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HYALURONAN AND WATER CONTENT IN THE LUNG OF PRETERM AND TERM INFANTS WHO DIED LESS THAN 24 HOURS AFTER BIRTH

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Fetal connective tissue is known to have a very high concentration of hyaluronan (HA) and of water. In rabbit pups the concentration of HA in the lung has its lowest value one day before term gestation (Am J Physiol 260, 1449, 1991). After birth an increase in lung HA is accompanied by an increase in lung water (Ped Res 1992;32: 635& 1994;35:280). AIM: To determine the concentration of HA and water in the lung of infants who died less than 24 hours after birth. RESULTS: The HA concentration in the lungs of infants born after 23-27 gestational weeks (g.w.)ranged between 1030-2832 µg/g dry lung weight(n=8) and in those born after ≥ 28 g.w. between 374-1875 µg/g(n=21). The relation between HA concentration and gestational age seemed exponential. Lung water content was high in all infants. HA staining in lung structures was more widely spread in very preterm than in more mature infants. A subepithelial lining of HA could be seen in moderately preterm infants. CONCLUSION: The concentration of hyaluronan in the lungs of newborn infants decreased with increasing gestational age at births. The water content of the lungs of all infants in this study was high.

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TRACHEAL SURFACTANT INFUSION DURING 5 MIN IS LESS EFFECTIVE THAN BOLUS INSTILLATION IN RABBITS

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Surfactant bolus instillation has been reported to cause transient blood pressure (BP) changes in preterm infants. However, other methods of instillation such as slow tracheal infusion are less effective in improving oxygenation (Pediatr Res 34:490, 1993). Rapid tracheal infusion was evaluated as alternative method of surfactant instillation.

Respiratory distress was induced in 10 adult rabbits by repeated saline lung lavages until PaO_2 was <80 mmHg during mechanical ventilation with FiO_2=1.0. Curosurf (CS, 200mg/kg) labelled with colored microspheres was instilled either as bolus (n=5) or as rapid infusion during 5 min (n=5). Blood gases and BP were monitored for 2 h. After sacrifice, the lungs of each animal were cut into 60-70 pieces to measure the number of microspheres in each piece.

After CS bolus, PaO_2 increased to 355 ± 28 mmHg (m±SEM) within 2 min and remained above this value for 2 h. Mean BP dropped transiently from 93 ± 2.8 to 71 ± 9.9 mmHg. Pulmonary CS distribution was fairly homogeneous. After rapid infusion, PaO_2 rose to 223 ± 55.3 mmHg within 15 min but decreased again thereafter (ANOVA comparing both groups: $p < 0.05$). BP dropped transiently from 94 ± 5.9 to 81 ± 6.0 mmHg. CS distribution was very uneven.

With rapid tracheal infusion instead of bolus instillation, pulmonary distribution of exogenous surfactant is uneven, and oxygenation is less effectively improved. BP changes cannot be avoided.

Supported by Deutsche Forschungsgemeinschaft, DFG Ob 43/6-1

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LIPID PEROXIDATION ACTIVITY IN ERYTHROCYTES OF NEWBORN INFANTS FROM VARIOUS ECOLOGICAL ZONES

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Aim of this study was to investigate the lipid peroxidation (LP) status in erythrocytes of neonates from ecologically different zones, for which purpose we evaluated total malonic aldehyde (MA) content, MA degradation intensity, MA degradation intensity to MA content ratio (D/MA), antioxidative activity (AOA), free radicals (FR) content and MA conjugation percentage. We have found, that total MA content was higher in neonates from the industrial city with multiple chemical plants (group I - 34 newborns), than in infants from ecologically clean zone (group II - 28 neonates), being 1,35±0,06 versus 1,08±0,08 nmol/million erythrocytes, respectively. AOA followed the same pattern ($p < 0,01$), while other imdices were lower: MA conjugation percentage (63,18±2,17 versus 89,50±4,56%), MA degradation intensity (14,34±0,5 versus 17,25±1,41%), D/MA ratio ($p < 0,05$) and FR content (123,05±21,40 versus 344,95±67,92 conditional units). We conclude that lipid peroxidation activity is decreased in infants from ecologically polluted regions as compared with their counterparts from ecologically clean zones, affecting their further growth and development.

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TRANSIENT NEONATAL DIABETES AS AN EARLY MANIFESTATION OF AN INHERITED INSULIN RESISTANCE SYNDROME?

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A term, small for dates (1.7 Kg <3rd centile), female infant developed transient neonatal diabetes (TNDM), requiring insulin from 12 hours post-delivery until the age of 6 months. She then remained well, off insulin, until 13 years when diabetes mellitus was diagnosed with hyperglycaemia, dehydration and mild ketosis. An oral glucose tolerance test (OGTT) aged 15 years (with insulin therapy withdrawn for test) shows a raised fasting level of insulin 192 pmol/l (Normal range 30-60) with a blunted insulin response to glucose loading (maximum 385 pmol/l) and a frankly diabetic glucose curve. An OGTT performed on the 18 year old non-diabetic, mildly obese sister reveals an even higher level of fasting insulin (237 pmol/l) and an exaggerated insulin response to glucose loading with a maximum response at 30 minutes of 3024 pmol/l. An OGTT on mother (non-diabetic, grossly obese) shows a similar picture with a raised fasting insulin level (244 pmol/l) and a maximal level of 1156 pmol/l. Conclusion: This family study indicates that transient neonatal diabetes may be an early manifestation of inherited insulin resistance. We hypothesise that insufficient beta cell reserve associated with intra-uterine growth retardation seen in the family member with TNDM causes an inability to mount the exaggerated insulin response needed to compensate for this inherited defect, especially at times of metabolic stress such as birth and puberty. Study of other cases of TNDM is warranted and in progress.

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CYCLIC FLUCTUATIONS IN CEREBRAL BLOOD VOLUME (CBV) AND MEAN ARTERIAL BLOOD PRESSURE (MAP) IN PRETERM INFANTS.

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Cyclic fluctuations in cerebral perfusion and blood pressure have been reported to play a role in the pathogenesis of intracranial haemorrhage in preterm infants. The purpose of this study was to investigate the prevalence and frequency of cycles in CBV with near infrared spectroscopy (NIRS) and to find a correlation with cycles in MAP.

Patients and methods: 20 infants requiring mechanical ventilation, haemodynamically stable and not receiving vasoactive drugs, were studied during the first 36 hours of life. Gestational age ranged between 26 and 29 weeks. Deoxygenated, oxygenated and total haemoglobin reflecting CBV were measured with a 4 wavelength instrument (Critikon Oxygenation Monitor 205) in orthogonal mode. MAP was recorded from an umbilical artery catheter with a Statham transducer. Signals were sampled with 2 Hz.

Results: All 20 infants showed cyclical variations in CBV and MAP. Fourier analysis revealed two peaks for CBV cycles: one at 1 to 7 min^{-1} and a second one at 0.14 to 0.2 min^{-1}. MAP fluctuated between 0.2 and 2 cycles min^{-1}. Cerebral pathology included cystic leukomalacia (2 infants), subependymal (3) and intraventricular (9) haemorrhage and did not correlate with the frequency of oscillating signals.

Conclusion: Cyclic fluctuations of CBV and MAP seem to be a common phenomenon in preterm infants. Cycles in CBV are independent of cycles in MAP which may be due to auto regulation of cerebral perfusion.

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COPPER/MOLYBDENUM METABOLISM - INTERRELATIONSHIP IN PRETERM INFANTS?

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Interferences of copper (Cu) and molybdenum (Mo) metabolism have been described (1). We evaluated in preterm infants 1.Cu balances under consideration of formula Mo content and 2. the course of the Cu concentration in feces and urine in stable isotope studies with 100Mo.

1.) Intake, urinary and fecal excretion were collected over 72 hrs. in 14 male infants (gest. age: 32-37, 1.5-2.0 kg birth weight, 22 balances, formula: Prematil (Milupa AG, Germany)); Mo and Cu concentrations were determined by atomic absorption spectrometry :

Formula Batch	Mo(µg/l)	Cu(µg/l)	Cu intake (µg/kg x d)	Fecal Cu excret. (% of intake)	Cu retention (% of intake)
A1(n=5)	147	540	85(83-98)	62(53-104)	29(-7-44)
A2(n=6)	193	350	56(53-85)	65(15-155)	28(-58-86)
B1(n=6)	12	540	94(87-106)	57(40-76)	40(23-59)
B2(n=5)	19	227	42(29-82)	57(28-109)	36(-29-68)

2.) In 10 preterm infants fecal and urinary specimens were collected over 48-72 hrs. after the intake of 25 µg/kg 100Mo added to formula. Within 14 hours urinary Mo increased 13(4-84)fold. For fecal Mo a 3.2(1.1-5.5)fold increase was observed in all but 2 infants within 24(6-26.25)hrs. Compared to the initial values, in 6/9 infants Cu concentrations increased up to 220(183-326)% in urine and 142(120-156)% in feces after the 100Mo intake. In the others, specimens preceeding the 100Mo intake rendered the highest Cu concentrations. Despite their considerable range the results suggest a potential influence of Mo intake on Cu excretion. (1)AmJClinNutr(1972); 25:1022-1037.