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Neonatal Society

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A retrospective study of phenobarbitone as an adjunct to phototherapy in rhesus haemolytic disease in the newborn. R Alvez and J Osborne. Department of Paediatrics, Southmead Hospital, Bristol.

The efficacy of phenobarbitone, in addition to phototherapy, in preventing hyperbilirubinaemia due to rhesus haemolytic disease was investigated in a etrospective study of 115 uncomplicated cases. The selection of treatment has varied with current trends and has not depended on the expected severity of the disease. Phenobarbitone was given to the mother alone (60 mg orally three times a day for at least 14 days before delivery), or to the mother (as before) and the baby (5 mg/kg per dose given intramuscularly twice a day until the bilirubin level fell below 170 μmol/l; 9·9 mg/100 ml), or to neither the mother nor the baby. The 115 cases were not comparable in severity. No significant difference was detected in mean maximum bilirubin or the number of exchange transfusions required. Random selection of equal numbers of severe, moderate, and mild cases for each treatment group provided 90 comparable cases. There was still no significant change in the mean maximum bilirubin concentration or the number of exchange transfusions required. Combining the two treatment groups did not affect the results. A prospective controlled trial of phenobarbitone as an adjunct to phototherapy in the treatment of rhesus haemolytic disease is justified.

Serum 25-hydroxy-vitamin D (25-OHD) and 1,25-dihydroxyvitamin D (1,25 $(OH)_2D$) after vitamin D administration during the first week of life in premature infants. L David, E Delvin, F Glorieux, G Putet, and B L Salle. Hôpital Edouard Herriot, Neonatal Department, Lyon, France, and McGill University, Shriners Hospital Genetics Unit, Montreal, Canada.

In order to evaluate vitamin D intestinal absorption and activation by the liver and the kidney in preterm infants we studied two groups of 7 preterm infants (gestational ages 32–36 weeks, birthweights 1600–2250 g); group 1 was a control group and group 2 received a daily oral dose of 60 μg vitamin D3 from 3 to 120 h after birth. Serum samples were obtained at 1–2 and 120 h. There were no differences in serum calcium, phosphorus, or parathyroid hormone between the two groups. At 1–2 h serum 25-OHD was $8·3 \pm 4$ ng/ml (mean and SD), and 1,25 $(OH)_2D$ $39·3 \pm 12·4$ pg/ml (mean and SD) ($n = 11$). In the control group 25-OHD remained low $7·8 \pm 4·7$, and 1,25 $(OH)_2D$ increased slightly to $56·4 \pm 22·3$ ($P > 0·5$). In group 2, 25-OHD_3 increased to $29·3 \pm 7·2$ ($P < 0·001$), and 1,25 $(OH)_2D$ to $154·4 \pm 43$ ($P < 0·001$).

These data indicate that vitamin D in preterm infants is adequately absorbed in the gut and is hydroxylated in the liver and the kidney.

Role of aldosterone for full development of renal sodium homeostasis. A Aperia, L Larsson, and R Zetterström. Department of Paediatrics, St Göran's Children's Hospital, Stockholm, Sweden.

The importance of aldosterone for the control of salt balance was examined in preterm infants (gestational ages 28–34 weeks) and in term infants. The postnatal age varied from 2 to 21 days. The sodium excretion was significantly higher in preterm infants than in term ones during the first 6 days of life. During the first week of life the sodium balance was negative in preterm infants and positive in term ones. Aldosterone excretion was high during the first week of life and increased still more between the second and third week of life both in preterm and term infants. The correlation between aldosterone excretion and urinary potassium/sodium quotient was 0·87 in term infants, 0·57 in preterm infants aged 13–20 days, and was nonexistent in preterm infants aged 2–10 days. Those observations suggest that the high excretion in newborn preterm infants can partly be explained by a lack of response to aldosterone at this developmental stage. It is also suggested that aldosterone influences the development of sodium reabsorption by inducing the formation of sodium potassium activated ATP-ase.

Those hypotheses were examined further in experimental studies on developing rat kidneys. The outer cortex of 8-day, 24-day, and 40-day-old rats was studied with regard to ATP-ase content,

structural development (by electron microscope), and functional development (by micropuncture). The structural and functional development of the superficial nephrons in te rat kidney between 24 and 40 days will correspond to the overall renal development in infants between the 30th postmenstrual week and the first year of life. It was found that the ATP-ase content of proximal tubular cells increased linearly between 8 and 40 days of age. The induction of ATP-ase could be accelerated by steroid hormones, but aldosterone was by far the most potent inductor.

Postnatal development of renal function in preterm and term infants. A Aperia, O Broberger, P Herin, and R Zetterström. Department of Paediatrics, St Göran's Children's Hospital, and Huddinge Hospital, Stockholm, Sweden.

This study was designed to examine the effect of gestational age on the immediate postnatal development of renal function. Term infants were compared with infants of gestational ages <34 weeks. This limit was chosen because earlier studies had implied that renal functional development was accelerated between the 34th and the 36th gestational week, an acceleration which coincides with the completion of nephrogenesis. One of the main purposes of this study was to find out if the structural immaturity that exists before the 35th or 36th week of life predisposes to a functional heterogeneity. A secondary purpose was to find out if a functional heterogeneity could have any importance for the homeostatic properties of the kidney. For this reason 3 aspects of renal function were determined: glomerular filtration rate, β-2-microglobulin reabsorption representing a single tubular transport process, and sodium excretion representing an important homeostatic function of the kidney. The results show that the glomerular tubular balance differs greatly between preterm and term infants, at least during the first 3 weeks of life. This implies that the homeostatic properties of the kidney will, at least during the first 3 weeks of life, differ between preterm and term infants.

Lung mechanics in preterm newborn rabbits after antenatal treatment with terbutaline or hydrocortisone. U Freyschuss, B Bergman, G Grossmann, T Hedner, R Nilsson, and B Robertson. Department of Clinical Physiology, Karolinska Institute, Serafimer Hospital, Department of Paediatric Pathology, Karolinska Institute, and Department of Clinical Pharmacology, Sahlgrenska Hospital, Gothenburg, Sweden.

There is now evidence that terbutaline, a β_2-adrenergic agonist, inhibits the secretion of fetal lung liquid and induces release of surfactant phospholipids in the premature fetus. We wished to find out how antenatal treatment with terbutaline or hydrocortisone affected the *in vivo* lung mechanics of preterm newborn rabbits.

Rabbit fetuses were delivered on day 28 of gestation: group 1, three hours after receiving intramuscular injection of terbutaline 0·1 mg in 0·1 ml saline or saline only, group 2 after intramuscular injection of 2 mg hydrocortisone or the vehicle 2 days before delivery. The fetuses were tracheotomised and pneumotachograms and intraoesophageal pressure were recorded during spontaneous breathing. The recordings were made during the first breath and subsequently at 15, 30, 60, and 120 minutes after delivery.

Animals treated with terbutaline had bigger tidal volumes and increased dynamic compliance 15–30 minutes after birth, whereas steroid-treated animals had bigger tidal volumes only and these were during the first breath and after 60 minutes. The improvement of lung mechanics in terbutaline-treated animals was accompanied by increased lecithin/sphingomyelin ratio in lung wash.

Lung volumes and lung mechanics in babies born vaginally and by elective and emergency lower segment caesarean section. A W Boon, I E Hopkin, and A D Milner. Department of Neonatal Medicine and Surgery, City Hospital, Nottingham.

Serial measurements of lung volumes and lung mechanics were made within the first 3 days of life in a group of 56 babies. 31 of the babies were born by vaginal delivery, 15 by lower segment caesarean section (LSCS) where labour had not been established (elective LSCS), and 10 by LSCS in established labour (emergency LSCS).

The study confirmed the striking differences in the thoracic gas volumes between babies born vaginally and by elective LSCS.[1] The babies born by emergency LSCS formed an intermediate group. Corresponding differences were seen in the lung mechanics of the three groups. By the age of 48 hours the differences in lung volumes and lung mechanics had disappeared.

It is concluded that both labour itself and passage down the birth canal promote the clearance of fetal lung liquid.

Reference

[1] Milner A D, Saunders R A, Hopkin I E. Effects of delivery by caesarean section on lung mechanics and lung volume in the human neonate. *Arch Dis Child* 1978; **53**: 545–8.

Evaporative and nonevaporative heat loss of low birthweight infants in a metabolic chamber and in a convection incubator. A Okken. Department of Paediatrics, University Hospital, Groningen, Holland.

Oxygen uptake (Vo_2), insensible water loss (IWL), and the storage of heat in the body (H_s) were measured simultaneously in low birthweight infants in a metabolic chamber and in a single-walled convection incubator. Total heat loss, evaporative heat loss, and nonevaporative heat loss were calculated from Vo_2, IWL, and H_s. Paired data were obtained from infants in the metabolic chamber and in the convection incubator. Measurements were taken for 29 infants.

In most infants total heat loss was greater in the convection incubator than in the metabolic chamber. The increase in total heat loss was almost entirely due to the increase in evaporative heat loss. Surprisingly, there was very little increase in nonevaporative heat loss in the infants in the convection incubator despite the relatively cold incubator walls. A study is now being undertaken to assess the influence of wall temperature of the convection incubator on heat loss of the low birthweight infants.

Methods for reducing water loss in low birthweight babies—a comparison of two methods. J Brice, D Hull, and N Rutter. Department of Neonatal Medicine and Surgery, City Hospital, Nottingham.

The importance of keeping low birthweight babies warm has often been stressed. Previous studies have shown a high insensible water loss through the skin in the preterm very low birthweight neonate. This water loss represents a considerable evaporative heat loss. The application of soft paraffin to the skin 'waterproofs' the babies and reduces this high insensible water loss. The effectiveness of regular paraffin applications was compared with the use of a plastic 'thermal blanket' in reducing insensible water loss. 44 very low birthweight (<1·5 kg) babies were placed alternately in one of two treatment groups. The paraffin group received 6-hourly applications of paraffin to their whole bodies. The thermal blanket group were nursed continuously under the blanket, so far as this was possible. Each group was nursed in incubators and studied for 2–4 weeks from birth, and treatment was otherwise similar. Temperature control, fluid balance, weight loss/gain, and clinical progress were carefully monitored.

In babies <1 kg the paraffin group had better temperature control, and this was just statistically significant. Temperature control in the heavier babies was comparable in both groups, and other measures of morbidity and mortality were similar. The only complication noted from paraffin application was a higher incidence of benign neonatal urticaria.

Paraffin application to the skin is simple and may have a useful place in reducing insensible water loss and improving temperature control in the very low birthweight neonate.

Mucosal receptors for IgA in the breast-fed neonate. S A Roberts and G Wincup. Paediatric Department and Neonatal Unit, John Radcliffe Hospital, Oxford.

Lysozyme, IgA, lactoferrin, and carbonic anhydrase levels in the milk of mothers of preterm and term infants. O G Brooke, N D Carter, C M West, and C Wood. Department of Child Health, St George's Medical School, London.

It has been reported[1] that gross levels of nitrogen in the milk of mothers of preterm infants are significantly higher than in the milk of mothers of term infants. We have assayed milk samples for IgA, lysozyme, and lactoferrin (all proteins with anti-infective properties), and for carbonic anhydrase (a zinc-containing enzyme).

Milk samples were obtained from 14 mothers of preterm babies between the 4th and 36th day postpartum, and were compared with milk from 19 mothers of babies born at term at similar stages of lactation.

The Table gives the mean concentrations of lysozyme, IgA, lactoferrin, and carbonic anhydrase in milk after the 5th day postpartum. IgA was measured as a % of a standard of pooled colostrum. There was no significant difference in the levels of these proteins between the milk from mothers of preterm infants and the milk from the mothers of term infants.

We conclude that the increased nitrogen content of the milk of preterm mothers is not reflected by increases in anti-infective proteins.

Table

	Preterm	*Term*
Lysozyme (μg/ml)	121·9 ± 113·6	208·0 ± 186·0
IgA (%)	5·9 ± 2·3	5·7 ± 3·8
Carbonic anhydrase (μg/ml)	1·3 ± 0·6	1·5 ± 1·2
Lactoferrin (%)	16·5 ± 7·4	14·8 ± 4·2

Reference

[1] Atkinson S A, Bryan M H, Anderson G H. Human milk—difference in nitrogen concentration in milk from mothers of term and premature infants. *J Pediatr* 1978; **93**: 67–9.

Incubator cover. A R Newson and V Pucholt. Department of Neonatal Medicine and Surgery, City Hospital, Nottingham.

Delay in diagnosing a significant pneumothorax and the subsequent delay in its prompt treatment constitutes a major hazard to the newborn. Diagnosis on clinical grounds can be difficult, and conventional *x*-ray methods have several disadvantages.

Recognition of pneumothorax by transillumination is an attractive alternative.[1-2] It appears to be reliable, it is fairly economical, it does not disturb the baby, it avoids irradiation, and the result is known immediately. However, two requirements have to be satisfied: a source of bright light, such as fibreoptic light which is applied to the baby's chest, and adequate darkness surrounding the baby. The latter may be difficult to obtain during the day. Lack of sufficient darkness around the baby not only limits the use of transillumination but also makes it unreliable.

For this reason a light-excluding incubator cover was designed and produced. It can be placed quickly over the incubator. It gives almost complete darkness around the baby, making transillumination a quick and reliable way of diagnosing pneumothoraces at any time.

References

[1] Kuhns L R, Bednarak F J, Wyman M L, Roloff D W, Borer R C. Diagnosis of pneumothorax and pneumomediastinum in neonate by transillumination. *Pediatrics* 1975; **56:** 355–60.

[2] Wyman M L, Kuhns L R. Accuracy of transillumination in the recognition of pneumothorax and pneumomediastinum in the neonate. *Clin Pediatr* (*Phila*) 1977; **16:** 323–4.

Environmental factors and neonatal septicaemia. R Bennet, M Eriksson, and R Zetterström. Department of Paediatrics, St Göran's Children's Hospital, Stockholm, Sweden.

Neonatal septicaemia is still a serious condition, and in the maternity hospitals referring babies to St Göran's Children's Hospital the incidence has increased from 1·4 per thousand in 1969–73 to 3·1 per thousand in 1974–8. The two 5-year periods were compared with respect to causative organisms and perinatal risk factors. No major difference could be found in the pattern of bacterial infection. During both periods most of the infants had several perinatal risk factors. Nosocomial risk factors were also considered in relation to the care routine. It was found that bacterial colonisation took place very early and was not influenced by environmental factors such as intensive care or increased admission rate.