

Human Milk Banking

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A human milk bank can be defined as an institution established for the purpose of collecting, screening, processing, storing and distributing donated human milk that is dispensed to recipients who are not the biological offsprings of the mother.

The concept of human milk banking is not a new one. As early as in the 17th and 18th centuries wet nurses were employed to breastfeed babies when their mothers were not in a position to do so. In fact to ensure adequate nutrition of the baby as well as the health of the wet nurse, rules were laid down for wet nursing (Taylor 1949). Gradually, as the availability of wet nurses dwindled, breastmilk banks were introduced early in the 20th century and were soon accepted as the technological alternative to the age old practice of wet nurses. The first official Milk Bank being opened in Vienna at the beginning of the century (Balmer, 1989). Soon a number of human milk banks were started in Europe, U.S. and Australia (Baum, 1990)

After the first world war, formula feeds gained popularity and many breast milk banks had to close down with only 3 milk banks existing in the early 70 's (Baum, 1990). With increasing scientific data supporting the nutritional and immunological superiority of breast milk in the late 70 's (Vahlquist, 1975) (Anderson, 1985) the tide turned,

the demand for donated human milk increased and human milk banks once again gained popularity. Another setback for milk banking was posed by the AIDS panic and its implication for breastmilk transmission.

In the 1990's we seem to be coming in a full circle with the nutritional and immunological superiority of breastmilk being reiterated on one hand and the growing literature on the role of human milk factors in inhibiting the HIV virus on the other hand (Orloff et al 1993, Newburg et al 1992, Arnold 1992).

Need For Human Milk Banking In A Developing Country

In India, though breastfeeding continues to be popular in rural areas, there is a declining trend especially in urban cities (Fernandes 1980, Gopujkar et al 1984). Urbanization, formation of more and more nuclear families resulting in loss of supporting senior female members of the extended family, non-conducive hospital feeding policies and ready availability of alternatives have contributed to this decline. Moreover with western influences creeping in, mothers in high society sometimes prefer not to breastfeed under the mistaken belief that modernization and emancipation are associated with bottle feeding (Fernandes & Savargaonkar 1989). Although the educated and affording mother may not face the complications of formula feeding as she can afford to buy sufficient milk, and has a fair concept of hygiene, most Indian mothers particularly in the slums run the risk of losing their babies of gastroenteritis and malnutrition when top fed. The incidence of Low birth weight is extremely high and if these babies have to survive in hospitals and when they go home, it is necessary to ensure breastmilk for our mothers in hospitals and continue to supply when they are at home.

Banking of human milk therefore serves multiple purposes in developing countries. It helps ensure a

continuous supply of safe human milk to sick and preterm babies and thus help reduce infection rates in hospitalised babies. Frequent expression of breastmilk in mothers whose babies are unable to suck would help maintain lactation. This in turn would reduce long term morbidity and mortality in babies. Moreover, emphasis on the use of human milk, either mother's own or banked milk has a positive influence on breastfeeding practices in the hospital itself and the community as a whole, thus arresting this declining trend.

Organisation of Human Milk Banks

Most milk banks in the west are established in conjunction with neonatal Intensive care units and are hospital based. The milk bank at the L.T.M.G. hospital is located in the Department of Neonatology and is under medical supervision. Also recommended are consultants from the Departments of Microbiology and the services of Lactation Management nurses (Fernandes et al, 1993).

Equipment

The minimum equipment required to set up a human milk bank includes refrigerators for receiving and for thawing of milk, freezers (preferably non defrosting) for storing the milk at -20°C, a generator to run the freezers and fridge in case of power failure. Pasteurizers are expensive, however shaker water baths with thermostatic control are easily available and much cheaper. The backup of a microbiology laboratory is generally available in larger hospitals (Hughes, 1990).

Donor Population

In a majority of milk banks the world over the donor population is community based i.e. voluntary donors who are enlisted, express and collect the milk at home and periodically deposit their collection in the bank. In striking contrast the donor population in reports from India (Fernandes et al 1990) are essentially hospital based i.e. the milk donations are made in hospital; there are two donor population groups

1. Those mothers expressing milk to feed their own

preterm or sick babies in the N.I.C.U., all of whom are admitted in the postnatal care (PNC) ward. (the surplus of this milk is then banked.)

2. Mothers in the PNC ward and those following up in the follow up clinics whose breastmilk is in excess of their baby's demands and are willing to donate.

The second group account for the major portion of the milk donated. Donors are provided with a glass of milk following donation, no payment is made.

Donor Selection Criteria

Most milk banks have their own criteria for donor screening depending on local experiences, advisory boards and current literature for set policies. An excellent comprehensive manual with guidelines for establishment and operation of a donor human milk bank (Hughes 1990) gives the details of the screening procedures recommended by HMBANA. In some states in the U.S. screening for Hepatitis B virus is required by law as a part of prenatal testing and this information is readily available from donor's physician (Pierce & Tully 1992). All milk banks in the west, have made serological screening of donors for syphilis, Hepatitis B and HIV mandatory (Mehta and Sivasubramanian 1990). In our country since the donor population is large and hospital based routine screening of all patients is not cost effective. Donor selection criteria have been laid down. To ensure safety of donated milk all the samples of milk are pasteurised.

Milk Collection Procedures

To ensure the highest quality of donated milk, all donor mothers are instructed regarding cleaning hands with soap and water and washing breasts with water prior to expressing milk. This advice is reinforced by written instructions which also includes information on washing and sterilizing milk pumps, handling of sterile containers, labeling and storing and transportation of mother's milk (Hughes 1990, Pierce & Tully 1992).

Milk can be expressed from the breast in a variety of

ways. Different types of hand or manual pumps are available. Milk banks generally own pumps which are rented or sold to mothers. (Mehta and Sivasubramanian 1990) Mechanical expression is also found to be effective with the use of electrical pumps. Pumped milk has been found to have a higher fat content and volume (Garza 1982). However hand expression is a low cost and effective means of expressing milk provided the mothers are taught the correct technique of expression (King 1977). A number of studies demonstrate that the incidence of bacterial contamination is least with manual expression especially if the first 5-10 ml of milk are discarded (Asquith and Harold 1979).

Another method of collecting milk is to collect the drip milk i.e. the milk which drips spontaneously from the non-feeding breast in about 20% of lactating mothers with the use of breast milk shells. Baum (1982) has reported that individual mothers may contribute between 10ml to 40 litres of drip breast milk. However in general drip milk has a lower calorific value due to low fat content and a high incidence of bacterial contamination (Baum, 1982).

Collection Of Storage Containers

Each milk bank has its own preference for the type of container used for collection and storage of milk. Any storage causes loss of some protective factors (Garza et al 1986) and the search is still on for the ideal type of container. Containers used may be of sterile glass or pyrex or different types of plastic. Various studies have demonstrated the benefits and drawbacks of different types of containers. Cylindrical wide mouthed stainless steel containers with close fitting caps have been used in our country.

Transport And Storage of Milk

Studies have shown that mother's milk kept at room temperature can be used fresh to feed an infant upto 10 hours (Ghildiyal et al 1990). However the potential for contamination is lesser if milk is refrigerated. Various studies support storing milk at 4°C from 24 hours to 5 days without increasing bacterial contamination while

retaining cell viability. In case of donors that are home based milk should be kept in the freezer till it is sent to the milk bank. In case of on site hospital milk collection milk is sent to the milk bank in insulated containers. In the milk bank milk is stored at -20°C.

Pooling Of Donor Milk

As the volume of milk donations range from a few hundred cc's to a few litres, it is the practice of most milk banks to pool donor milk. In some centres milk from five mothers is mixed to assure more consistent level of proteins (Tully 1991). Pooling of milk is generally done prior to heat treatment of milk bank. In those milk banks where serological screening of all donors for HIV is not practised all milk is subjected to heat treatment before use.

At the L.M.G. Hospital, Bombay, milk is pooled as soon as it reaches the milk bank prior to freezing. Care is taken to pool and store colostrum, preterm milk and mature milk separately (Fernandes et al 1993).

Heat Treatment Of Banked Milk

Storage and preservation of human milk has been of concern since the early days of milk banking. The emphasis being not only increasing the shelf life but also on techniques that preserve the unique components of human milk while preventing the transmission of disease. It has been found that pasteurization at 73°C for 30 minutes results in marked reduction in IgG, IgA, lactoferrin, lysozyme and C complement (WHO, 1988). Pasteurization at 62.5°C for 30 minutes (holder method) results in 30% loss of IgG, no loss of IgA, 56% loss of lactoferrin and 60% of lysozyme (Ruff et al 1992) and complete loss of lymphocytes (Liebhaber et al 1977). The technique of heat treatment has been sufficiently refined and currently heating milk aliquots to 56°C and maintaining it at this temperature for 30 minutes followed by rapid cooling of containers in an ice slurry is found to preserve > 90% of total IgA, lactoferrin and 100% of lysozyme, destroying 99% of pathogens including HIV virus (Eglin and Wilkinson, 1987) (Human Milk Banking Association 1992). Heat treatment is carried out using a

conventional pasteurizer designed for human milk pasteurization. However use of a shaker water bath with a thermostatic control is found to be equally effective and helps to cut costs. (Fernandes et al 1990). After heat treatment, an aliquot of processed milk from each batch is Bacteriologically tested and the containers are placed in a freezer till regained for babies. Any Bacteriological growth of organised is unacceptable for heat processed milk. Milk that does not meet these standards may be used for research only (Fernandez et al 1990). After heat treatment an aliquot of processed milk from each batch is bacteriologically tested and the containers are placed in a freezer till required for babies. Any bacteriological growth of organisms is unacceptable for heat processed milk. Milk that does not meet these standards may be used for research only (Fernandez et al 1990). Unprocessed fresh frozen milk can be kept in the freezer and should be used within three months from the date of collection. Whereas heat treated milk can be kept for upto six months without much change in its composition (Arnold 1988).

Distribution Of Banked Milk

Milk from the bank is distributed on a first – in – first – out basis, the oldest milk being used first. After removal from the freezer, the milk is thawed by keeping it in the refrigerator or in warm water, repeatedly shaking the container if rapid thawing is required. Stored heat processed milk can be kept for upto 72 hours at 4⁰ C (Hughes, 1990). While thawing frozen milk or warming refrigerated milk, the least possible amount of heat should be used. Refrigerated milk can be warmed by standing the container at room temperature or in luke warm water (Pierce 1992).

Recipients :

In a number of tertiary care centres where mother's milk is the only in house formula, banked milk is routinely used for first feeding of prematures weighing less than 1500 grams, when mother's own milk is not available (Fernandes et al 1993). In most centres abroad banked milk is available on medical prescription.

Problems Associated With Milk Banking

There has been a great concern about human milk being a vehicle for transmission of certain viruses especially the HIV virus (Ruff et al 1992) which has resulted in closing down of a large number of milk banks in the U.S.

In a study commissioned by the FDA, wherein the effects of heat treatment on HIV in human milk was explored, using the HMBANA's protocol for holder pasteurization it was found that the virus both cell free and infected cell form was destroyed at 56⁰ C and 62.5⁰ C and that no virus could be rescued when heat treated samples were recultured (Neuburg et al 1992). Other encouraging studies include the demonstration of an antiviral factor in breast milk that causes the viral activity to disappear within 30 minutes when milk spiked with all free HIV was held at 0⁰ C for 30 minutes. This antiviral activity is attributed to lipids in human milk following lipolysis. A mucinous glycoprotein associated with the human milk fat globule membrane has been implicated in the inhibition of the binding of HIV envelope protein to lymphocytes. As some amount of lipolysis occurs following storage, banked milk may actually be advantageous. Moreover this inhibitory effect is seen to persist following heat treatment (Newburg et al 1992 Arnold 1992). Thus stringent guidelines for milk banking related to donor screening and heat treatment of all milk samples where serological donor screening is not feasible brightens the outlook for milk banks in the future.

Breastmilk banking as an adjunct to breastfeeding is a need of the past, the present and needs to be continued right into the future (Arnold, 1992). Human milk banks have a pivotal role to play in developing countries. It ensures that every baby whether normal, preterm or sick will receive safe human milk.

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