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A Barnes M-101 Infrared Radiometer was used to map the skin temperature changes occurring on the backs of nine selected unwaddled newborn babies in a room air conditioned at 26.3°C (range 24.4–28.1°C). Polaroid photographs of the serial thermal variations observed during cooling were analyzed with a densitometer to provide quantitative support for grossly evident differences in rates of cooling over the surfaces examined. In particular, not only the interscapular but also the posterior flank skin regions cooled significantly less ( $p < 0.05$ ) than skin over the coccyx, deltoid, midback, and lateral flank regions. Brown fat collections have been identified in the interscapular fat pads of newborns, and thermography may prove a valuable aid in monitoring the activity of this tissue. On the other hand only small amounts of multilocular fat have been identified in subcutaneous flank tissue. Since in this early experience with thermography the flank tissue has been found to mirror the interscapular tendency to cool relatively little in cold stressed babies, continued caution must be exercised in interpreting the significance of the 'warm nape of the newborn' as it relates to brown fat activity. Further experience with radiometry may prove useful in clarifying this and other enigmatic problems relating to the complex flux of heat in newborn babies.

147 *Inhibited Lipolysis by Hypoxia: Its Potential Role in Neonatal Thermogenesis.* DAVID BAUM, COURTNEY, L. ANTHONY, JR. and CAROL STOWERS, Univ. of Washington Sch. of Med., Seattle, Wash.

Because of impaired thermogenesis, cold stress is poorly tolerated by hypoxic neonates. Since free fatty acids (FFA) are a major fuel for heat production, deficient FFA mobilization could contribute to reduced heat production at low oxygen tensions. In order to determine the effect of hypoxia upon cold-stimulated lipolysis and its potential role in thermogenesis, plasma glycerol and FFA levels, and deep rectal temperature were studied in cooled puppies made hypoxic.

Upon lowering ambient temperature from 30 to 20°C, levels of plasma glycerol and FFA increased in 12 puppies ventilated with air ( $\text{PaO}_2 < 75$  mm Hg). In contrast to persisting high plasma glycerol and FFA levels with continued cooling in the control group, plasma glycerol fell from  $172 \pm 8\%$  to  $85 \pm 10\%$  and FFA from  $206 \pm 25\%$  to  $105 \pm 13\%$  mean control values (mean  $\pm$  S.E.) in six animals made hypoxic ( $\text{PaO}_2$  25–35 mm Hg) for 45 min. Comparison of core temperatures during cooling revealed that the rate of temperature fall was accelerated by hypoxia, and that the mean peak fall was significantly greater in hypoxic than in control animals ( $p < 0.005$ ).

These observations indicate that lipolysis stimulated by cold stress is inhibited by hypoxia, which results in the reduction of FFA as a fuel source. This loss of FFA as a fuel may explain the handicap to thermogenesis observed in the hypoxic neonate.

148 *Large Insensible Water Loss (IWL) in Low Birth Weight Infants Treated with a Plastic Heat Shield.* AVROY FANAROFF, HOWARD GRÜBER, MICHAEL WALD and MARSHALL KLAUS, CWRU Sch. of Med., Dept. of Ped., Cleveland, Ohio.

Published fluid requirements appear to be grossly inadequate for some small premature infants. To explain the large water needs of these infants, detailed

water balance studies were performed during the first six weeks of life on 22 infants whose birth weights ranged between 700 and 1,800 g, mean 1,232 g, and whose weights were appropriate for their gestational age. IWL determinations were made from measurements of loss in body weight over 3-h periods, with the infants nude in standard single walled isolettes, humidity 45 to 90% and the environmental air temperature in the neutral thermal range. In 9 infants with birth weights under 1,200 g, who were below 10 days of age, IWL was 2 to 4 times greater (equivalent to 80 to 120 g/kg/day) than previously reported for larger infants. To elucidate these large losses, paired measurements were made within 24 h on 11 infants before and after the insertion of a plastic heat shield converting the isolette into a double walled chamber. Mean IWL within the double walled chamber was 1.50 g/kg/h S.D. 55 compared to a mean of 2.18 g/kg/h S.D. 1.0 under standard conditions ( $p < 0.001$ ). There is thus a 30% decrease within the double walled chamber. These results, in contrast to previous reports, indicate the ability of the small premature infant to markedly increase IWL in a relatively cool environment. These large losses can be reduced by diminishing radiant heat losses. Heat shields are useful not only for controlling the thermal needs of small immature infants but also in significantly reducing fluid requirements.

149 *Poverty and Race: Effects on Prenatal Nutrition.* RICHARD L. NAEYE and WILLIAM BLANC, Pennsylvania State Univ. Coll. of Med. and Columbia Univ. Coll. of Physicians and Surgeons, Depts. of Path., Hershey, Pa. and New York City.

Perinatal mortality rates are higher in the U.S. than in many other nations. An excess number of low birth weight infants in families of low socioeconomic status accounts for much of this high perinatal mortality. Necropsy material was examined from 1,002 consecutive autopsies on stillborn and newborn infants. 449 of the cases were excluded because of disorders that might have affected fetal growth. Income data was available on 469 of the remaining cases and they were classified by economic status using a U.S. Government poverty index. Autopsy weights and measurements were calculated in percent of published normal mean values.

Body weight for infants from poor families was 15% less than the mean value for infants from non-poor families. Mean gestational age for both groups was 29 weeks. In infants from poor families, weights of thymus, spleen, liver and adrenal glands were disproportionately smaller than weights of other organs. Brain and placental weights were almost identical in the two groups. The following additional measurements were less in the poor infants: thickness abdominal subcutaneous fat, mean volume adipose cells and skeletal muscle fibers, cytoplasmic mass of cells in various visceral organs and Wharton's jelly. If organ structure in the non-poor group is considered to be normal, infants from poor families were undernourished at birth. Racial groups showed few differences when they had similar economic status. In the poor, undernutrition became more severe with each gestation while nutrition-status improved with each gestation in the nonpoor.

150 *The Effect of Early Mother—Infant Separation on Later Maternal Performance.* JOHN H. KENNEL, DAVID GORDON and MARSHALL H. KLAUS, Case

Western Reserve Univ. Sch. of Med., Dept. of Ped., Cleveland, Ohio.

The care of premature infants in most nurseries entails prolonged physical separation of a mother from her baby. To determine whether this period of separation results in altered maternal behavior we measured feeding performance in a group of mothers who were permitted physical contact with their premature infants (mean b.w. 1,551 g) beginning in the first days of life (Early Contact). Their feeding behavior was compared at the time of discharge and one month later with another group of mothers who first handled their babies (mean b.w. 1,409 g) after 20 days of age (Late Contact). We made 34 time lapse movies of 24 mothers feeding their infants. Mothers' and babies' reactions were analyzed in detail at 1-sec intervals for 10 min of each 15 min filmed. Each frame was scored for twenty five activities ranging from caretaking skills such as the presence of milk in the tip of the nipple to measurements of maternal affection, such as the mother's body touching the infant's trunk (cuddling). Although the amount of time the mothers were looking at their babies was the same in both groups, the Early Contact group had significantly greater 'en face' (mothers' face rotated so that her eyes and those of the infant meet fully in the same vertical plane) 14.8% vs. 5.7% ( $p < 0.05$ ) and also more cuddling 46.3% vs. 21.1% ( $p < 0.025$ ) in the pre-discharge but not the one month feeding. Both of these reflect to some extent the active interest of the mother in her infant. There were no significant differences in measures of caretaking. It is intriguing to consider whether the differences in maternal behavior are due to early initiation of physical contact.

151 *Health of the American Indian: Papago Children.* MORTON S. ADAMS and JERRY D. NISWANDER, Univ. of Rochester, Rochester, N.Y. and Nat. Inst. of Health, Bethesda, Md. (introduced by Philip L. Townes).

The health of the American Indian is a matter of increasing concern. The availability of extensive lineage records, the preservation of traditional cultural factors and the relative absence of miscegenation characterize the Papago tribe of southwestern Arizona. A complete cohort of 134 full-blooded Papago children born between July 1965 and December 1967 and living on reservation were studied with their families. In addition over 900 school children from all parts of the reservation were examined.

The survival of the Papago is dependent upon cultural patterns adaptive in the arid environment of the Southwest. However, this culture carries with it other, less desirable, consequences including (1) a high frequency of several congenital malformations (myelodysplasia and microphthalmia) due to endogamous marriage practices, (2) high mortality and morbidity from infectious disease, (3) normal perinatal development followed by growth retardation, and (4) the early onset of obesity and a high frequency of diabetes mellitus.

This study has suggested modifications of the health care system more compatible with the cultural setting which will lessen the adverse impact of these adaptations on Papago children.

152 *The Offspring of Alcoholic Mothers.* CHRISTY ULLELAND, RICHARD P. WENNBERG, ROBERT P. IGO and NATHAN J. SMITH, Univ. of Washington Sch. of Med., Seattle, Wash.

Maternal chronic alcoholism was associated with 41% of infants who were born undergrown for gestational age at King County Hospital during the past two years.

In order to assess the risk of maternal alcoholism on the outcome of pregnancy and subsequent development of the infant, the offspring of 11 alcoholic mothers were followed closely in a special clinic.

Twelve infants (one set of twins) were studied. Ten infants (9 mothers) were undergrown for gestational age (range 34-40 weeks). Except for poor maternal diet, lack of prenatal care (7 mothers), and premature delivery (4 mothers), pregnancies were apparently normal. Five mothers were 35 years old or older. Six were Indian, four Caucasian, and one Negro. Detailed nutritional histories from 7 mothers indicated that 5/7 had deficient diets during pregnancy, 2 of which were severely deficient in both calories and protein.

Eight infants failed to grow, with weight and head circumference remaining below the third percentile. Six of the eight were receiving adequate diets at home for growth, and two infants with a history of poor diet failed to grow normally when hospitalized. Gesell or Denver developmental evaluations were administered to 10 infants. Two were normal, three suspect, and five clearly had retarded development.

These observations indicate that infants of alcoholic mothers are at high risk for pre- and post-natal growth and developmental failure, and suggest that greater attention should be given to alcoholic women during the child bearing years.

153 *A Three-year Follow-up Study of Abused and Neglected Children.* STANFORD B. FRIEDMAN, CAROL W. MORSE and OLLE JANE Z. SAHLER, Univ. of Rochester Med. Center, Rochester, NY.

From 1963 to 1965, 26 children from 24 families were identified as victims of physical abuse or gross neglect. 25 of these children (23 families) were located 2 to 4 $\frac{1}{2}$ /<sub>12</sub> years (median = 2 $\frac{11}{12}$ ) following the incident of abuse. For 21 children, a parental interview was conducted and the child's physical and behavioral status was assessed. In all cases, information regarding each child was obtained from local hospitals and emergency departments, physicians, protective and other community agencies, and when appropriate, from schools.  $\frac{1}{3}$  of the children again had been subjected to abuse or gross neglect, even though 5 children had not been returned home following initial hospitalization. 70% of the children were judged to be developmentally retarded, though often mental retardation or hyperactivity was thought to have preceded the abuse. One or both parents in 18 families exhibited emotional disturbance and/or mental retardation. These and other factors result in a situation in which a child may be identified as being vulnerable to further abuse, and placement outside the home must be considered. Of the methods of intervention examined, the approach of the public health nurse was judged to be most successful.

154 *Psychological Sequelae to Bacterial Meningitis: Two Controlled Studies.* SARAH H.W. SELL, WARREN W. WEBB and JOHN E. PATE, Vanderbilt Univ. Sch. of Med. (introduced by David T. Karzon).

There is a growing suspicion that survivors of bacterial meningitis have deficits which may not become apparent until the children encounter the stress of school. Controlled studies are needed to evaluate such subtle sequelae.