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Ionised calcium ( $Ca^{++}$ ), total calcium (CaTot) and immunoreactive parathyroid hormone (iPTH) and electrocardiographic changes with CPD blood before and during exchange transfusions.

$Ca^{++}$ , CaTot, Mg, PO<sub>4</sub> protein, pH and iPTH were measured in 16 1-6 day old hyperbilirubinemic infants before and during exchange transfusions with CPD blood. 9 of the 16 infants were supplemented with 0.11 mmoles iv Ca-gluconate after every 100 ml (20-30 min.) exchanged blood. Basal levels were:  $Ca^{++}$  2.15-4.41 mg/dl (adult range 4.07-5.21), CaTot 6.1-10.3 ml/dl (8.9-10.2), PO<sub>4</sub> 4.1-10.0 mg/dl, and iPTH 16-102 ng/ml (<40). After 30 ml (7.3±0.6 min.) exchanged blood,  $Ca^{++}$  decreased by 6.9% (paired t test p<0.001), Q-O<sub>2</sub> increased by 8.5% (p<0.01) and iPTH by 26.8% (p<0.02). After 90 ml (20.0±1.5 min.) Ca Tot increased by 3.1% (p<0.01) and PO<sub>4</sub> by 21.7% (p<0.001). At the end of the exchange,  $Ca^{++}$  decreased by 19.2% (p<0.001) and CaTot increased by 20.4% (p<0.001), Q-O<sub>2</sub> by 11.6% (p<0.001) and PO<sub>4</sub> by 35.8% (p<0.001), whereas iPTH returned to basal levels. iv Ca-supplementation resulted in an increase of CaTot, but not in  $Ca^{++}$ , Q-O<sub>2</sub> decreased by up to 10% for less than 1 min. Mg, proteins and pH remained unchanged.

In conclusion,  $Ca^{++}$  is decreased and iPTH increased in 1-6 day old infants in relation to the normal adult range. Exchange transfusions with CPD blood resulted in a decrease in  $Ca^{++}$  with a Q-O<sub>2</sub>-prolongation and an increase in iPTH and CaTot. iv supplementation with Ca is ineffective, since it is bound within seconds.

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Stimulation of  $\gamma$ -Globin Chain Synthesis after Exchange Transfusion in the Neonatal Period.

In order to determine the influence of exchange transfusion (ET) on the erythropoiesis of the neonate the relative rates of  $\beta$ -,  $\gamma$ - and  $\alpha$ -globin chain synthesis were determined in reticulocytes of 6 newborns with haemolytic disease (HD) and in 8 normal newborns. After incubation of reticulocytes with <sup>14</sup>C-leucin globin chains were separated by column chromatography on CM-cellulose. This determination was performed directly after birth (before ET) and in weekly intervals thereafter. From these data the  $\beta/\alpha$ ,  $\gamma/\alpha$  and  $(\beta+\gamma)/\alpha$  ratios were calculated. Directly after birth (before ET) the three ratios in newborns with HD ( $0.35 \pm 0.20$ ,  $0.67 \pm 0.12$ ,  $1.06 \pm 0.29$ ) were similar to those of normal newborns ( $0.33 \pm 0.07$ ,  $0.65 \pm 0.06$ ,  $0.98 \pm 0.06$ ). The gradual increase in the  $\beta/\alpha$  ratio seen during the postnatal period of normal newborns was also observed in newborns with HD after ET. In contrast, the  $\gamma/\alpha$  ratio was found to be increased ( $1.89 \pm 0.25$ ) in all infants with HD in the second week after ET. The corresponding value for normal newborns was  $0.48 \pm 0.25$ . Possible reasons for this imbalance of globin chain formation after ET may be the decreased erythropoiesis and/or the abnormal high Hb A concentration after ET or the introduction of an unknown,  $\gamma$ -chain formation stimulating agent by ET.

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Influence of phototherapy on the serum lipids of jaundiced newborns.

The effectiveness of phototherapy in the treatment of neonatal jaundice has been proved, but many metabolic questions about it remain unanswered: e.g. a negative metabolic balance may be created because of increased needs and of reduced absorption. The serum free fatty acids, triglycerides, cholesterol and phospholipids of 15 fullterm and 13 premature jaundiced infants were measured by chemical and chromatographic methods before and after a 48 hrs phototherapy and compared to a matched group of controls. The obtained values, corrected for hemoconcentration, show a significant decrease of free fatty acids after phototherapy: NEFA before phototherapy: Full term  $0.192 \pm 0.007$  mEq/L, pretermes  $0.170 \pm 0.010$  mEq/L; after full term  $0.100 \pm 0.010$  mEq/L, pretermes  $0.089 \pm 0.016$  mEq/L. The cholesterol values were moderately decreased. No differences were observed for the phospholipids and the triglycerides. The above findings can be due to the decreased absorption and increased catabolism of lipids. The probable binding of NEFA by bilirubin, during the phototherapy, must also be considered.

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Acid-base balance during the first 10 days

of life in prematures.

In 10 healthy male prematures (birth weight 1750-2270 g, gestational age 33-34 weeks) acid-base balance studies were performed. Meb, a formula adapted to human milk, was given. Urine was collected over the first 10 days of life and examined for net acid excretion (NAE) equivalent to titratable acidity (TA) + NH<sub>4</sub> - HCO<sub>3</sub>, as well as for organic acids (OA), sulfate (SO<sub>4</sub>) and other electrolytes. Selected results are recorded below for 3 representative days of the following periods: period A (days 1+2), period B (days 3+4) period C (days 5-10).

Day	N-balance g/kg/d	Urine pH	U r i n e (mEq/kg/day)						
			NAE <sup>+</sup>	Na <sup>+</sup>	K <sup>+</sup>	OA <sup>-</sup>	SO <sub>4</sub> <sup>-</sup>	Cl <sup>-</sup>	PO <sub>4</sub> <sup>-</sup>
2	- 0.10	7.08	0.7	0.7	1.0	1.6	0.3	0.5	0.3
4	+ 0.14	6.46	1.0	1.0	0.5	1.2	0.2	0.6	0.9
10	+ 0.33	5.89	2.5	1.8	1.0	1.8	0.5	1.3	4.8

These results suggest, that the increasing NAE during the first 10 days of life is due to the change from the catabolic to the anabolic state and to the increasing electrolyte excretion concerning predominantly the anions. The high NAE observed on feeding the formula reflects an inadequate electrolyte composition in contrast to human milk.

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The timing of intraventricular haemorrhage in very low birth weight babies.

The proportion of transfused cells circulating produced by transfusion of adult cells to LBW infants was used to estimate the timing of intraventricular haemorrhage (IVH) a) during life by noting a fall in the fetal red cell mass b) retrospectively by analysing the clot at necropsy. Half the IVH babies had a gestation of 28 weeks or less, were severely asphyxiated at birth and bled within 12 hours. In the rest the converse was true. To elucidate the aetiology of IVH events before haemorrhage were compared with events in gestational age controls. Babies before IVH had a lower arterial pressure than controls. There was no difference in red cell mass, central venous pressure or alkali therapy. We conclude that in half the IVH babies IVH is predetermined before birth and the finding of hypotension in the rest suggests that poor perfusion may cause ischaemic damage of the germinal layer and that IVH may be an event secondary to this.

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BONE DENSITOMETRY WITH THE AID OF COMPUTER ASSISTED TOMOGRAPHY (CAT).

Mineralization of trabecular bone changes more rapidly than that of cortical bone which alters in thickness rather than density. A separate determination of cortical thickness, cortical density and trabecular density would be desirable. Current methods do not allow this. Radiography yields measurements of cortical thickness only, while  $\gamma$ -ray absorption technique (Cameron) measures the total mineral content. We have approached the problem by combining the photon absorptiometry with CAT which is used successfully to study the brain (EMI-scan). With this technique a cross-sectional image of the bone can be constructed and thickness and density of cortical bone in the diaphysis as well as density of trabecular bone in the metaphysis can be quantified. - So far our study has been focused on trabecular density at the distal metaphysis of the radial bone in children older than 4 years and in adults. Preliminary results indicate that the values are not age dependent but that there is a great individual variation. However, there is a variation in the order of only 2% between left and right arm and between repeated measurements over 60 days in healthy individuals. Immobilization of the arm in a cast (fracture) results in a massive drop in trabecular bone density within 2 to 3 weeks. In children with advanced renal insufficiency decreased as well as increased values have been found.