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EFFECTS OF AMBIENT TEMPERATURE ON CIRCULATION AND O₂ CONSUMPTION ($\dot{V}O_2$) IN NEWBORN LAMBS, AT REST AND DURING ACUTE HYPOXIA. D. Sidi, J.R.G. Kuipers, M.A. Heymann, A.M. Rudolph. Univ. Calif., CVRI and Dept. Peds., San Francisco.

To assess the effects of environmental temperature on the response to hypoxia in neonates, we studied 5 unsedated lambs in the first week after birth. We catheterized the carotid artery (CA) and pulmonary artery (PA) (via the jugular vein). After at least one day, we measured pH, blood gases, arterial and mixed venous O₂ content, $\dot{V}O_2$, heart rate (HR), CA and PA pressures, and cardiac output (CO) in both warm (W) (25°C) and cool (C) (17.4 ± 1.1°C) environments. In C, with no shivering, $\dot{V}O_2$ increased 40% (14.9 to 20.8 ml/kg/min) and arteriovenous O₂ content difference (A-V) 19%, CO 18%, and HR 14%. In 4 lambs, we studied the same variables during hypoxia (FIO₂=0.09 for 1 hr) at both temperatures. In C, hypoxia produced a greater fall of $\dot{V}O_2$ (26% vs. 6%) and of A-V (30% vs. 19%) and a smaller increase of CO (8% vs. 14%) and of HR (26% vs. 43%); in W, core temperature decreased more (2.1° vs. 0.4°), but base deficit was the same (-6 vs. -4.5 meq). Despite the greater fall in $\dot{V}O_2$ during hypoxia in C, the lowest value achieved was still higher than that in W, even during normoxia. Similarly, CO during hypoxia was greater in C than in W. These findings may explain variabilities reported in normal resting values and responses to hypoxia. They also indicate that, contrary to previous reports, during severe hypoxia neonates have a decreased reserve of metabolic and cardiovascular responses in a cool compared with a warm environment. (Supported by NIH grant HL 23681.)

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SILENT INTRACRANIAL HEMORRHAGE (ICH) IN THE TERM NEONATE

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ICH is prevalent in premature infants and thought to be related to various obstetrical and neonatal factors. The prevalence of ICH in term infants, however, has not been determined. Using real time ultrasound B scanning (RTBS), on the third to fifth day of life, we determined the incidence of ICH in 29 asymptomatic term infants born at LAC/USC Medical Center. This group consisted of 16 females and 13 males with a birth weight range 2780 - 4876, gestational age range 37 - 42 weeks, and, apgar scores > 8. 19 of the infants were appropriate for gestational age (AGA), and 10 were large for gestational age (LGA). 24 were products of uncomplicated vaginal delivery (20 spontaneous, 4 outlet forceps); the remaining 5 were delivered by cesarean section - all without fetal distress. All infants had a normal physical examination in the nursery and were discharged on schedule. RESULTS: ICH was detected in 4 of the 29 (13.8%) and confirmed on CT scanning. The four affected babies had been delivered vaginally, from vertex presentation and were AGA.

The simplicity of RTBS and the frequency of ICH in asymptomatic infants may warrant routine scanning. The impact of neonatal ICH on subsequent development requires long term follow up study.

Supported in part by Ariel Kaare Rosholt Weathers-Lowin Medical Research Foundation.

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APNEA OF PREMATURITY AND INTRACRANIAL HEMORRHAGE

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The association of apnea of prematurity with intracranial hemorrhage (ICH) has long been suspected clinically. To test this relationship we studied 22 healthy preterm infants from the first hours of life. The birth weight range was 800 - 1680gms., gestational age range was 28 - 34 wks., and 5' Apgar score range was 5 - 9. Respiration was monitored by impedance pneumography and continually recorded on pneumotachograph for the first 10 postnatal days. In addition, all infants underwent cranial real time ultrasound scanning 1 - 7 times. Apnea was defined as the cessation of respiration ≥ 15 seconds. Infectious, metabolic, obstructive and thermoregulatory causes for apnea were ruled out. The infants were divided into 2 groups. Group A consisted of 11 infants with > 10 apneic episodes during the first 10 days. Four required assisted ventilation for severe apnea. The remaining seven had a range of 13 - 252 apneic episodes. Group B consisted of 11 infants who had ≤ 10 apneic episodes during the first 10 days. Results: In group A, 10 of the 11 infants demonstrated ICH in contrast to group B where only 1 of the 11 infants showed ICH (P < 0.01). There was no difference between the groups in terms of birth weight, gestational age and Apgar score. Three of the four infants who required assisted ventilation had extensive ICH. In two of these the ICH was found prior to being placed on the respirator. The results confirm the strong association between apnea and ICH in preterm infants. Further studies are necessary to define the causal relationship between ICH and apnea of prematurity. - Supported in part by Ariel Kaare Rosholt Weathers-Lowin Medical Research Foundation.

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A NEW SCORING SYSTEM FOR THE DIAGNOSIS OF PATENT DUCTUS ARTERIOSUS IN PREMATURE INFANTS. RAMA S. SINGH* AND MANOHAR RATHI (SPONSOR: D. VIDYASAGAR) Perinatal Medicine, Christ Hospital, Oak Lawn, Illinois

A new scoring system which can help in early diagnosis of patent ductus arteriosus in premature infants with or without associated respiratory distress syndrome has been developed. This system is based on non-invasive clinical parameters, which include the presence or absence of cardiac murmurs, state of peripheral pulsation, presence or absence of true apnea and duration of ventilatory support required, in addition to echocardiographic and x-ray findings. Each of the parameters is given a score of 0 to 2, depending on the severity. A total score of between 4 and 6 is considered suggestive of PDA. In our experience we have found this scoring system to be very useful and reliable in the diagnosis of PDA in the sick newborn. This system has also helped in reducing significantly, the use of invasive retrograde aortic angiography.

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TOLAZOLINE: LIMITED EFFICACY IN PULMONARY VASO-REACTIVE HYPOXEMIA. Melinda R. Slack, Nirmla S. Desai, M. Douglas Cunningham, Dept. of Pediatr., Coll. of Med., U. of Kentucky, Lexington (Spon. by Jacqueline A. Noonan).

The persistent fetal circulation syndrome is associated with significant mortality, despite the availability of pharmacologic agents that dilate pulmonary vasculature. Presently, the most commonly used agent is tolazoline (TLZ). Our 5 yr experience with TLZ includes 39 neonates treated for refractory hypoxemia, defined as PaO₂ < 50 torr in an FIO₂=1.0 with mechanical ventilatory support. Infants received 1-2 mg/kg by bolus, followed by 2-6 mg/kg/hr continuous infusion. A positive response was a sustained increase in PaO₂ > 20 torr lasting 120 min: 41% of patients responded. The mean increase of PaO₂ in responders was 96.3 torr ± 17 SEM (p<0.01) vs the non-responders' mean increase of 5.9 torr ± 1.8 SEM (p<0.01). Tachyphylaxis occurred in 6 patients (15%). These infants required a gradual increase in dose to 5-6 mg/kg/hr to sustain a response. At this dose no further response was seen; 50% of patients with tachyphylaxis died. Review of other complications revealed: 41% had increased gastric secretions; 28.2% became hypotensive; 23% had gastric bleeding; 12.8% developed thrombocytopenia (<100,000); 7.7% developed tachycardia (>180/min); 5% had decreased urine output (<1 cc/kg/hr); 2.6% had pulmonary hemorrhage. Conclusions: 1) <50% of patients responded and response appeared to be an all or none phenomenon, 2) response is associated with improved survival, and 3) despite initial response, TLZ tachyphylaxis occurred in some infants with an associated decrease in survival.

● 1431

SURFACTANT THERAPY IN HYALINE MEMBRANE DISEASE (HMD) John A. Smyth, I. LeRoy Metcalfe, Paul Duffy, Goran E. Enhornig, Fred Possmayer, Peter M. Olley, M. Heather Bryan, Hospital for Sick Children, University of Toronto, Depts. of Pediatrics and Obstetrics, Toronto, Ontario.

Three infants with severe HMD were given surfactant with dramatic results. The surfactant phospholipid was extracted from a bovine lung wash by the Folch procedure, all but a trace of protein removed, and autoclaved at 120°C for 30 minutes. Each infant was mechanically ventilated and received 8 ml. of surfactant into the endotracheal tube. The rapid improvement in oxygenation led to a decrease in F_iO₂ and ventilation as shown in the table.

Infant	1	2	3
Birth weight (gms)	1280	1800	1400
Gestation (wks)	28	35	31
F _i O ₂ pre-surfactant	0.65	0.65	0.55
Surfactant given at age (hrs)	15	15	15
Time to air post-surfactant (hrs)	2	2	0.1
Ventilation post-surfactant (days)	2	4	0.25
Age at extubation (days)	7	6	8

Partial clearing of the chest x-ray was followed by diffuse opacification (atelectasis and edema). The initial marked improvement in oxygenation did not "cure" other aspects of prematurity. Baby 2 had intraventricular hemorrhages on day 2 and later was ventilated for apnea. Baby 3 had a PDA treated conservatively. Post extubation all required supplementary O₂ (< 30%) for 10, 2 and 1.5 weeks.