CONDENSED REPORTS

Human milk bank in a district general hospital

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Summary and conclusions

A human milk bank was organised in the special care baby unit of a district general hospital. The staff of the unit and members of a voluntary organisation helped to contact donors and arrange collection of milk samples. Over two years 2093 samples of expressed breast milk were collected from 187 donors and examined bacteriologically. Of these samples, 1171 (56%) grew no bacteria. If the organism count exceeded $2\cdot5\times10^6$/l but was less than 1×10^9/l samples were subjected to mild heat treatment. If the count exceeded 1×10^9/l the milk was not fed to babies. Sixty-five babies received milk from the bank during the second year. Although these infants were vulnerable, mortality and morbidity were not adversely affected by the banked milk they received.

The cost of establishing and running a human milk bank need not be high. Extensive resources such as extra staff and laboratory and transport facilities were not needed. Enthusiastic co-operation and good will between hospital staff, voluntary helpers, and donors contributed greatly to the success of the scheme.

Introduction

The advantages of human breast milk over even the latest modified artificial milk have been well publicised.[1 2] Even though it is probably inferior to milk from the infant's own mother,[3] there is still some benefit in collecting breast milk from other mothers to give to certain groups of babies for whom all or some of the milk cannot be provided by their own mothers. These infants include those of low birth weight,[1] those who cannot tolerate cows' milk,[2] those who are particularly prone to infection,[3] and those who require additional feeds, when the mother intends to breast-feed herself.[4]

The cost of running a milk bank need not be high,[4] and we describe two years' experience of running a milk bank in a district general hospital, where few resources were needed besides good will, both voluntary and professional.

Methods

The bank is located in the special care baby unit in the maternity department (3000 deliveries a year) of a general hospital in outer London. It is organised partly by the staff of the special care baby unit and partly by members of a voluntary organisation who contact donors and help to arrange collection.

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Donors—These are found by the local branch of the National Childbirth Trust (NCT) and by staff of the maternity unit, as well as by other means. The donors do not undergo examinations or investigations but they are asked to withhold their milk when ill, and to notify us if they are receiving drugs. We received milk from 187 donors in two years.

Collection—Although some of the milk is collected during the first few days after delivery, mostly it is hind milk collected when breast-feeding is established. Occasional samples were collected as drips from nipple shields, but most were obtained by expression either manually or by vacuum pump. Before expressing the milk, the donor is asked to wash her nipples with soap and water. Milk is expressed directly into autoclaved glass bottles which are opened and used for only one expression. It is then kept in the domestic fridge until it is sent to the hospital, preferably within 24 hours.

Transport—Milk is brought to the hospital by NCT volunteers, donors or their husbands, nurses and doctors working in the maternity unit, and community midwives. None of these methods is costly, since the carriers usually do not have to deviate greatly from their daily routine. Many collections are done twice a week, but donors often give a sample when it is convenient to bring it to the hospital. The donor is asked to label each sample with her name, date of expression, and the name of any drug she is taking.

Reception and processing—Milk from each expression is kept separate and deep frozen (−20°C) for up to six weeks, while a few millilitres of milk are sent for bacteriological culture and colony count. If the sample contains a non-pathogenic count of less than $2\cdot5\times10^6$ organisms/l, that aliquot of milk will be given to a baby without further processing. If the organism count is more than $2\cdot5\times10^6$/l but less than 1×10^9/l the milk samples are individually placed in a sterile jug within boiling water for 10 minutes (milk temperature 63-65°C) shortly before being fed to infants. All milk that contained more than 1×10^9 organisms/l and grew *Staphylococcus aureus* or *Pseudomonas*, *Klebsiella*, or *Proteus* spp, or other enteropathogenic organisms was not fed to babies.

Recipients—During the second year of the bank's existence 65 infants received milk from it, and some milk was also sent to other neonatal units. Some infants were initially fed entirely on donated milk if they weighed less than 2 kg at birth or if they were ill, particularly if the mother ultimately intended to breast-feed herself. Three infants who were suspected of cows' milk allergy were initially given donated milk to augment mother's own milk.

Bacteriology—One 0·002-ml and recently 0·01-ml loopful of milk was inoculated on to blood agar and MacConkey agar aerobically, one colony on the plate representing 5×10^5 and 1×10^5 organisms/l respectively. One millilitre of milk was added to 10 ml of selenite F broth, which was incubated at 37°C for 48 hours, and then subcultured on to deoxycholate-citrate agar. This in turn was incubated at 37°C overnight to exclude enteric pathogens. The organisms were identified according to the methods of Cowan and Steel.[5]

Results

Between December 1975 and January 1978, 2093 separately expressed samples were collected, stored, and examined. Of these, 1171 (56%) grew no organisms, and 260 out of 317 samples (82%) subjected to heat treatment in a pilot study subsequently grew no organisms (table I). Table II shows the types of organisms isolated from samples contaminated by bacteria.

Multiple samples were studied in 33 women who donated at least 20 samples each, the maximum from one donor being 168. They were categorised into the type of growth and by the number of organisms isolated (table III). Application of the χ^2 test to each classification

TABLE I—*Bacterial counts in raw and heat-treated milk. Figures are numbers (%) of samples*

Bacterial counts (organisms/l):	No growth	$>5 \times 10^5$ but $<2{\cdot}5 \times 10^6$	$>2{\cdot}5 \times 10^6$ but $<1 \times 10^9$	$>1 \times 10^9$	Total No of samples
Raw milk	1171 (56)	88 (4)	515 (25)	319 (15)	2093
Heat-treated milk*	260 (82)	2 (0·6)	45 (14·2)	10† (3·2)	317

*Samples having initial counts $>2{\cdot}5 \times 10^6$ organisms/l but $<1 \times 10^9$ organisms/l were subjected to heat treatment.
†In these samples adequacy of heat treatment and length of time they were kept at room temperature are uncertain.

TABLE II—*Type of growth and bacterial counts of organisms isolated from 979 samples of milk. Figures are numbers (%) of samples*

Bacterial counts (organisms/l):	$>5 \times 10^5$ but $<2{\cdot}5 \times 10^6$	$>2{\cdot}5 \times 10^6$ but $<1 \times 10^9$	$>1 \times 10^9$	Total
Staphylococci (coagulase-negative)	65 (72·2)	293 (52·3)	23 (7·0)	381 (38·9)
Staphylococci (coagulase-positive)	6 (6·7)	8 (1·4)	5 (1·5)	19 (1·9)
Streptococcus faecalis	2 (2·2)	1 (0·18)	7 (2·1)	10 (1·0)
Escherichia coli	5 (5·6)	32 (5·7)	12 (3·7)	49 (5·0)
Klebsiella spp	2 (2·2)	7 (1·2)	16 (4·8)	25 (2·5)
Pseudomonas spp	2 (2·2)	8 (1·4)	20 (6·1)	30 (3·1)
Proteus spp	0	0	2 (0·6)	2 (0·2)
Coliform (other lactose and non-lactose fermenting organisms)	0	128 (22·9)	192 (58·4)	320 (32·7)
Enteric pathogens	0	0	0	
Mixture of various organisms	8 (8·9)	83 (14·8)	52 (15·8)	143 (14·6)
Total	90	560	329	979

TABLE III—*Type of growth and bacterial counts in 1454 samples of milk from 33 donors who gave 20 or more samples. Figures are numbers (%) of samples; figures for "no growth" are common to both groupings**

Type of growth		Samples with no growth	Bacterial counts (organisms/l) irrespective of species		
Staphylococci	Other organisms and mixed growths		$>5 \times 10^5$ but $<2{\cdot}5 \times 10^6$	$>2{\cdot}5 \times 10^6$ but $<1 \times 10^9$	$>1 \times 10^9$
274 (18·8)	420 (28·9)	760 (52·3)	217 (14·9)	261 (18)	216 (14·9)

*A more comprehensive table giving information on individual donors is available from the authors on request.

showed that the distribution of the organisms in individual donor's samples differed significantly from that expected ($P < 0{\cdot}001$). This difference in distribution of organism type was because milk from 15 of the women had at least 60% of samples in one category; organism counts were similarly distributed, samples from 24 of the women having at least 50% in one of the four categories.

As we expected, morbidity and mortality were increased among the infants, but we have no evidence that this was attributable to the donated milk. Two of these babies died of necrotising enterocolitis and two had transient diarrhoea of uncertain cause. Another had severe prolonged diarrhoea from the first day of life, apparently due to intolerance of most constituents of milk. An extremely immature infant later developed staphylococcal osteomyelitis that had probably been introduced by umbilical catheterisation.

Discussion

Boiling and even holder pasteurisation (62·5°C for 30 minutes) destroys some of the immune properties of human milk.[6] This is why we decided to keep each milk sample separate and use it intact without pasteurisation, provided that the bacterial count was low and non-pathogenic.[7] Moreover, it allows donors with consistently highly colonised milk to be detected. Unlike others, we have found separate bacteriological culture of samples quite practical.[8] The more heavily colonised milk may also be harmless, but we have no evidence of this. The donors were not otherwise screened—for example, by clinical or serological examination—though they were asked not to contribute while they were ill. In our own antenatal population, white women were found to have a 0·02% incidence of hepatitis B antigenaemia, which made it unlikely that any donor was a carrier.[9]

In our series 56% of fresh milk grew no organisms (table I). A pilot study showed that the rather mild "pasteurisation" procedure that we used caused 82% of the samples that originally had more than $2{\cdot}5 \times 10^6$ organisms/l to leave no growth subsequently. Of the 979 samples with organisms (table II), the most common were *Staphylococcus albus* and the group of coliform organisms excluding the well-known pathogens, and thirdly a group with a mixed culture. Lightly colonised milks had a particularly high incidence of *Staphylococcus albus* growth, with a small but definite proportion of *Staphylococcus aureus*, but practically no culture of coliform organisms. This contrasts with the heavily colonised samples, which mainly grew organisms resembling faecal flora, a greater proportion of them having mixed growth. No enteropathogenic organisms were isolated from milk samples. Donors tended to be moderately consistent through several samples in both size of growth and species, the difference between donors being much greater than that attributable to chance alone.

Milk was not checked for contamination with cows' milk or water. Donors were recruited in the maternity unit by staff, and outside hospital by the NCT. Occasionally a donor was notified by a friend or by a community midwife or health visitor. Although a little of the milk was "early milk" expressed during the lying-in period, most of it was collected when breast-feeding had been fully established, and was continued as long as the donor was able or willing.

Most breast-milk banks are described as needing extensive resources in terms of extra personnel and space, and laboratory and transport facilities.[4 7 10] The organisation of this bank was in the hands of the staff of the special baby care unit. The ad-hoc transportation arrangements bear some resemblance to the use of newspaper sellers in Paris,[10] but incurred no expenses apart from the cost of two insulated carrier bags and reimbursement for petrol expenses of volunteers and nurses. A deep-freezer was installed in the ward. Autoclaving of bottles was carried out by the existing service in the hospital and previously used milk-feed and infusion bottles were used. Apart from the economics, another advantage of this spontaneous arrangement has been

the close contact between hospitals, donors, and voluntary organisation. Further supplies may be obtained at any time by telephone if needed urgently. This is an example of the large store of practical good will existing between some members of the local community and the health service which seems hardly to have been capitalised yet.

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Respiratory syncytial virus infection: admissions to hospital in industrial, urban, and rural areas

Report to the Medical Research Council Subcommittee on Respiratory Syncytial Virus Vaccines

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Summary and conclusions

A collaborative study at 10 centres during the winters of 1973-4 and 1974-5 showed that respiratory syncytial virus (RSV) was the major cause of admission to hospital for respiratory disease in children under 5 years of age in industrial, urban, and rural communities. In all areas the distribution of clinical symptoms and their severity was similar, but the rate of admission in relation to population was over twice as high in industrial as in other areas. The maximum yearly admission rate occurred among infants aged 1 to 3 months: 24·5 per 1000 of that age group were admitted to hospital. Two methods of diagnosing RSV infection—virus isolation and immunofluorescence from postnasal aspirates—were compared, and the two methods were found to agree in 91% of cases.

The results of this study confirmed the importance of RSV as a respiratory pathogen in young children. Further studies are needed to determine how the virus produces its effects and to develop preventive measures.

Introduction

Respiratory syncytial virus (RSV) has a worldwide distribution, and major outbreaks of infection regularly occur in the winter months in Britain[1 2] and elsewhere.[3] RSV is the virus most often responsible for bringing children in Britain into hospital with respiratory illness[4 5] and is one of the main causes of acute respiratory failure in infancy.[6] In some patients the initial respiratory infection may lead to further respiratory problems during childhood.[7 8] The prevalence of illness caused by RSV outside hospital is difficult to assess, and incidences of 1·6%[5] and 2·9%[9] of respiratory illnesses seen in general practice are probably underestimates, especially when one remembers the large proportion of children with antibody to the virus by the age of 2 years.[10-12]

The aims of our collaborative study were to show the importance of RSV in different areas of the country and compare the severity of disease in industrial, urban, and rural communities. Immunofluorescence and virus isolation were compared in the participating laboratories as methods for the routine diagnosis of RSV infections.

Methods

The study was performed during the winters of 1973-4 and 1974-5. Ten centres in Britain serving industrial, urban, and rural populations took part. The centres were Edinburgh (industrial-rural), Newcastle and west Cumbria (industrial-rural), Blackburn (urban-rural), Manchester (industrial), Chester (urban-rural), Leicester (urban-rural), Cambridge (urban-rural), Oxford (rural-urban), Bristol (industrial-rural), and Exeter (urban-rural). An industrial area was defined as one with a population of over 400 000, an urban areas as one with a population of 50 000 to 400 000, and a rural area as one with no towns of 50 000 people or more.

Not every centre was able to provide all the requested data in analysable form. Certain centres have therefore been omitted from some of the analyses.

CLINICAL CATEGORIES

Children under 5 years old with respiratory infections who were admitted to hospitals associated with the virus laboratories in each centre were studied. The clinical diagnosis recorded was the final one, the following categories being used, based on those of Court[13]:

Upper respiratory tract infection (URTI)—a spectrum of illnesses with a range of overlapping symptoms including colds, pharyngitis, tonsillitis, and otitis media;

Febrile convulsions—acute febrile illness with one or more convulsions associated with suspected infections. Children in this group often showed other symptoms as well. Convulsions were recorded as a separate category only in the second winter of the study;

Participants in the trial were: Dr S K R Clarke, Dr B D Corner, Dr C Haines, Dr P G Swift, and Dr D Stevens, Bristol; Dr J Nagington and Dr D Gairdner, Cambridge; Dr P M Poole, Dr D W Fielding, and Dr G P McMullin, Chester; Dr H Simpson and Dr H Inglis, Edinburgh; Dr R J C Hart, Dr F S W Brimblecombe, Dr L Hass, and Dr R C I'E Orme, Exeter; Dr H Mair, Dr K Simpson, and Dr W Matheson, Leicester; Dr M Longson, Dr G Corbett, Dr A Holzel, and Dr B Wolman, Manchester; Professor P S Gardner, Miss J McQuillin, and Dr A J Martin, Newcastle upon Tyne; Dr A H Tomlinson, Dr M A Rossiter, Dr J M Scurlock, and Dr E H Smith, Oxford; Dr D N Hutchinson and Dr P D Moss, Preston.

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