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DECREASED DEFORMABILITY OF IMMATURE NEUTROPHILS MAY CONTRIBUTE TO IMPAIRED MICROCIRCULATION

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Leukocytes exert about 1000 times more resistance to the passage of 5 μm diameter filter pores than erythrocytes. Thus, in whole blood with a 1:1000 ratio of white to red cells, about 50% of the flow resistance is provided by the leukocytes. The whole blood of healthy neonates contains more leukocytes (6000-20000) and more immature granulocytes than adult blood. In septicemia, up to 50% of the granulocytes may be immature. Volume and deformability of peripheral immature (band and myelocytes) and mature polymorphonuclar neutrophils (PMN) were studied in venous blood of healthy neonates, children and adults. Metamyelocytes were only found in neonatal blood. Membrane cytoplasm tongues of PMN were aspirated into 2.5 μm (diameter) micropipettes over a period of 1 min.

	Cell Type	Volume	Tongue Length (μm) after aspiration times of		
	(Number of cells)	(fL)	5s	20s	60s
Neonates	PMN (80)	351±30	3.4±0.6	5.6±1.1	8.6±1.3
	Band (80)	401±57*	2.3±0.7*	3.9±1.0*	4.8±1.4*
	Metamyelocytes (21)	465±83*	1.2±0.4*	2.6±0.9*	3.7±1.1*
Children	PMN (80)	367±44	3.6±0.5	5.9±1.1	9.0±1.3
	Band (38)	428±75*	2.1±0.5*	3.5±1.0*	4.5±1.2*
Adults	PMN (80)	360±46	3.7±0.5	6.1±1.1	9.2±1.7
	Band (29)	415±72*	2.3±0.3*	3.6±0.9*	4.7±1.0*

Compared with mature PMN, final tongue lengths of band cells were decreased by 44 to 50% and volumes were increased by 14 to 17%. Neonatal metamyelocytes were more rigid and larger than neonatal band cells. Among mature PMN and band cells in neonates, children and adults cellular volume and deformation behavior were similar. We conclude that immature neutrophils are markedly less deformable than mature PMN and that these cells may contibute to impaired microcirculation in patients with a marked rise of immature neutrophils in peripheral blood.

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NOSOCOMIAL TRANSMISSION OF ADENOVIRUS INFECTION IN NEONATES

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Limited information about the impact of viral infections in neonatal intensive care units (NICU) represents an important gap. On 30 December 1992 onset of acute respiratory illness with lobar Pneumonia, fever and oxygen deficit was observed in a full-term hospitalized newborn who was admitted to NICU six weeks ago with meconium ileus and M. Hirschprung diseases. In spite of isolation of the male infant in the unit, five neonates became ill with coryza and fever after 6 days of his isolation. Of the six neonates, three were full-term male newborn suffering from humerus fracture, mucoviscidosis, congenital vitium cordis for 6, 14 and 26 days, respectively. The other two sick female neonates were nursed for 41 and 10 days, respectively, in Unit of Premature infants. Adenovirus infection was proved from nose and fecal samples by virus isolation and immunofluorescence assay of all sick newborns. In male infants, particularly, the viral infection associated with serious complications. All of them developed pneumonia and onw was lost. Rigorous triage and cohorting of staff and babies were started and the nosocomial outbreak abruptly stopped on 19 January. It was concluded that health care workers could be important contributors to the nosocomial spread of adenovirus infection to newborns. Attention is called to the importance of effective preventive measures and well-trained staff in NICU to decrease the risk of nosocomial viral infections.

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XANTHINE OXIDASE (XO) GENE EXPRESSION IN DEVELOPING HUMAN TISSUES IN RELATION TO ENZYME ACTIVITY

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XO has been implicated in tissue injury following ischemia-reperfusion, a common occurrence in the perinatal period. To determine the organ-specific expression of XO-mRNA in man, we isolated, cloned, and sequenced part of the human cDNA and studied expression of the mRNA in Northern blots using RNA probes. In postmortem RNA samples from human fetuses and preterm infants, full-length mRNA of the expected size (4.5 kb) was detected only in the liver and intestine, which also show the highest enzyme activities. In samples of older infants and adults, additional mRNA bands of smaller size were seen also in the lung (2.7 kb), and in the pancreas (4 bands of 1.7-3.0 kb). We hypothesize these developmental changes represent alternative processing of XO pre-mRNA. In intestine resected because of necrotizing enterocolitis, XO mRNA-expression was similar to normal, with no gradient from normal to necrotic intestine. Also in postmortem lung RNA samples from preterm infants with RDS, XO mRNA-expression was undetectable. These findings suggest tissue-specific regulation of XO expression at the mRNA level, but no increase in transscription in presumed ischemia-reperfusion conditions.

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ELEVATED PRECURSORS OF THE PRIMARY BILE ACIDS (PBA): CHOLIC-AND CHENODEOXYCHOLIC ACID (CA; CDCA) IN NEONATAL CHOLESTASIS (NC)

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The bile acid concentrations in serum of 2 preterm infants (GA: 27 and 32 wk; BW: 900 and 1800 g) with NC were compared with the values of 7 preterm infants (mean GA 30 wk; mean BW 1345 g) without cholestasis (NonC) during the first 4 weeks after birth with a radio-immunoassay method (RIA) and a gas chromatography/mass spectrometry (GC/ MS) method. NC was diagnosed with "normal" liverfunction tests: direct acting bilirubin, SGOT, SGPT and γ-GT. There was no difference in feeding: parenteral, oral, frequency, formula or mother's own milk. The mean values of the conjugated CDCA and CA were the same in both groups with both procedures. The mean GC/MS values of hyocholic-,lithocholic-,3-ß-hydroxy-5-cholenoic- and deoxycholic acid were also the same during the study. The precursors of CDCA: 3α,7α-dihydroxy-5ß-cholestanoic acid (DHCA) and of CA: trihydroxycoprostanoic acid (THCA) measured with GC/MS were much higher in infants with NC at the end of the first week till the end of the investigation.

	DHCA (mean μmol/l)			THCA (mean μmol/l)		
day	4-7	8-14	> 15	4-7	8-14	> 15
NC	0.13	0.18	0.24	0.05	0.09	0.16
NonC	0.04	0.04	0.04	0.01	0.01	< 0.01

In conclusion: serum PBA concentration in preterm infants is not conclusive to diagnose NC. In infants with NC, however the precursors of the PBA are elevated, probably as the result of a temporary deficiency of the enzymsystem or of the peroxisomal function.

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BREATHING PATTERN OF INFANTS WITH INTRAUTERINE COCAINE EXPOSURE. (IUCE)

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Infants with IUCE have a higher incidence of SIDS. We studied the changes in the breathing pattern in infants with IUCE with four channel (HR,RR,O2 sat, nasal air flow) 12 hr pneumograms within 24 hrs after birth and on the 10th day. 18 full term non-asphxiated healthy newborns whose urine, meconium, or maternal urine tested positive for cocaine were included in the study. A control group of health newborns were also studied (n = 8).

	Cocaine			Control		
	day 1	10	P	1	10	P
Apnea ? 6s#	24.6±6	77±24	<.05	11±14	71±100	NS
AD	.5±.1	1.7±.5	<.05	0.24±.3	1.3±1.7	NS
PB%	.59±1	5.3±2	<.03	0.02±.05	3.3±5	NS
HR	132±6.8	147±7.9	<.01	134±7.6	147±8.2	.02
RR	45±4	44±3.5	NS	41±2.8	41±4.5	NS

There were no differences in the incidence of obstr. apnea, mean apnea length, longest apnea and O2 desaturations between day 1 & 10 in both groups. There were no differences between the control & cocaine group in any of the above variables on day 1 and day 10. There is an increase in the heart rate in both groups of infants by the 10th postnatal day. However, infants in the cocaine group have significant increase in apnea >6 seconds, apnea density (AD) and periodic breathing (PB) by the 10th postnatal day. Whether these changes in the breathing pattern in the cocaine group is due to an abnormal control of breathing is not clear and needs further investigation.

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ADAPTIVE RESPONSE OF VLBW INFANTS TO INDWELLING NASOGASTRIC TUBE (NGT)

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NGTs are known to increase the airway resistance acutely in preterm infants. We hypothesized that infants adapt to the indwelling NGT by altering their breathing strategy. We studied 18 preterm infants BW 1110±248 gms, GA 29.3±1.8 wks at a postnatal age of 29.4±15 days and body wt. 1476±167 gms. Pulm. mechanics and energetics were measured with a pneumotach and esophageal balloon and metabolic rates were measured by indirect calorimetry. Measurements were obtained prior to and 6, 12, 24, and 48 hrs. after (5 Fr) NGT.

Hours	0	6	12	24	48
VO_2(ml/min/kg)	5.5±.4	7.4±1.2*	6.2±.3*	6.3±.4*	6.5±.6*
VE(ml/min/kg)	501±187	516±215	436±118*	422±137*	430±95*
Rs(cmH_2O/L/sec)	40±4.1	109±16.5*	94±17*	75±16*	73±10*
Work(kg-cm/kg)	13±1.5	47±12*	31±5*	21±3*	24±3*
Ti (sec)	.36±.01	.45±.03*	.43±.02*	.43±.02*	.43±.02*
VT (ml/kg)	6.6±1.8	7.8±2.6	6.7±1.5	6.8±2.4	7±1.8

*p = < .05 from baseline

Our results indicate that there is a significant increase in VO_2, Rs, Work of breathing, Ti, after NGT and these changes persist even at 48 hrs after NGT. There is a 19% increase in Ti (insp. time) and 100% increase in resistance. VO_2 increased by 20% and has a direct correlation to Ti. We speculate that VLBW infants respond to insp. load (NGT) by increasing Ti which leads to higher VO_2. Infants who develop apnea probably are not able to adapt to this. These results have implications in the feeding practice of VLBW infants.