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Serum 25-hydroxyvitamin D (25-OHD) was measured once between October 1974 and March 1976 in each of 110 White 5-year-old West Midlands children. Values for 25-OHD ranged from 6.4 ng/ml to 37.1 mg/ml. There was a marked seasonal variation with maximum values for 25-OHD in mid-August and minimum values in mid-February. Intake of vitamin D estimated by 24-hour dietary recall was lower than recommended in most children. In 88% of the children intake was <2.5 μg (100 IU) vitamin D per day and 67% of children had intakes less than half this recommended amount. Nevertheless, correlation between dietary intake of vitamin D and serum 25-OHD was not significant, even allowing for the seasonal variation in 25-OHD.

There was a correlation between hours of sunshine recorded in the 4 weeks before the blood sampling and 25-OHD (r = 0.397, P < 0.001) and between the seasonal UV energy of the sunlight and 25-OHD (r = 0.446). However, correlation with 25-OHD was greater (r = 0.452) for the combined product of sunshine and UV light. Peak values for 25-OHD occurred about 6 weeks after the peak for sun and UV light. Therefore, 25-OHD levels were falling before utilisation of vitamin D would be expected to exceed synthesis, suggesting that there may be a feedback mechanism controlling either the rate of synthesis or the liberation of 25-OHD into the blood. Children who had had a summer holiday at the seaside had 25-OHD levels 3 ng/ml higher for the time of year than children who had had no holiday away from home. It is concluded that the degree of exposure to sunlight of 25-OHD synthesising wavelength is more important than the dietary intake of vitamin D in determining serum 25-OHD levels in healthy White British children.

Biology of drip breast milk. A. Lucas, J. A. H. Gibbs, and J. D. Baum. Department of Paediatrics, John Radcliffe Hospital, Oxford.

The milk which drips from the opposite breast during breast feeding (DBM) is used in some centres to feed preterm babies, yet there is little scientific information on the biology of this secretion. Samples of DBM, donated to the Oxford milk bank, were analysed for fat, protein, lactose, Na, K, Ca, Mg, osmolarity, lysozyme and caloric content, and 24-hour volumes were recorded. These factors were studied sequentially in relation to the postpartum age of the mother. In addition, certain characteristics of women who produce DBM were compared with those of lactating women who do not. In order to measure the fat and caloric content of human milk, a simple microcentrifugation method has been developed, based on the measurement of percentage cream, 'creamatocrit'. Women who produce DBM showed no difference in age of parity from those who did not, and their babies did not differ in sex, gestation, or birthweight.

In contrast to expressed breast milk, DBM has a low fat and caloric content which decreases progressively post-partum. The fat and caloric content at any stage of lactation is linearly related to the daily volume of DBM produced. The protein and Na content of DBM falls during the period of lactation, whereas the Ca and Mg rises: lactose, potassium, osmolarity, and lysozyme content do not change. The average daily volume of DBM produced does not change until weaning. A knowledge of this predictable pattern of changes in DBM can be used to select donors for a DBM bank. These longitudinal studies show that DBM differs from average EBM though the changes seen in DBM composition may reflect the changing composition of fore milk.

Variations in weight velocities with changes in infant feeding regimens and incidence of breast feeding. L. Taitz. Children's Hospital, Sheffield.

The years 1971 to 1977 have seen profound changes in artificial feeding patterns in S. Yorkshire infants from an intake of over-concentrated full-cream formulae with very early introduction of solids, to the universal use of modified milks with no solid in the first 6 weeks of life. These changes have been coupled with a gradual but progressive rise in the number of breast-fed infants. Analysis of the incidence of breast feeding in primaparae and multiparae indicates that the trend towards breast feeding is still upward.
During this period rates of weight gain of artificially-fed infants have fluctuated widely, with a progressive fall in weight velocities associated with the following changes in feeding pattern. Comparisons will be presented of weight velocities associated with the following feeding regimens. (1) Full-cream milk with very early introduction of solids. (2) Full-cream milk with later introduction of solids. (3) Modified milks without solids.

The weight velocities of breast-fed infants have shown considerable stability throughout the period of study and are similar to those reported for breast-fed American infants. The implications of these findings are that rates of weight gain in early infancy are very sensitive to dietary regimens even within an apparently normal range of caloric intake, and that since rates of gain of breast-fed infants are stable over a period of time, they should be used as the basic yardstick of comparison.

Determination of body fat. Lorna J. Hawk (introduced by C. G. D. Brook). Middlesex Hospital, London.


A study of behavioural effects of anticonvulsant therapy in epileptic children with behaviour disorder. D. H. Mellor and I. Lowit. Paediatric Assessment Unit, City Hospital, Nottingham.

Evaluation of the 'Sheffield' at risk scoring system for unexpected death in infancy: preliminary results from 11 areas. J. R. Oakley, C. J. Tavaré, and A. N. Stanton. Children's Hospital, Western Bank, Sheffield.

The present 'Sheffield' scoring system (Carpenter et al, 1977) uses 8 factors, each with a numerical weighting, to discriminate within the first few days of life between normal children and children likely to die unexpectedly in infancy. The system identifies nearly 60% of subsequent deaths in approximately 15% of the population. In a retrospective study we analysed the maternity notes of 234 unexpected infant deaths, together with 248 age- and area-matched controls from 11 areas (Manchester, Liverpool, Edinburgh, Leeds, Oxford, Gateshead, Newcastle upon Tyne, Barnsley, Doncaster, Rotherham, Birmingham). In all, 49% (115/234) of indexes scored 'at risk', together with 27% (66/248) on controls. This degree of discrimination would not be of use in a prospective prevention programme. In only one area, Gateshead, was there good discrimination using the Sheffield system.

Newcastle (56 cases) and Birmingham (83 cases) provided sufficient numbers for a case/control analysis of the 8 factors of the system, together with nearly 200 further variables obtained from maternity notes. There was no difference between cases and controls in either area for 5 of the 8 factors (maternal blood group, urinary tract infection during pregnancy, length of second stage of labour, parity, or feeding intention on discharge). Maternal age, birth-weight, and twins maintained significant differences. Several other factors achieved significant case/control differences, notably that the mothers of index cases booked later at hospital, and had a shorter interval between consecutive pregnancies.

It appears that the Sheffield discriminant needs to be refined for use in other communities. Our data suggest that there are too few factors available from maternity notes, which maintain a case/control difference in all areas, to produce a discriminant for common use. Work continues in the 11 areas to add easily obtainable objective environmental factors to those available from maternity notes, in the hope that we can produce a common discriminant for use in prospective studies in many communities.

This work was funded by a grant from the DHSS.

Reference


In cyanotic congenital heart disease surgical treatment is frequently governed by the size and anatomy of the pulmonary arteries. This is particularly true in patients with pulmonary atresia or tricuspid atresia in whom it may be difficult to demonstrate the pulmonary arteries by conventional methods. The anatomical characteristics of the pulmonary arteries were investigated in 28 neonates, infants, and children with pulmonary atresia or under-developed pulmonary arteries, by selective pulmonary venous angiography and by conventional cardiac catheterisation and angiography. By injecting radio-opaque contrast medium into a pulmonary vein it was possible to show the size and extent of the pulmonary arteries more clearly than by standard methods. The passage of contrast medium to the
pulmonary arteries appeared to take place proximally and not via pulmonary capillaries. The demonstration of these proximal communications between the pulmonary arteries and pulmonary veins may offer an explanation for the occurrence of right-to-left shunting in neonates and infants without congenital heart disease.

**Rat model of human asthma.** F. Carswell and J. Oliver. Bristol Children’s Hospital.

Animal models of asthma may allow the intrapulmonary immunological processes to be investigated in detail. They also permit standardisation of the initial sensitisation. Hooded Lister rats were sensitised to DNP-ovalbumin by intraperitoneal injection. The respiratory response to aerosol challenge was measured by whole body plethysmography. Sensitised rats showed a fall in respiratory rate, reduction in minute volume, and a decrease in expiratory flow rate which was significantly greater than that produced in control unsensitised rats on aerosol challenge with DNP-ovalbumin. The magnitude of the respiratory response did not correlate with the specific IgE concentration in the serum of the sensitised rat immediately before challenge. A similar pattern of respiratory response was inducible in unsensitised rats by prior administration of IgE-rich sera. The magnitude of the respiratory response in these passively sensitised rats was related to the quantity of specific IgE injected. The respiratory response was not produced by challenging actively sensitised rats with intragastric DNP-ovalbumin but these rats did respond to subsequent aerosol challenge. Our preliminary results suggest that the respiratory response of the sensitised rat to aerosol challenge is IgE-mediated. The route of presentation of the antigen clearly modifies the reaction, emphasising the relevance of local immunological events in IgE-mediated respiratory reactions.

**Pulmonary pressure/volume relationships during last phase of delivery and first postneonatal breaths in human subjects.** R. A. Saunders and A. D. Milner. Department of Child Health, University of Nottingham and Nottingham City Hospital Maternity Unit.

**Foot length: new and potentially useful measurement in the neonate.** D. James, E. Dryburgh, and M. L. Chiswick. Special Care Baby Unit, St. Mary’s Hospital, Manchester.

It is difficult and often impossible to obtain baseline and follow-up measurements of weight, length, and head circumference in neonates receiving intensive care. The difficulty is one of gaining access without jeopardising the baby’s health. The foot, however, is easily accessible for measurement even in babies receiving intensive care in incubators. Height and foot length are closely correlated in adults (Dahlberg and Lander, 1948; Helmuth, 1974), and foot length in the fetus is closely related to body-length (Pospisilova-Zuzakova, 1962) and gestational age (Mankowski and Lawler, 1977). The purpose of this study was to investigate the relationship between certain indices of body size and gestational age with neonatal foot length. The length of the left foot was measured during the first 5 days of life using a foot-gauge designed and constructed in this hospital. To estimate within and between observer error the foot length was measured in one baby on ten occasions by one observer (mean 7·62 cm, SD 0·08 cm; coefficient of variation 1·05%) and on one occasion by ten observers (mean 7·56 cm, SD 0·11 cm; coefficient of variation 1·46%).

152 infants were studied (124 singletons; 14 twin pairs). Neonatal foot length in babies of appropriate weight for gestational age (AGA) was closely correlated with crown-heel length \( (r = 0·91) \), crown-rump length \( (r = 0·88) \), occipitofrontal circumference \( (r = 0·88) \), weight \( (r = 0·89) \), and gestational age \( (t = 0·86) \). The same close correlations were found in small-for-dates babies (SFD). The percentage reduction of the means of certain indices of body size in term SFD babies compared with term AGA babies were: weight (31%), crown-heel length (9%), crown-rump length (9%), occipitofrontal circumference (7%) and foot length (9%).

The potential applications of neonatal foot length measurements include: (1) extrapolation of body size measurements (especially weight) in babies receiving intensive care from birth to calculate volumes of feed, drug dosages, and for the prompt diagnosis of SFD babies; (2) assessment of postnatal growth. Measurement of foot length can be performed accurately and easily in babies receiving intensive care. It may prove a very useful index of body size.

References


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Exchange transfusion in treatment of severe infections in newborns and of sclerema neonatorum. R. G. Pearse and P. J. J. Sauer. Department of Paediatrics, Erasmus University and Academic Hospital, Sophia Children's Hospital and Neonatal Unit, Rotterdam, Holland.

We have begun to use exchange transfusion (XCT) in the management of babies who are seriously ill with a systemic infection and who have not responded to appropriate conventional therapy, after the observation that some newborns with disseminated intravascular coagulation and sepsis responded dramatically to an XCT with fresh heparinised blood. 27 babies were so treated. All had clinical signs of severe infection, a 'left shift' in the white blood cells and changes in serial platelet and leucocyte counts. They all received one or more XCT. In 19 of these babies blood culture was positive (group I) and in 8 it was negative (group II). The controls (group III) were the 17 babies who, in our unit in 1976, fulfilled the above criteria and had positive blood cultures but who received no XCT. In all other respects they received similar treatment to groups I and II.

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Using the necessity for intermittent positive pressure ventilation (IPPP) during the course of an infection as a measure of severity, it is clear from group III that this indicated a very poor prognosis (9/11, 82%, died). However, only 6/16 (37%) of the babies who needed IPPV in group I died. Group II highlights the difficulty of diagnosing neonatal infection. 6/8 babies needed IPPV and 2 died. The effect of XCT on sclerema is also shown. 8/15 of the babies with sclerema who had an XCT survived, whereas all 6 babies with sclerema who had no XCT died. XCT is an effective adjunct to the treatment of severe infections in babies and in the management of sclerema neonatorum.


The management of malignant disease in children involves the frequent repetition of frightening and painful procedures over long periods of time. The agents which have been used for the relief of anxiety and pain, such as barbiturates, benzodiazepines, antihistamines, butyrophenones, and opiates, have generally proved unsatisfactory or unsafe, especially in the hands of operators not fully trained in anaesthetic techniques. Ketamine hydrochloride is a rapidly acting general anaesthetic for parenteral use which produces an unusual anaesthetic state characterised by loss of consciousness with profound analgesia but with cardiovascular and respiratory stimulation and unimpaired pharyngeal and laryngeal reflexes. The occurrence of emergence hallucinations has limited the use of this agent in adults but these are less troublesome in children. We have used ketamine to provide general anaesthesia for minor procedures and radiotherapy in children attending an outpatient oncology clinic held on a general paediatric ward without an anaesthetist in attendance. During 3½ years 821 ketamine general anaesthetics were given to 40 children ranging in age from 10 months to 14 years. 2 children were each given more than 50 anaesthetics. An average dose of 5 mg/kg IM or 2 mg/kg IV was used; our increasing preference has been for the IV route. As long as certain simple precautions were observed, side effects were minor and included salivation, lacrimation, nystagmus, tremor, and transient rashes. In some older children agitation on waking, and occasionally frank hallucinations, occurred; a small dose of diazepam before the ketamine usually eliminated these symptoms. Thus ketamine seems to be an exceptionally safe and effective anaesthetic agent for minor procedures in children and can be used by nonanaesthetic medical staff.


Methotrexate is now widely used in the treatment of ALL. In large doses it is known to produce severe intestinal damage. Smaller doses often lead to oral ulceration and the possibility that it may also cause malabsorption both of food and drugs has been investigated. 18 children were studied using a 1-hour blood xylose test. Children with ALL who had not received methotrexate had a normal xylose absorption test whereas in those who had taken methotrexate there was a significant degree of malabsorption. The severity of this is related to the spacing of methotrexate doses and to the length of treatment. It is suggested that to give the drug once every 7 days may be too frequent. The absorption of methotrexate itself has also been studied and it has been found that prolonged administration may lead to a change from a fast to a slow pattern of absorption with lower peak blood levels and perhaps diminished antileukaemic activity.

Serum and certain secretions from CF patients have been shown to inhibit Na+ reabsorption from saliva and sweat, to decrease glucose-stimulated short circuit current in isolated preparations of rat jejunum, and to inhibit Na-K adenosine triphosphatase ([Na+ − K+]−ATPase) in pigeon erythrocytes. We have investigated the effect of CF and normal serum on the transport of water, Na+, and glucose, and transmucosal potential difference (TPD) in an in vivo closed loop model in the rat jejunum.

CF serum inhibited TPD (P < 0.01) and glucose transport (P < 0.02) compared with normal serum, but had no significant effect on water and Na+ transport. After storage of serum at −20°C for 3 weeks the differences between normal and CF serum were more pronounced: glucose transport was further reduced (P < 0.005), sodium transport was inhibited (P < 0.05), and there was reduced water transport in all but one of 8 animals. We suggest that a 'factor' in CF serum inhibits transport systems in the small intestine. The effects of freezing are unexplained.


The value of the excretion of glucose in 12- and 24-hour collections of urine was assessed in 24 diabetic children as a guide to their control. Glucose was determined by a modification of a manual orthotoluidine method. 14 children (70%) excreted >20 g glucose in a 24-hour period. There was little correlation between these results and those obtained by the standard twice daily preprandial urine tests in individual children. The Clinitest method, using the 0–5% charts for urinary glucose, gave reliable results in the range considered optimal for control (0–20 g/day). When used on two 12-hour collections of urine the Clinitest method gave an immediate answer which could be used in the home or clinic when assessing alterations in insulin dosage. 12 children (50%) excreted 20% or more of their allocated carbohydrate in the urine, equivalent to 8% of their energy intake. This large loss of carbohydrate must increase the proportion of energy obtained from fat metabolism resulting in secondary hypertriglyceridaemia. Monitoring diabetic control by quantitative urinary glucose excretion may help to minimise this unwanted effect.

Assessment of nutrition status of the fetus by examination of amniotic fluid. J. G. Bissenden, P. Scott, and B. A. Wharton. Sorrento Maternity Hospital, Birmingham.

In postnatal life children who are frankly malnourished show a variety of biochemical changes in their urine, e.g. in nitrogen partition or hydroxyproline excretion. At the same time the plasma free alkaline ribonuclease is raised. It seemed conceivable that biochemical examination of amniotic fluid may, in a similar way, provide evidence about the growth and nutrition of the fetus. Amniotic fluid was obtained from 79 term deliveries, mainly following surgical induction of labour by hind water rupture with a Drew-Smythe catheter. 45 pregnancies (32 European, 13 Asian) were normal with well grown babies (>10th centile for gestational age corrected for maternal height and parity, and sex of baby). In 22 pregnancies (18 European, 4 Asian) the mothers were hypertensive and the babies well grown. In 12 pregnancies (8 European, 4 Asian) the babies were light-for-dates (LFD <10th centile).

Compared to well grown pregnancies in the same race, amniotic fluid total hydroxyproline (THP) was lower in the LFD European pregnancies (P < 0.05), and free alkaline ribonuclease was higher in the Asian LFD pregnancies (P < 0.025). When European and Asian pregnancies were considered together, uric acid was higher in amniotic fluid from the LFD pregnancies (P < 0.05). The best criteria for prediction of the LFD European baby was an amniotic fluid uric acid N > 1.5 nmol/l and total hydroxyproline < 76 nmol/l (P < 0.001). Although all these results were significant, there was considerable overlap with results from normal and hypertensive pregnancies so their clinical use without further evaluation is limited.