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INCREASED CEREBRAL INTERSTITIAL FLUID ADENOSINE CONCENTRATION (ADO_i) AND BLOOD FLOW DURING HYPOGLYCEMIA

Vineta J. Ruth*, Jeffrey M. Gidday, T. S. Park. Department of Neurosurgery, Washington University School of Medicine, St. Louis, Missouri, USA and *Children's Hospital, University of Helsinki, Helsinki, Finland.

During hypoglycemia (HG), cerebral blood flow (CBF) typically increases. To evaluate if this is caused by the cerebral vasodilator ADO_i, we used microdialysis and hydrogen clearance to measure ADO_i and local CBF, respectively, in the frontal cortex of newborn piglets during normoglycemia (NG) and insulin-induced HG (blood glucose (GLU) < 1.4 mmol/l). ADO_i was measured with HPLC from 20 min dialysate samples (artificial CSF containing no GLU, 2 μl/min).

RESULTS: Blood GLU correlated with ADO_i (r=-0.38, p=0.003) and CBF (r= -0.42, p=0.003). HG caused a mean increase in ADO_i of 90%, and in CBF of 35%. Values below (mean ± SEM):

		NG	HG
ADO_i nM	(n=9)	95 ± 11	162 ± 28 (p=0.041)
CBF ml/min/100g	(n=6)	38 ± 4	50 ± 7

Simultaneous perfusion of the contralateral frontal cortex with CSF containing GLU (3.6 mmol/l, n=5) caused no increase in ADO_i or CBF, thereby eliminating any correlation with blood GLU concentration.

CONCLUSION: Cerebral ADO_i increases during systemic HG in newborn pigs concomitant with increases in CBF, suggesting adenosine involvment in the mediation of HG hyperemia.

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COMPARISON BETWEEN PERIPHERAL AND CENTRAL OXYGENATION DURING BOTTLE FEEDING IN PRETERM INFANTS: A NEAR-INFRARED SPECTROSCOPY STUDY (NIRS) Kurt von Siebenthal, Ilse Jonkers, Hans Daniels and Paul Casaer. Department of Paediatrics, University Hospital 'Gasthuisberg', Leuven, Belgium

Immaturity of cardiorespiratory control in preterm infants has been related to inefficient feeding behaviour. We used NIRS to assess whether these infants become hypoxic during feeding.According to their drinking efficiency 21 preterm infants with a gestational age of 33-38 weeks, have been considered to be good or bad drinkers. The latter (N=12) showed an overall decrease in oxygen saturation (Sat), whereas in the good drinkers (N=9) no singificant changes in Sat was found Results:Sign Test:significant++,not signif.--)

	SatO2	HbVol	HbO2	Hbred	Cytaa3
Good	--	--	--	--	--
Bad	++	++	++	--	--

In the bad drinkers the total haemoglobin volume (HbVol), the sum of oxygenated (HbO2) and reduced haemoglobin (Hbred), increased in 10 of 12 newborns. This increment was due to a consistent raise in HbO2, that we did not expect in peripheral deoxigenation. Cytochrome aa3 (Cyt aa3), an index of intracellular O2 availability did not change significantly.
Conclusion: In spite of peripheral hypoxia, preterms considered to be bad drinkers do not have signs of central hypoxia. They seem to have adequate autoregulation to maintain sufficient O2 supply to the brain.

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INFLUENCE OF DIFFERENT MODERATE LEVELS OF NEONATAL HYPOXIA IN RAT BEHAVIOR. EFFECTS IN MAZE TEST RESOLUTION.
F. Carratalá, M. Moya, E. Ferrer. Ped. Dep. Hosp. San Juan. University of Alicante. Alicante. Spain.

Sligth hypoxic-ischemic perinatal event can originated some problems in later neurodevelopment. The aim of this job is to show the effects of two levels of hypoxia in a maze test resolution.

Three groups of newborn Wistar rats were placed in an exposure chamber. They were keep in their mothers' cages till weaning (day 21). Days 25 and 26 they were submitted to maze trials. After fasting from day 28 until 30th, they were submitted again to a new maze trial. The variable validating the animals' behaviour was the number of squares crossed in the maze resolution (SC). Results and statistical analisys (ANOVA) are as follows:

	Vol O_2 %	Size n=	Death n=	Day 25 SC ±SD	Day 26 SC ±SD	Day 30 SC ±SD
V5	5	25	5	50.5±29.0	31.2±16.1	29.0±13.2 p<0.01
V10	10	20	0	39.7±14.7	30.0±15.0	41.3±24.6 ns
SHAM	21	28	2	41.1±23.0	32.2±19.1	27.4±16.8 p<0.05

(Exposure conditions: Time=15 min; Temp°C=24°C)

V5 group obtained a best profile in the learning capacity than V10 group. Number of errors (SC) decreased dramatically in V5 as happend wiht SH group, while V10 remained the same level of the first trial. However we are not sure if these effects can be exclusively related to the absence of presumed handicap rats who died, or to any other genetic/environmental factor.

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EFFECT OF FREQUENCY OF UTERINE CONTRACTIONS ON HUMAN FETAL CEREBRAL OXYGENATION MEASURED BY NEAR INFRARED SPECTROSCOPY (NIRS). D.M.Peebles, A.D.Edwards, J.S.Wyatt, A.P.Bishop, M.Cope, D.T.Delpy, E.O.R.Reynolds. *Departments of Paediatrics, Obstetrics, and Medical Physics and Bioengineering, University College and Middlesex School of Medicine, London, UK.*

The purpose of this investigation was to study the effect of uterine contraction frequency on the cerebral concentrations of oxyhaemoglobin (HbO_2) and deoxyhaemoglobin (Hb) measured by NIRS. Two optical fibres were placed via the cervix at a fixed distance (3 or 4 cms) from each other on the scalp of 8 term fetuses[1]. For each fetus between 45 and 60 mins of continuous data where external tocography clearly demonstrated uterine contractions were analysed. Changes in cerebral [HbO_2] and [Hb] were calculated from the start of one contraction to that of the next and were related to the time interval between the two contractions (measured from peak to peak).

interval (mins)	1.00 - 1.99	2.00 - 2.99	3.00 - 3.99	4.00 - 4.99	5.00 - 5.99
n	43	51	19	6	5
$\Delta[HbO_2]$*	-0.22 ± 0.31	-0.02 ± 0.31	0.42 ± 0.34	0.39 ± 0.10	0.87 ± 0.32
Δ[Hb]*	0.35 ± 0.48	-0.02 ± 0.46	-0.37 ± 0.51	-0.21 ± 0.49	-0.81 ± 0.38

* mean ± SD (μmol.100g^{-1})

The results (Table) showed that (1) $\Delta[HbO_2]$ was positively and Δ[Hb] negatively related to contraction interval ($p<0.001$, ANOVA).(2) At contraction intervals < 2 mins the usual finding was a fall in [HbO_2] and a rise in [Hb]. We conclude that short contraction intervals were associated with intracerebral desaturation.

(1) D.M.Peebles et al. Am J Obstet Gynecol (in press).

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EFFECT OF CHANGES IN INTRACRANIAL PRESSURE ON CYTOCHROME AA3 (CYTAA3) AND HAEMOGLOBINVOLUME (HBVOL): A NEAR INFRARED SPECTROSCOPY (NIRS) STUDY Kurt von Siebenthal, Amerins van der Vlugt, Hugo Devlieger and Paul Casaer. Department of Paediatrics, University Hospital, Leuven, Belgium

Treatment of posthaemorrhagic ventricular dilatation in neonates is still a matter of debate. In 8 neonates between 26 and 31 weeks with posthemorrhagic hydrocephalus the effect of a decrease in intracranial pressure (ICP) on cerebral oxygenation was evaluated by NIRS. Lumbar puncture (LP) had been performed postnatally between 31 and 38 weeks. All infants had intraventricular haemorrhage grade III or IV (Papille). Results:(range of the differences between before and after LP in micromoles/liter)

	Group 1 (N=4)	Group 2 (N=4)
Cytaa3	0,249 to 1,611	-1,085 to 0,063
HbVol	1,558 to 15,027	-2,759 to 4,074

Using Cytaa3 as an index of intracellular O2-availability and HbVol, the sum of oygenated and reduced haemoglobin as a measure of cerebral blood volume, neonates in group 1 with a fast increase of headcircumference, large diastasis and bulged fontanel exhibited a significant raise in Cytaa3 and HbVol (MWU:<0,05) In group 2, which did not have the above mentioned clinical signs of ICP, Cytaa3 remained stable or decreased,while HbVol showed a small raise. These findings gives new insights in the pathophysiological understanding of increased ICP and could have an impact on the therapeutical procedure.

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CEREBRAL CHANGES IN CYTOCHROME aa_3 AS AN INDICATOR OF BILIRUBIN UNCOUPLING OF OXIDATIVE PHOSPHORYLATION. Paul Y.K.Wu, Frans F.Jobsis and Avis L. Sylvia. Dept. of Peds.,Univ.of So.California,and Dept. of Physiol., Duke Univ., Los Angeles and Durham, U.S.A.

The flow of electrons from substrates through the mitochondria respiratory chain to cytochrome aa_3 (Cyt aa_3) and O_2 provides the energy for ATP production by oxidative phosphorylation (OXPHOS). Bilirubin by uncoupling OXPHOS interfers with this process. This should result in an increased flow of electrons and therefore a tendency for Cyt aa_3 to become more reduced. A near-infrared, multiwavelength, differential spectrophotometer was used to test whether hyperbilirubinemia alone or in association with hyperosmolar opening (HOSMO) of blood brain barrier (BBB) can affect the redox state of Cyt aa_3. Eight anaesthetized rats, m.wt = 229 g were studied. Following achievement of a steady state of 30% inspired O_2 the rats received an IV infusion of bilirubin, dissolved in 0.1 N NaOH, 4% albumin in 1 M PO_4 buffer sol.,calculated to reach a Se. bili.conc. of 30 mg/dl. Hyperbilirubinemia alone caused a slight or no reduction in Cyt aa_3, oxygenated Hb (HbO_2) or blood volume (BV). However, in combination with HOSMO of BBB with IV infusion of 1.6M arabinose sol., there was a significant reduction of Cyt aa_3, 26-47% of total labile signal, smaller changes in HbO_2 and an increase in BV. A second dose of arabinose caused an exaggeration of these changes. Similar studies with 5 newborn piglets yielded similar results. We conclude that changes in the redox state of Cyt aa_3 can be developed as an index of bilirubin toxicity. Near-infrared spectroscopy may be used to amplify clinical and biochemical findings and assess the risks of hyperbilirubinemia.