Establishing demand feeding in hospital

It has been suggested that infants should be fed when they wake up and cry for a feed, 'demand feeding', rather than according to any rigid schedule, 'clock feeding' (Woody and Woody, 1966; Mac Keith and Wood, 1971). However, many hospitals, including our own, have in the past continued to feed babies according to a rigid schedule in the belief that demand feeding would be incompatible with ward efficiency. In the summer of 1975 it was decided to introduce demand-feeding for both breast- and bottle-fed babies throughout the hospital for a trial period. At the time of this study 65% of all mothers leaving the hospital were breast feeding their babies.

Methods

Demand feeding instructions were sent out to all the midwifery staff in the last week of July 1975, to be introduced on August 1, and was defined as follows. The mother was to be encouraged to pick up her baby whenever she felt that he was hungry and to offer him a feed. She was also to be encouraged to have her baby at her bedside at night. If a mother chose to have her baby looked after in the ward nursery (each 4-bedded maternity ward has a nursery for 4 cots adjacent), instructions were given for the baby to be brought to the mother if he awoke. In addition, the practice of giving formula milk feeds to breast-fed babies, either as complements or supplements, was to be generally discouraged. Where additional feeds were thought to be indicated, water was to be offered, except in the case of small-for-dates infants considered to be at risk of developing hypoglycaemia, who were to be allowed formula feeds in the early neonatal period.

For the last 10 days in July all mothers, except those in the isolation unit, those whose babies were in the special care baby unit, and those whose babies were small-for-dates, were asked to complete detailed feed charts. The mothers recorded the time of each feed, and the number and nature of supplementary and complementary feeds. The charts were completed throughout the mothers' stay in hospital. Because we were mainly interested in the effects of demand feeding on breast-fed babies, only the charts of breast-fed singleton babies were analysed. There were 46 such charts of which 4 were rejected because incomplete.

During August all mothers (except those excluded as above) completed feed charts during their stay in hospital. Charts completed during the second half of August, when demand feeding had become well established, were analysed for comparison with the July charts. Of 57 breast feeding charts of singleton babies in this period, 2 were rejected because incomplete. The distribution of the remaining 55 babies between the four maternity wards showed an excess of babies from one ward compared with the clock-fed group. In order to obtain a sample with the same distribution between the wards as the initial clock-fed sample, a group of 8 was randomly selected from the 20 on the ward for inclusion in the analysis.

In addition, information was collected on the infants' weight gain and the occurrence and severity of jaundice among the two groups of babies. At the end of August mothers and nursing staff were asked to record their impressions of the new ward routine.

Results

Parity, birthweight, and gestational age. There was no difference in parity between the two groups of mothers. The birthweights of the babies in the two groups were similar (clock-fed: mean 3455 ± SD 458 g; demand-fed: mean 3535 ± 466 g), as were gestational ages (39-8 ± 1.4 weeks; and 40-1 ± 0.8 weeks).

Time intervals between feeds. The pattern of feeding was analysed according to the infants' postnatal age in days. In each case the number of days was calculated in 24-hour periods from the time of birth. The time intervals between feeds on the first and second days within each group were similar, as were the intervals on the 5th, 6th, and 7th days. The results are therefore presented in terms of these two groups of days, representing the beginning and end of the first week after birth.

During the first and second days after birth there was a significant difference between the demand-fed and clock-fed groups in the distribution of time intervals between feeds (P < 0.001 using the χ² test).
The demand-fed babies showed a much greater variation in the interval between feeds than the clock-fed babies. Only 40% of demand feeds followed 3 to 5 hours after the previous feeds while 60% of the clock feeds did so. 20% of the demand feeds took place after a gap of 6 hours or more compared with 10% of the clock feeds. There were also more demand feeds taking place after an interval of less than 2 hours compared with clock feeds (Fig.).

By the 5th, 6th, and 7th days after birth there were no differences between the two groups. This congruence was achieved entirely by a change in the pattern of the demand-fed group: as postnatal age advanced, the group showed decreased variation in the time intervals between feeds (Fig.).

**Complementary and supplementary feeds.** There were differences in the number of supplementary and complementary water and milk formula feeds given to the clock-fed and demand-fed groups. These differences were most evident in the first 2 days after birth when the demand-fed group received fewer night time supplementary feeds of milk formula, and an increased number of supplementary water feeds in the daytime.

**Patterns of weight gain and jaundice in the two groups.** The pattern of weight loss and gain was similar in the two groups. 17 babies in the demand-fed group and 15 babies in the clock-fed group had bilirubin levels measured because of jaundice. The peak bilirubin level for the two groups was similar (demand-fed group 10.3 ± SD 2.9 mg/100 ml (176 ± 49.6 μmol/l); clock-fed group 10.2 ± SD 3.2 mg/100 ml (174 ± 54.7 μmol/l)). There was no difference in the postnatal age at which the peak bilirubin was reached in the two groups.

**Discussion**

At the beginning of August 1975 the feeding practice for this hospital was changed to encourage all mothers, whether feeding by breast or by bottle, to feed their babies according to the baby’s demands. We had expected the introduction of demand feeding to pose difficulties in organising the normal maternity ward routine. Our experience of demand feeding for both bottle- and breast-fed babies in this hospital has, however, contradicted this expectation.

In the first few days after birth demand feeding produced a greater variety of time intervals between breast feeds, but the overall tendency was towards feeds more widely spaced than the 4-hourly schedule previously used in this hospital. On the first 2 days after birth it was not uncommon for demand-fed babies to go for 7 or 8 hours between feeds; such babies would be wakened for a feed under a clock-feeding regimen. However, it was a little surprising to find that during the clock-feeding regimen the interval between feeds was far from consistently 4 hours. Notably, by the time the infants were 5 or 6 days old the pattern of feeds appeared to be similar for the demand- and clock-fed groups. The demand-fed babies appeared to have established a fairly regular pattern of feeding.

Our efforts to discourage the practice of giving formula milk feeds to breast-fed babies appeared to be successful. Very few formula milk feeds were given to the demand-fed group, although these babies did require bottle feeds of water, either as supplementary or complementary feeds during the night and day.

There were many other differences between the two regimens of infant feeding which were more difficult to measure. There was no disruption in ward routine as a result of demand feeding, indeed many midwives commented favourably that the system allowed them to spend more time with the mothers who were having difficulties with breast feeding. The majority of mothers likewise commented favourably, but the occasional mother said she would have preferred some imposed routine from the outset. There were few complications of breast feeding during the survey and there was no indication that demand feeding resulted in any increase or decrease in such problems as sore nipples. This maternity hospital has now established demand feeding as the normal
hospital routine. This is the same conclusion as was reached by Illingworth et al. (1952) with one difference: demand feeding is inappropriate for low birthweight and small-for-dates infants who are at risk of hypoglycaemia.

Summary

In the summer of 1975 demand feeding was introduced for all babies born at the John Radcliffe Hospital, where previously babies were fed according to a rigid schedule to fit in with ward routine—clock feeding. Over a 10-day period before demand feeding was introduced details were collected about infant feeds concerning 42 normal babies whose mothers had decided to breast feed. 2 weeks after the introduction of demand feeding similar details were collected about 43 normal breast-fed babies. At the time of the observations 65% of all babies born in this hospital were being breast fed.

Comparing breast feeding patterns, there was a wider scatter of interfeed time intervals in the demand-fed group than in the clock-fed group, over the first 2 days after birth. By the end of the first week these differences were no longer present. The introduction of demand feeding presented no problems in ward management and is now the established routine in this maternity hospital.

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References


P. Cruse, P. Yudkin, and J. D. Baum

Departments of Midwifery, Obstetrics, and Paediatrics, University of Oxford, John Radcliffe Hospital, Headington, Oxford OX3 9DU.

Correspondence to Dr J. D. Baum.

Oxidative metabolism in cord-blood polymorphonuclear leucocytes

Serious bacterial infections occur more frequently in newborn infants than at older ages during childhood. The body defences of infants have been studied extensively to try to explain this increased susceptibility to infection. Polymorphonuclear leucocytes (PMNs) provide the major defence against bacterial infection. The increase in oxidative metabolism (OxM) that accompanies phagocytosis by these cells is unquestionably required for efficient antibacterial activity (DeChatelet, 1975). Accordingly, many investigators have assessed postphagocytic OxM of PMN from newborns. Results have been contradictory (Strauss and Mauer, 1976). Most workers have failed to detect metabolic abnormalities, but decreased activity of OxM was reported in a few studies of both resting (Jemelin et al., 1971) and phagocytic (Coen et al., 1969; Anderson et al., 1974) leucocytes from infants when compared to cells from older individuals.

Cord and venous blood from infants in the immediate newborn period contain a mixture of cells including transformed lymphocytes, young erythrocytes, and monocytes (Prindull et al., 1975). These cells are metabolically active and some are phagocytic. They are present in varying numbers from sample to sample and could theoretically influence experiments intended to selectively evaluate PMN metabolism. Leucocyte suspensions rather than isolated PMNs were studied in previous reports. In our study, OxM of isolated cord-blood PMNs was assessed by two techniques. Hexose monophosphate shunt (HMS) activity was selected because an increase in the activity of this pathway characteristically accompanies phagocytosis by normal PMNs, and failure to do so is invariably associated with PMN dysfunction (DeChatelet, 1975). The kinetics of OxM were measured as the rate of light emission by chemiluminescence, an assay related to superoxide and singlet oxygen formation (Johnston et al., 1975) that has not been used previously to evaluate PMNs from infants.

Materials and methods

Cord blood was collected into sodium citrate (0.38%, final concentration) from the placental side of the divided umbilical cord of healthy, term infants. Contamination with maternal blood was estimated by the acid elution technique (Dacie and Lewis, 1968), and samples with >10% maternal erythrocytes were excluded. Although rarely mentioned in previous reports, this precaution should be a routine procedure when studying cord blood. Several samples consisted almost entirely of maternal erythrocytes (and presumably leucocytes) and would have been assumed, incorrectly, to represent infant blood. PMNs were isolated by standard techniques of dextran sedimentation, Ficoll-Hypaque centrifugation, and hypotonic lysis. Final suspensions were