

The effect of CPAP on  $\text{PaO}_2$  was measured in the 7 infants and on 30/31 occasions  $\text{PaO}_2$  rose 10–300 mm Hg within 5 min. There were no consistent changes in arterial  $\text{CO}_2$  tension or pH. Aortic blood pressure was measured in all infants. Application of CPAP never caused narrowing of pulse pressure or fall in mean aortic pressure ( $\bar{P}_{ao}$ ) but resulted in a rise in  $\bar{P}_{ao}$  in 8/20 occasions. In 3 infants serial measurements of the effects of CPAP on heart and respiratory rates, tidal volume, esophageal pressure and dynamic compliance, made on 9 occasions, showed no consistent changes. Less than 20% of the CPAP was transmitted to the intrathoracic space (by esophageal pressure). CPAP results in improved oxygenation in severe IRDS without mechanical ventilation, and without adverse effects on arterial  $\text{CO}_2$  tension, acid base or cardiovascular status or survival. (Supported in part by HEO 6285.)

135 *Early Correction of Neonatal Acidemia in the Pre-term Low Birth Weight Infant.* C. J. HOBEL, W. OH, M. A. HYVARINEN, G. C. EMMANOULIDES and G. KLYMAN, Harbor Gen. Hosp., UCLA Sch. of Med., Torrance, CA.

The effects of early correction of acidemia in the newborn period was evaluated in 43 pre-term infants. Criteria for inclusion into the study was a pH of less than 7.25 either from fetal scalp blood, cord arterial blood or from umbilical arterial blood up to 20 min after birth. The infants were placed at random into: Group A, birth weight <1,500 g, early treatment (Rx.), Group B <1,500 g late Rx., Group C 1,501–2,250 g early Rx., and Group D 1,501–2,250 g late Rx. Infants in the early Rx. groups were given intravenous sodium bicarbonate within 30 min of age. The late Rx. groups were given bicarbonate at 2–3 h of age. All infants were otherwise similarly managed. Predetermined clinical parameters were used to make the diagnosis and to grade the severity of respiratory distress syndrome (RDS) at designated intervals. No significant difference was observed in arterial blood pH,  $\text{PO}_2$ ,  $\text{PCO}_2$  and base deficits between groups during the first 30 min of life. The arterial blood pH were significantly higher during the first 12 h following early correction of acidemia. Group A has significantly higher  $\text{PaO}_2$  than Group B during the first 12 h. The arterial  $\text{PaCO}_2$  was similar in early vs. late Rx. groups, but the base deficit was significantly lower in early Rx. infants at  $\frac{1}{2}$ –12 h. The incidence of RDS between groups was similar. However, the degree of severity of RDS was less in the early Rx. group. Four of 21 early Rx. and 6 of 22 Rx. infants died during the first 10 days of life. These preliminary data suggest that early correction of acidemia in low birth weight infants improves acid base and blood gas status as well as the clinical course of RDS.

136 *Developmental Changes in the Oxygen Equilibrium Curve of Infants as Related to the 'Functioning DPG Fraction' and Its Alteration with Disease.* MARIA DELIVORIA-PAPADOPOULOS and FRANK A. OSKI, Dept. of Ped., Univ. of Pennsylvania Sch. of Med. and The Children's Hosp., Philadelphia, PA.

The red cell organic phosphate 2,3-diphosphoglycerate (DPG) has been shown to bind to adult hemoglobin and decrease its affinity for oxygen while it has little effect on altering the oxygen equilibrium curve of fetal hemoglobin. Sequential studies of the  $\text{P}^{50}$  (partial pressure of oxygen at which hemoglobin is 50% saturated), fetal hemoglobin and red cell DPG were performed in 31 term and 28 premature infants. In

term infants the  $\text{P}^{50}$  averaged 19.4 mm Hg on day 1; 20.6 on day 5; 26.6 at 3–4 months, and 28.0 at 6 months (normal adults  $27.5 \pm 0.8$ ). The initial  $\text{P}^{50}$  of the premature infants was lower and its change with age more gradual. The  $\text{P}^{50}$  did not correlate precisely with the percent fetal hemoglobin alone or the DPG alone but correlated significantly with the product of the percent adult hemoglobin times the DPG content ('functioning DPG fraction'). Calculations indicate that the term infant at age 3 months with a hemoglobin of 11.0 g% is delivering more oxygen to his tissues at a mean venous  $\text{PO}_2$  of 40 mm Hg than is the newborn with a hemoglobin of 17.0 g%. Sick infants were found to have low  $\text{P}^{50}$ 's and DPG levels. Infants given either simple or exchange transfusions of fresh adult blood showed an increased 'functioning DPG fraction', a shift of the oxygen equilibrium curve to the right and their oxygen unloading capacity reached that of a 6-month infant. Such treatment appears useful in the sick infant because it facilitates peripheral oxygen delivery to the tissues.

137 *Development of Fibrinolytic Proteins in Health and Disease.* MARCIA HYVARINEN, STANLEY N. GRAVEN and E. RICHARD STIEHM, Dept. of Ped., Univ. of Wisconsin Med. Center, Madison.

Because of the propensity of newborns, especially low birth weight (LBW) infants, to bleeding and thrombosis, and the possibility of a fibrinolytic defect in the respiratory distress syndrome (RDS), serum proteins of the fibrinolytic system were measured in healthy term and LBW infants and compared to maternal levels and levels in sick LBW infants with and without RDS. Levels of plasminogen (PLM), two antiplasmins, alpha-2-macroglobulin ( $\alpha$  2-MC) and alpha-1-antitrypsin ( $\alpha$  1-AT) and albumin and IgG globulin were measured by radial immunodiffusion on paired maternal-cord serums of 45 term newborns, 37 LBW well newborns, 28 LBW infants with RDS, 24 sick LBW infants without RDS, and 9 immature (<0.8 kg) infants. Term infants had PLM levels of  $45 \pm 14$  (1 standard deviation) mg/100 ml, compared to maternal levels of  $90 \pm 18$  mg% and adult controls of  $70 \pm 7$  mg%. Levels of  $\alpha$  2-MC and  $\alpha$  1-AT in term infant serum were  $149 \pm 35$ % (percent of standard serum) and  $132 \pm 37$  mg%, respectively; in maternal serum  $139 \pm 43$ % and  $262 \pm 48$  mg%; and in adult control serum  $152 \pm 34$ % and  $133 \pm 22$  mg%. There were significant ( $p < 0.01$ ) reductions of levels of  $\alpha$  2-MC and PLM with decreasing birth weight; no such relationship was noted for  $\alpha$  1-AT. Significant correlation existed between maternal and cord levels of albumin, IgG, PLM,  $\alpha$  1-AT and  $\alpha$  2-MC, suggesting transplacental passage of these proteins. No differences were noted in levels of PLM,  $\alpha$  2-MC and  $\alpha$  1-AT in the RDS or other ill LBW infants.

The relatively high levels of antiplasmins compared to plasminogen levels suggest impaired fibrinolysis at birth. These studies do not correlate well with prior functional studies of the fibrinolytic system, suggesting that poorly characterized activators and inhibitors play a major role in the regulation of fibrinolysis.

138 *Angiocardiographic and Metabolic Studies in Immersed Lamb Fetuses Perfused Through an Artificial Placenta.* WARREN M. ZAPOL, THEODOR KOLOBOW, JOHN DOPPMAN, JOSEPH E. PIERCE, GERALD G. VUREK and ROBERT L. BOWMAN, NHLI, NIH, Bethesda, MD (introduced by Gordon Avery).