20 involved only the axis. The infants were part of a consecutive cohort of 362 infants born in 1983-85; they comprised 90% of the 94 impaired infants in the cohort. The results were as follows:

	n	Abnormal Scan	Ventricular dilatation or Hydrocephalus	Parenchymal Haemorrhage	Cystic PVL
Sy	38	23 (61%)	11 (29%)	2 (6%)	2 (6%)
Asy	27	23 (85%)	4 (15%)	10 (37%)	1 (4%)
Axis	20	19 (95%)	11 (55%)	0	2 (10%)
Total	85	65 (76%)	38 (45%)	12 (14%)	5 (6%)

Both the prevalence and the type of ultrasound-detected brain lesions differed among the three groups of neuromotor impairments. These findings support the epidemiological evidence of differing aetiologies for Sy and Asy impairments.

1. Powell et al. Dev Med Child Neurol 1988;30:11-18,19-25

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Effect of indomethacin on cerebral oxidised cytochrome aa_3 concentration in preterm infants.

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Using near infrared spectroscopy (NIRS) we have shown previously that the intravenous administration of indomethacin for treatment of patent ductus arteriosus (PDA) in sick preterm infants caused a reduction of approximately 40% in cerebral oxygen delivery[1]. We have used NIRS to investigate the effect of this change on the cerebral concentration of oxidised cytochrome aa_3 ($[CytO_2]$),the terminal enzyme in the mitochondrial electron transport chain.

Studies by NIRS were performed on 15 infants born at 23-29 weeks gestation weighing 600-1620 grams, who required treatment for PDA aged 8-27 days. Infants received indomethacin 0.1-0.2 $mg.kg^{-1}$, seven by fast (30 secs) and eight by slow (30 mins) infusion. The expected haemodynamic changes were seen in all infants. In 5 infants an unequivocal fall in $[CytO_2]$ was observed (range 0.3-0.9 $\mu mol.l^{-1}$), while the remaining 10 infants showed no definite change. No significant difference between the fast and slow infusion was observed.

We conclude that following indomethacin the close relationship between cerebral intracellular oxygen supply and cerebral energy metabolism was frequently maintained, but in 5 cases there was evidence of a relative intracellular oxygen deficit.

1. AD Edwards et al. Pediatr Res 1989;26:522

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Response of cerebral blood volume to changes in arterial carbon dioxide tension in newborn infants.

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The purpose of this study was to define gestation-related changes in the response of cerebral blood volume to changes in arterial carbon dioxide tension ($PaCO_2$). Twelve newborn infants born at 27-41 (median 31) weeks of gestation were studied aged 8-97 (26) hours by near infrared spectroscopy (NIRS). All were receiving mechanical ventilation and had normal brains as judged by clinical criteria and ultrasound scans.

NIRS was performed at the cotside and measurements of cerebral blood volume made as previously described[1]. Following baseline measurements $PaCO_2$ was altered by 1-2 kPa in the range 3.9-9.6 kPa by adjusting the ventilator rate. The change in cerebral blood volume in response to changing $PaCO_2$ was calculated for each infant. A highly significant positive linear relation between gestational age and this response was found (ANOVA, $p<0.01$) The mean value for the regression at 27 weeks gestation was 0.15 (95% CI -0.09, 0.39) $ml.100g^{-1}.kPa^{-1}$ and at 41 weeks 0.58 (95% CI 0.33, 0.83) $ml.100g^{-1}.kPa^{-1}$.

We conclude that the response of cerebral blood volume to changing $PaCO_2$ is markedly diminished in preterm compared with term infants.

1. JS Wyatt et al. J Appl Physiol (in press)

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Relation between arterial carbon dioxide tension and cerebral oxidised cytochrome aa_3 concentration in preterm infants.

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The aim of this study was to find out whether the intracerebral concentration of cytochrome aa_3 ($[CytO_2]$) (the terminal enzyme of the respiratory electron transport chain) altered in response to changes in arterial carbon dioxide tension ($PaCO_2$).

Six infants born at 23-36 (median 28) weeks of gestation and aged 1-6 (2) days were studied by near infrared spectroscopy as previously described[1]. The infants were mechanically ventilated and had no clinical or ultrasonographic evidence of cerebral injury. $PaCO_2$ was altered by 0.8-1.3 (1.1) kPa within the range 4.3-9.6 kPa by changes in ventilator rate, and the effect on total cerebral haemoglobin concentration ([tHb]) and $[CytO_2]$ observed. In all infants these variables were positively related: The change in $[CytO_2]$ with changes in $PaCO_2$ ranged from 0.10 to 0.40 (0.25) $\mu mol.l^{-1}.kPa^{-1}$. The ratio $\Delta[CytO_2]/\Delta[tHb]$ ranged from 0.063 to 0.119 (0.083). There was no positive relation between changes in $[CytO_2]$ and arterial oxygen saturation (SaO_2), which ranged from 88 to 98%.

We conclude that $[CytO_2]$ was directly related to $PaCO_2$, probably through changes in cerebral perfusion. However $[CytO_2]$ did not appear to be related to SaO_2 in the range studied.

1. JS Wyatt et al. Arch Dis Child 1989;64:953-967