

**991** RECURRENT UNDETECTED HYPOXIA AND HYPEROXIA, A NEWLY RECOGNIZED IATROGENIC PROBLEM OF "INTENSIVE CARE" Jerold F. Lucey, Joyce L. Peabody and Alistair G. S. Philp. University of Vermont College of Medicine, Department of Pediatrics, Burlington, Vermont.

The sleeping quiescent fetus develops in an environment of low, relatively stable oxygen tension. The premature, sick, sleep deprived (?) newborn struggles to survive in a chaotic oxygen environment. Continuous monitoring of transcutaneous O<sub>2</sub> tension reveals that events such as feeding, crying, suctioning, blood sampling, noise, handling, apnea, restlessness, diaper changes, chest P. T., physical exams, etc., result in profound drops in arterial oxygen tension. Our hypothesis is that the stress of "intensive care" examinations, nursing care and diagnostic studies interrupt the sleeping state, cause episodes of apnea, disorganized ineffective breathing, apnea and hypoxia, which in turn lead to more handling and diagnostic studies. We question the usefulness of present techniques for monitoring respiration. They are neither adequate for detecting nor preventing hypoxia and may actually interfere with the normal maturation of respiratory control. Unnecessary hypoxic stresses, identified by continuous t<sub>c</sub>PO<sub>2</sub> monitoring, should be avoidable through simple changes in techniques of care. Similarly, episodes of hyperoxia can be minimized.

**992** NEWBORN HEART RATE MONITORED WITHOUT ELECTRODE ATTACHMENT. Andrew J. Macnab (Spon. by Sydney Segal) Univ. of British Columbia, Dept. of Ped., Vancouver

To simplify detection of significant bradycardia secondary to apnea, heart rates and/or ECG of 40 infants were monitored using a new electrode mat: during resuscitation (10), ambulance transport (8), routine care (16), exchange transfusion (10) and surgery (2). The 28 X 10 cm mat incorporated 3 metal foil electrodes making skin contact with the infant lying across them. ECG tracings were comparable with patterns obtained by conventional methods. Connection to a cardiac monitor or pulse meter provided audible or visual cardiostimetry. The electrodes were radiolucent, warmed quickly to ambient temperature, allowed immediate initiation of monitoring, avoided maceration and trauma from electrode attachment and permitted simultaneous use of a mattress apnea detector. Contact interruption from movement caused only transient ECG distortion but frequent movement interfered with accuracy of heart rate registration, not a problem with sick infants. The use of adult size electrodes cut in half provided better contact with infants under 1,500 g.

**993** CALCIUM HOMEOSTASIS IN EXCHANGE TRANSFUSION. M. Jeffrey Maisels, Zvi Friedman, Keith H. Marks, Susan Uhrmann, Cheryl Lee, J. Kenneth Denlinger (Spon by Nicholas M. Nelson), Penn State Univ Coll Med, M S Hershey Med Ctr, Dept Ped, Hershey, PA.

The effect of exchange transfusion (ET) on plasma ionized calcium (Ca<sup>++</sup>) was studied in 27 exchange transfusions on 19 infants using CPD blood. The addition of 0.1 g Ca gluconate per 100 ml exchanged did not prevent a fall in Ca<sup>++</sup> in term or preterm infants (Group I). ET was then performed with 0.5 g CaCl<sub>2</sub> (Group II) or 0.1 g CaCl<sub>2</sub> (Group III) added to 450 ml heparinized CPD blood. In Group II Ca<sup>++</sup> and total Ca increased markedly during the ET, the total Ca reaching 15.5 mg/100 ml in one case. However, Ca levels were normal within 30 minutes of the end of the ET. In Group III, although Ca<sup>++</sup> levels in the donor blood were very low (0.6±0.21 mg/100 ml) the fall in Ca<sup>++</sup> was abolished during ET in term infants. Nevertheless, the decline in Ca<sup>++</sup> could not be prevented in the preterm infants although total Ca increased. Mechanisms of Ca homeostasis during ET are complex and it may not be possible to achieve normal Ca<sup>++</sup> levels without excessive elevation of total Ca. However, addition of Ca to the donor blood will prevent the fluctuation in Ca<sup>++</sup> seen with intermittent Ca administration. In addition, it appears that in vitro titration of donor blood with CaCl<sub>2</sub> to normocalcemic levels should not be used as a means of determining the appropriate dose of Ca in ET.

**994** EDUCATIONAL VALUE OF A COMPREHENSIVE NEONATAL TRANSPORT PROGRAM. C. Major, A. Skeilton, E. Perckett, R. Vaughan, K. Iversen, T. Whitworth, and M. Stahlman. Dept. of Pediatrics, Vanderbilt Med. Ctr., Nashville, Tennessee.

Initial care of the sick neonate is crucial to his outcome. To improve this care, a full-time transport team of nurses, fellows, and faculty was established in 1974 that provided nurse-physician education, consultation, and neonatal transport. An 80 hour didactic course on the recognition and stabilization of the high risk neonate was attended by 222 nurses in 1974-76. Using a mobile intensive care unit, 614 babies were transported from 55 predominantly rural hospitals within a 125 mile radius. At each transport, status of the neonate, educational interactions, and an evaluation of referring hospital capabilities were recorded. Diagnosis and therapy were discussed in detail with 40% of the referring physicians and 21% personally participated in management. Nursing staff participation provided the team with an opportunity to develop and reinforce concepts previously presented in didactic sessions. During the second year of operation, improved care was reflected by increased referral at 0-2 hours of age (31% in 1975 vs 23% in 1974), initial temperature > 36°C (79% vs 63%), dextrostix >45 mg% (64% vs 42%), prior IV therapy (33% vs 19%), and proper monitoring of infants (64% vs 38%). The incidence of infants receiving minimal or no care prior to transport decreased from 31% to 15%. These results indicate the value of broadening the scope of a transport program to include on-going assessment of referral capabilities, appropriately directed consultation and reinforced nurse-physician education.

**995** A SIMPLE DEVICE FOR REDUCING INSENSIBLE WATER LOSS (IWL) IN LOW BIRTH WEIGHT INFANTS. Keith H. Marks, Zvi Friedman, M. Jeffrey Maisels (Spon. by Nicholas M. Nelson). Penn State Univ Coll Med, M S Hershey Med Ctr, Dept Ped, Hershey, PA.

IWL was measured in 5 non-distressed premature infants, 1-4 days old, by a multiple weighing technique using an electronic balance inside an incubator. The babies were studied naked before and after being covered with a transparent "thermal blanket" made from plastic packing material. Operative incubator temperature was within the thermoneutral zone and relative humidity between 25 and 40%. Consecutive three hour Δ weight measurements were made 30-60 minutes after gavage milk feeds. IWL was determined as Δ weight. Pulmonary water loss, assumed to be constant, was excluded from the calculation. Consecutive paired IWL studies:

Means ± SD		IWL	
Infants		Naked	Thermal Blanket
Weight (gm)	Gestation (wks)	g/kg/hr	g/m <sup>2</sup> /hr
1300±230	30±2	2.5±1.0	18.5±5.5
		0.5±1.0	5.5±1.1

Use of the thermal blanket produced a 70% mean reduction in IWL and a net caloric saving of 27 kcal/kg/day (t=3.4; p<.01). There was minimal interference with nursing care. The results indicate that (1) the simple insulating blanket used is a highly effective means of reducing IWL, (2) the caloric saving achieved by reducing IWL and evaporative heat loss may be an important determinant of intact survival in the high-risk infant.

**996** THE EFFECT OF CLOTHING ON THE GROWTH OF VERY LOW BIRTHWEIGHT (VLBW) INFANTS. Keith H. Marks, Susan B. Uhrmann, Zvi Friedman, M. Jeffrey Maisels. (Spon by Nicholas M. Nelson). Penn State Univ Coll Med, M S Hershey Med Ctr, Dept Ped, Hershey, PA.

VLBW infants are frequently nursed naked in incubators. A plastic shield or clothing will reduce insensible water loss (IWL) radiant heat loss and caloric expenditure. We studied 6 VLBW infants (680-1300g, gestation 28-31 wks) with and without clothes to assess the effect on growth. To enter the study, infants had to have regained their birth weight and be thriving. They were nursed in servocontrolled incubators, relative humidity 25-40% and abdominal skin temperature was maintained at 36.5°C. Infants were studied for one week naked (diapers only) and one week clothed (shirts, socks, caps), the order being randomized using a balanced latin square design and each serving as his own control. Caloric intake per kg body weight was constant for each study period. Mean weight gain over one week when clothed was 157±28g (SD) versus 97±44g (SD) when naked (p<0.05). No significant differences were found in length, head circumference or skinfold thickness measured at 15 and 60 seconds using Harpenden calipers. (The Δ skinfold thickness at 15-60 seconds reflects subcutaneous interstitial water and that at 60 seconds subcutaneous fat.)

These data suggest that clothing VLBW infants reduces caloric expenditure and has a significant effect on their weight gain. This gain probably represents an increase in tissue mass and not water retention.