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RELATIONSHIP OF BODY TEMPERATURE IN FIRST SIX HOURS OF LIFE TO MORTALITY IN LBW INFANTS. Stanley N. Graven, University of Wisconsin and University of

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A relationship between body temperature and survival for LBW infants has been demonstrated by a number of centers. In reviewing the records for LBW infants for the Wisconsin Perinatal Program, the relationship between body temperature and survival was assessed.

Records of 1,615 infants with birth weights between 1.0 and 2.0Kg from 72 hospitals were reviewed. All infants survived more than 6 hours. Mortality was tabulated on the basis of the lowest body temperature recorded during the first 6 hours of life. The mortality rates were as follows:

| Group | Number | Mortality Rate |
|----------------------------|--------|----------------|
| 1. No temperature recorded | 954 | 39.9% |
| 2. <95° | 94 | 49.2% |
| 3. 95°-96° | 226 | 19.9% |
| 4. >96° | 341 | 14.9% |

The differences in mortality rate were most marked among the smaller infants (1.0-1.5Kg).

Although the infants were from many different hospitals and received care under a variety of conditions, the groups were comparable in terms of birth weight and general condition at birth. Factors associated with care of infants which affect outcome other than body temperature will be discussed.

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EFFECT OF A STATEWIDE REGIONAL PERINATAL PROGRAM ON NEONATAL MORTALITY. Stanley N. Graven, University of Wisconsin and University of South Dakota Schools of

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The Wisconsin Regional Perinatal Care system was one of the early developments in the now national movement towards regionalized perinatal care. There are still only isolated or fragmentary data on the true impact of regionalized perinatal care on perinatal outcome. A program involving regional center development, regional consultation and education and regional transport systems was developed in Wisconsin beginning in 1967. The impact of this program on mortality by weight group, age at time of death and place of death was reviewed for the years 1965 through 1974.

Neonatal transfers to center hospitals increased from <0.1% of births in 1966 to 2.2% in 1974. Neonatal deaths occurring in the center hospitals increased from <10% of total for the state in 1966 to 57% in 1974. The greatest reductions in mortality rates occurred for LBW infants and during the first 24 hours of life.

Small hospitals related to a regional center had consistently lower neonatal mortality rates in all weight groups than large hospitals not associated with a center. The highest mortality rates in all weight groups occurred in the small hospitals not associated with a regional center.

The impact of general educational programs, regional newborn center development and regional high-risk obstetric center development (perinatal) were individually examined in the assessment of the data. The relationship between these changes in care and mortality rates will be presented.

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THE EFFECT OF VITAMIN E ON BILIRUBINEMIA IN PRETERM INFANTS. Steven J. Gross, Duke University Medical Center, Durham and Stephen A. Landaw, S.U.N.Y., Upstate Medical Center, Syracuse (Spon. by George W. Brumley).

A study was undertaken to determine if vitamin E deficiency contributed to the development of hyperbilirubinemia in the preterm infant. Ten appropriately grown infants of <36 weeks gestation received intramuscular vitamin E in a total dose of 50 mg/kg during days 1 to 3 of life and 10 infants served as controls. The two groups were matched for birthweight, gestational age, Apgar scores, and hemoglobin level at birth. Serum bilirubin levels were monitored during the first week of life and carboxyhemoglobin (%COHb) values were obtained as an index of hemolysis. A significant difference in bilirubin was observed by day 3 which persisted for the remainder of the first week. The highest bilirubin averaged 11.4 mg/100 ml in the control group and 7.9 mg/100 ml in the vitamin E supplemented group (p<0.01). There was no difference in the use of phototherapy between groups.

| Groups: | Control | Vitamin E | p-value |
|------------------------------|----------|-----------|---------|
| Plasma Vitamin E (mg/100 ml) | 0.5±0.2 | 0.5±0.4 | NS |
| day 1 | 0.7±0.4 | 2.5±0.8 | <0.01 |
| day 8 | 3.3±1.0 | 3.2±1.4 | NS |
| Serum Bilirubin (mg/100 ml) | 9.1±1.6 | 6.4±1.6 | <0.01 |
| day 1 | 9.3±3.3 | 6.5±2.5 | <0.05 |
| day 3 | 0.86±0.2 | 0.72±0.1 | |
| %COHb (n=10) | | | |
| day 8 | | | |

The administration of vitamin E at a dose of 50 mg/kg resulted in a significant reduction in bilirubinemia associated with decreased hemolysis during the first week of life.

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SLEEP STATE AND MATURATION OF CO₂ SENSITIVITY IN THE PREMATURE PRIMATE, Robert D. Guthrie, Thomas A. Standaert, W. Alan Hodson, and David E. Woodrum, University

of Washington School of Medicine, Department of Pediatrics, Seattle, Washington. (Spon. by David E. Woodrum).

Sleep apnea and altered CO₂ sensitivity have been implicated in the pathophysiology of SIDS. To investigate the hypothesis that sleep state and postnatal maturation influence minute ventilation and steady state CO₂ sensitivity, 7 healthy premature M. nemestrina were studied serially in the first 3 weeks of life. \dot{V}_E /Kg in room air, 2,3,4, and 5% CO₂ was measured via nasal prongs and hot wire anemometer and arterial gases were sampled in 3 animals after a steady state was attained. Sleep state was assessed from EEG, EOG, EMG and respiratory pattern.

Baseline \dot{V}_E /Kg and V_T /Kg increased and f decreased in REM and NREM sleep with increasing postnatal age (p<0.05), but there were no differences in \dot{V}_E /Kg between the 2 states at each age. \dot{V}_E /Kg increased following inhalation of CO₂ in each state at each postnatal age, but there were no significant differences in CO₂ sensitivity between NREM and REM sleep. In NREM sleep CO₂ sensitivity increased progressively with increasing postnatal age (p<0.025) whereas in REM sleep this maturational increase in slope was not observed (p>.4). The CO₂ ventilatory response curve shifted to the left in both states with increasing age.

These results suggest that there is a sleep state specific difference in postnatal maturation of CO₂ sensitivity - a progressive increase in NREM sleep and no significant change in REM sleep. Failure of this normal maturational increase in NREM sleep may be important to the pathophysiology of SIDS.

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IRRELEVANCE OF RISK FACTORS IN PREDICTING KERNICTERUS M.E. Guttenberg, S.B. Turkel, J.E. Hodgman. Univ. of So. Calif. Sch. of Med., Depts. of Peds. and Path.

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Elevated serum bilirubin in the neonatal period has been related to the occurrence of kernicterus at autopsy. The level of bilirubin believed to be critical has been decreasing, especially for the small premature. To our knowledge, a controlled study of those factors potentiating kernicterus at relatively low levels of bilirubin has not been done. Thirty infants found at autopsy to have kernicterus (gross bilirubin staining of the basal ganglia) were matched with 30 other autopsied infants for gestational age, birthweight, life span and year of birth.

These infants were collected from January 1971 to January 1977. In each group, 6 weighed <1,000 gms., 9: 1,000-1,500, 6: 1,500-2,500, and 4 >2,500. Gestational age ranged from 25 to 41 weeks and length of survival from 1 to 28 days. Autopsy findings, clinical histories and laboratory profiles were examined for known potentiating factors and no significant differences were found for serum pH, pO₂, pCO₂, hematocrit, glucose, Apgar scores, temperature, blood group incompatibility and hydration. The average peak level of bilirubin was low in both groups and while slightly higher in the group with kernicterus, this difference was only minimally significant (paired t-test, p=0.05). The presence of kernicterus in these infants may not be preventable by controlling serum bilirubin to low levels. The levels of bilirubin demanding therapeutic intervention in the high risk infant needs re-evaluation.

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PROVISION OF NEUTRAL THERMAL ENVIRONMENT (NTE) DURING TRANSPORT. Alvin Hackel, Robert J. Moffat (Spons. by Philip Sunshine) Stanford Schools of Medicine & Engineering, Depts. of Anesthesia, Pediatrics, Mech. Eng., Stanford

We studied thermal characteristics of a self-sufficient radiant heat transport incubator allowing intensive care in semi-open NTE in low external temperatures. Heat is provided by a transparent electrically heated semi-cylindrical hood which rotates over the bassinet. In the usual procedure mode (PM 1) the hood is partly rotated allowing access along one side and one end of the incubator. Other PMs are below. The lowest external temperatures at which NTE can be provided in each PM for 2 hours with use of the incubator battery pack were determined under laboratory conditions. Two designs were tested, differentiated by use of a Mylar screen (Design 2) spaced out 0.5cm from the hood's inner surface. In Design 1, infants weighing >2500 gms may inadvertently touch the hood whose inner surface can exceed 85°C. Constant observation by transport personnel eliminates this hazard. In Design 2, the Mylar screen's low thermal capacitance allows patient contact without concern for thermal damage. The results were:

| Procedure Mode | Lowest Permissible External Temp | |
|-----------------------------|----------------------------------|-------------|
| | Design 1 | Design 2 |
| I. Hood open, end open | -1°C | +6°C |
| II. Hood open, end closed | -6°C | 0°C |
| III. Hood closed, end open | -6°C | 0°C |
| IV. Hood closed, end closed | -14°C | -6°C |
| V. Sealed Emergency Closure | Below -30°C | Below -30°C |

This radiant heat transport incubator will provide a semi-open NTE for at least 2 hrs. in low external temperature environments.