

71

EFFECT OF CORTICOSTEROIDS ON THE DOSE RESPONSE OF SURFACTANT IN PRETERM RABBITS. S Seidner, A Pettenazzo, M Ikegami, A Jobe. Department of Pediatrics, Harbor-UCLA Medical Center, UCLA School of Medicine, Torrance, CA, USA.

We injected 16 pregnant does with .1 mg/kg/day betamethasone (B) or vehicle (C) on the 2 days before C-section at day 27. The newborns were tracheostomized and randomly treated with normal saline (Sal), 5, 15, 30, or 50 mg/kg of rabbit surfactant (SA). They were then ventilated for 10 min with a ventilator-plethysmograph at tidal volumes of 12-15 ml/kg. After lung collapse, air pressure-volume inflation (V_i) and deflation (V_d) curves were measured from 0 (V_0) to 35 cm H₂O (V_{35}) with volumes expressed as mean±SEM for ml/g dry lung wt and lung stability index (LSI) as $(2V_{35}-V_{10}-3V_0)/(2V_{35}-2V_0)$.

SA dose/kg	50	30	15	5	0 (Sal)
$V_{35}(C)$	20.8±.9	17.8±.5	14.6±1.1	9.9±1.0	8.8±.4
$V_{35}(B)$	26.7±1.3	27.1±.9	28.0±.6	15.6±.9	15.1±1.9
LSI (C)	.57±.05	.50±.04	.27±.05	.18±.02	.19±.01
LSI (B)	.60±.03	.55±.02	.36±.07	.20±.02	.24±.02

There were significant differences for V_{35} , V_{d35} , V_{d15} and compliance between C and B at each dose ($p<.01$). The similarity of values for LSI between C and B showed that the steroid effect was not related to changing surface tension. Steroids have a threshold and synergistic effect on surfactant at low doses.

72

PASSIVE COMPLIANCE IS A MORE ACCURATE PREDICTOR OF POOR OUTCOME THAN VENTILATOR REQUIREMENTS IN VENTILATED INFANTS. H. Kirpalani, R. Wilkie, B. Schmidt, S. England, H. Bryan and A.C. Bryan. The Hospital for Sick Children and Mount Sinai Hospital, Toronto, Canada.

We examined accuracy in prediction of a poor outcome (severe BPD i.e. ventilated at 28 days or death) using passive respiratory mechanics. Infants (BW >1000 g) who were ventilated on day 1 of life were examined serially. Length corrected compliance (Crs:ml/cmH₂O/m) was compared in accuracy to other predictors: BW (g), Ventilation Index (VI) [FiO₂ (%) x mean airway pressure (cmH₂O)]. Out of 89 infants enrolled, 41 were still ventilated by day 6. On day 1, 75 infants were measured, 34 were measured on either days 5 or 6. Eleven infants had a poor outcome (1 death, 10 severe BPD). Results:

		Sensitivity	Specificity	Pos. Predict. Value	Neg. P.V.
Day 1	Crs <1.5	22%	96%	50%	89%
	VI >900	40	94	50	91
	BW <1.2	72	73	42	
Days	Crs >3.0	90	42	39	91
5-6	Crs <1.5	50	100	100	82
	VI >400	25	95	66	76
	VI <200	50	80	50	80

Of the predictors tested, Crs is the best by days 5-6.

73

PHYSIOLOGICAL AND BEHAVIOURAL EFFECTS OF HEELSTICK PROCEDURES ON NEONATES. R. Paludetto, C. De Fusco, A. Stagni, M.G. Corbo. Dept. of Peds., Univ. of Naples. This study was performed to evaluate possible physiological and behavioural changes in healthy neonates (n.) during heelstick procedures (h.p.). 25 n. in room air

and without severe perinatal complications (Minde s.<4) undergoing h.p. for bilirubin, glycemia, ht., in the first 2 wks of life, were included in the study (G.A. wks 34±3; B.W. g. 1935±580; Apgar s. 5m. 8.5±1). Behavioural states (B.S.), transcutaneous oxygen tension (TcPO₂), heart rate (H.R.) and respiratory rate (f.) were monitored 3m before and after h.p. and during h.p. that lasted from 20" to 240" \bar{x} =132". Data were sampled at 10" intervals using a timer and an audiotape. Variables were compared between periods before, during and after h.p. (p.t tests). B.S. increased from 2.9±0.9 to 5.6±0.5 during h.p. ($p<.001$), with behavioural distress lasting after h.p. H.R. increased from 138±14 before h.p. to 168±19 during h.p. ($p<.001$) and remained elevated after h.p. TcPO₂ did not change and f. decreased from 48±10 to 40±10 during h.p. ($p<.01$) but recovered rapidly after h.p. Our n. react to h.p. with fussing, crying and H.R. increasing; f. decreased briefly without impairing oxygenation.

74

THYROID HORMONE IS REQUIRED FOR MATURATION OF LUNG LIQUID REABSORPTIVE RESPONSE IN THE FETAL SHEEP. P.M. Barker, C.A. Ramsden, L.B. Strang, D.V. Walters. Dept. of Paediatrics, University College London.

The pulmonary epithelium of the fetal sheep normally secretes liquid (LL) which is reabsorbed during labour in response to an increase in fetal plasma adrenaline (1). The sensitivity to adrenaline increases about 10 times in the last 2 weeks of gestation. We have now shown that fetal thyroidectomy performed in 9 fetal sheep at 113-119 days' gestation, prevents the development of this reabsorptive response. After 130 days' gestation reabsorption of LL was the usual response to adrenaline in the euthyroid fetuses, whereas most of the thyroidectomised animals continued to secrete during adrenaline infusion. (Only 3 of 16 infusions caused a minimal reabsorption). In euthyroid fetuses addition of cAMP (5mg) to LL induced a reabsorptive response similar to that seen with adrenaline infusion (2) but in thyroidectomised fetuses, cAMP never produced LL absorption. We conclude that development of the reabsorptive effect depends on maturation of a post β receptor mechanism.

1. Brown MS, Olver RE, Ramsden CA, Strang LB, Walters DV. J. Physiol. (1983) 344, 137-152.
2. Olver RE, Ramsden CA, Strang LB, Walters DV. J. Physiol. (1987) In press.

75

RESPIRATORY WATER LOSS IN RELATION TO GESTATIONAL AGE IN NEWBORN INFANTS. Riesenfeld T, Hammarlund K and Sedin G. Dept. of Pediatrics, University Hospital, Uppsala, Sweden.

The insensible water loss plays an important role in the water balance of the newborn infant and especially in the preterm ones.

We have earlier shown that the transepidermal water loss is much higher in the preterm infant than in the fullterm infant. Recently we found that the respiratory water loss (RWL) contributes more than 50 % to the total insensible water loss at rest in fullterm infants on their first day after birth. We have now studied RWL, oxygen consumption and carbon dioxide production in preterm infants.

The method used is based on an open flow-through system with a mass-spectrometer for gas analyses. Measurements were made in infants of gestational ages between 29 and 36 completed weeks with the infant at rest and at the first day after birth. The infants were studied in incubators with ambient humidity of 50 % and ambient temperature so that the body temperature was stable between 36.5 and 37 °C. The results showed no clear difference in RWL in relation to gestational age. In addition there was no clear difference in oxygen consumption in relation to gestational age. This means that the RWL contributes to a much lesser extent to the total insensible water loss in the preterm infant than in the fullterm infant.

76

PROSTACYCLIN FORMATION IN UMBILICAL ARTERIES IS DOSE-DEPENDENTLY REDUCED BY MATERNAL SMOKING. Ahlsten G, Ewald U, Tuvemo T. Dept. of Pediatrics, Univ. Hospital, S-751 85 Uppsala, Sweden.

Smoking during pregnancy is associated with increased perinatal morbidity and mortality. Disturbed prostaglandin metabolism might be an important causal factor since the regulation of umbilical-placental blood flow and vasomotor function in the newborn infant is partly prostaglandin-dependent. The aim was to evaluate the impact of maternal smoking on reduced prostacyclin formation in umbilical arteries. Segments from human umbilical arteries were collected at 87 unselected term deliveries. The capacity for prostacyclin formation was estimated, blindly as to smoking habits, using a bioassay technique. In umbilical arteries from infants of non-smoking mothers the prostacyclin-like activity amounted to 81 ± 37 ng/g of umbilical arterial tissue, and in those from all smokers to 66 ± 34 ($p<.05$). When smokers were divided into those smoking 10 cigarettes daily or more and those smoking 1-9 cigarettes per day, only umbilical arteries of infants of the heavier smokers showed a significantly lower production of prostacyclin-like activity than the non-smoking group (56 ± 26 ng/g) ($p<.01$). Umbilical cord blood levels of nicotine and cotinine were measured and were markedly elevated in the smoking group, but did not correlate to levels of prostacyclin-like activity. A reduced capacity for prostacyclin production in umbilical arteries might imply a reduced capacity for vasodilation and consequently lowered defence against fetal hypoxia.