Changes in tidal ventilation can be detected by digital subtraction chest fluoroscopy

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Applying digital subtraction technique on image data, collected during chest fluoroscopy, we compared radiologically measured tidal ventilation volumes with volume values obtained using standard pneumotachometry. Three white NZ rabbits were studied, while ventilated on volume-controlled ventilator. Changes in X-ray transmittance due to tidal ventilation were calculated for whole chest area and for various regions of interest. There were highly significant linear correlations ($p<0.001$, $r=0.97$-0.99) between radiologically measured tidal volumes and those measured using pneumotachometry. When changes caused by tidal ventilation in various regions of interest were studied, the correlations remained highly significant, although with lower r values.

We conclude that digital subtraction chest fluoroscopy can be used in quantitative estimation of tidal ventilation. It may also allow to evaluate regional variations in ventilation.

THE PLASMA KALLIKREIN-KININ SYSTEM IS NOT ACTIVATED BY HYPOXANTHINE (HX) - XANTHINE OXIDASE (XO)

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The plasma kallikrein-kinin system is activated during trauma and shock, and oxygen radical generating systems may be involved in such activation. To study the effects of the HX-XO system, plasma prekallikrein (PK) and kallikrein inhibition (KKI) values were measured together with kallikrein (KK) activity by a chromogenic substrate (S-2302) in five groups of young pigs. 1) Pigs given XO as a bolus dose 1 U/kg into the right atrium. 2) Pigs infused with HX (10 mmol/l) before XO. 3) Pigs given allopurinol 50 mg/kg before XO. 4) Pigs given catalase (25.000 U/kg) and XO. 5) Pigs pretreated with indomethacin (7.5 mg/kg) before XO. The table shows mean (SD) relative changes from baseline levels 130 minutes after XO infusion.

Group:	1 n=7	2 n=6	3 n=6	4 n=6	5 n=5
PK %	73 (17)	83 (30)	71 (11)	84 (15)	73 (13)
KKI %	88 (9)	78 (18)	68 (22)	89 (11)	85 (10)
KK U/l	12 (10)	8 (4)	10 (6)	9 (3)	5 (3)

The data indicate that xanthine oxidase does not activate the kallikrein-kinin system during this short observation time.

Impact of surfactant replacement therapy on the incidence of retinopathy of prematurity (ROP)

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Natural surfactant replacement is associated with marked improvements in oxygenation (PaO_2 often >12 kPa) and a 40% reduction in mortality, though survivors may require prolonged periods of intensive care. We studied 66 babies [Mean (sd) birthweight 1013 (240)g, gestational age 27.2 (1.9) wk] who were treated with Curosurf for severe respiratory distress syndrome, to determine if treatment is associated with an increase in the incidence of ROP. Babies were examined by indirect ophthalmoscopy at 6 wk postnatal age and thereafter at 1-2 wk intervals to discharge. Findings were documented according to the International Classification of ROP. Fifty-three (80%) babies survived to discharge; 4 survivors were not examined due to transfer elsewhere. ROP developed in 14 (29%) of the 49 babies examined (8 stage I, 2 stage II, 2 stage II+, 2 stage III) but no baby required cryotherapy. The incidence of ROP in this uncontrolled group is similar to that of non-surfactant treated very low birth weight (VLBW) babies in the UK. We conclude that natural surfactant therapy does not increase the incidence of acute ROP in VLBW babies.

LUNG MECHANICS AND GAS EXCHANGE DURING ARTIFICIAL SURFACTANT (EXOSURF-E) ADMINISTRATION FOR HYALINE MEMBRANE DISEASE (HMD)

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Studies with animal surfactant preparations have shown dramatic improvements in oxygenation without concomitant changes in dynamic compliance. The present study deals with the effects of a purely synthetic surfactant (E) upon arterial blood gases (ABG) and compliance (Crs)/resistance (Rrs), determined by the recently introduced single breath occlusion technique. Six premature babies with HMD, enrolled in the European OSIRIS trial were studied. Crs/Rrs and ABG were determined 30 min. before and after E administration and repeated at 24 h intervals. Results: Pre- and post values (means) are given for the 1st and 2nd dose. Measurements 3 and 4 are follow-ups. *$p<0.05$ vs. previous value.

	1st dose	2nd dose	3./4. measurements	
Age (h)	13	25	46	70
Crs (ml/cmH2O/kg)	0.28/0.28	0.36*/0.36	0.34	0.40*
Rrs (cmH2O/ml/s)	0.11/0.11	0.09/0.09	0.13	0.16*
Ratio Pa02/FI02 (mmHg)	115/118	170*/128	221	323*

Conclusion: E fails to induce an acute amelioration of lung mechanics and gas exchange. Later improvements in oxygenation parallel those seen in Crs. The lack of immediate effect of E may be due to the absence of surfactant-associated proteins in this preparation.

CONTROLLED, RANDOMIZED MULTICENTER CLINICAL TRIAL OF HIGH-DOSE VERSUS LOW-DOSE BOVINE SURFACTANT IN VERY PREMATURE INFANTS

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Objective: Comparing high-dose (initial dose 100 mg/kg b.w., HD) with low-dose (initial dose 50 mg/kg b.w.) bovine surfactant given during hour 1 after birth. **Patients and methods:** Inclusion criteria: GA 24 - 29 weeks, b.w. 500 - 1500 g, need for intubation and ventilation, absence of congenital malformations and bacterial infections. Retreatment (max. cumulative dose 200 mg/kg b.w.) was permitted if the FiO_2 was >0.4. Endpoint: HD surfactant treatment improves oxygenation (paO_2/FiO_2) 2 h post treatment compared with LD treatment (sequential analysis, type I and II error 5 % each). Secondary endpoints: air leaks, BPD (FiO_2 >0.3 or mechanical ventilation at 28 days), IVH (grade II - IV), PDA, ROP (> grade III) and NEC. 41 infants (GA 27.3 weeks, b.w. 991 g) were randomized to HD treatment, 46 infants (GA 27.2 weeks, b.w. 959 g) to LD treatment. **Results:** Oxygenation was improved significantly in HD compared to LD treatment (paO_2/FiO_2 181 ± 119.7 versus 228.4 ± 112.3). Further outcome: HD versus LD infants: air leaks 15/33 %, BPD 24/39 %, IVH 24/35 %, PDA 32/37 %, ROP 10/13 %, NEC 0/2 %, death 15/13 %.

Conclusion: HD versus LD bovine surfactant treatment in very premature infants significantly improved oxygenation. A tendency towards decreased incidence of pulmonary air-leaks was observed.

ACTIVATION OF THE KALLIKREIN-KININ SYSTEM IN RDS

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Plasma prekallikrein (PK) and kallikrein inhibition (KKI) values together with plasma kallikrein (KK) activity were measured with a chromogenic substrate (S-2302) in 13 RDS babies and 9 premature controls the first three days after birth. (Mean gestational age 28.7 (SD 2.1) and 28.9 (SD 1.8) weeks respectively). Further, high molecular weight kininogen (HK) (band I) and its degradation products (bands II and III) were studied by immunoblotting. Mean values (SD) the second day after birth:

	PK%	KK%	KKI%	HK(AUC): Band I	II	III	TotalHK
RDS	21 (6)	8 (6)	55 (14)	2948 (2402)	2248 (1720)	109 (63)	5305 (3923)
CTR	37 (7)	10 (7)	71 (13)	9098 (14392)	6202 (6765)	2103 (2374)	8954 (20969)
p<	.01	NS	.05	NS	NS	.01	NS

PK, KKI, and total HK was lower in RDS than in controls during the study period. This indicates activation of the kallikrein-kinin system. The fraction of degraded HK (band III) is high during such activation. In RDS babies this fraction decreased from a high level, in mean 18%, to 2% (normal level) ($p<0.01$) from day 1 to day 2 indicating a possible reduction in activation of the kallikrein-kinin system.