



## Health Practitioners Knowledge, Beliefs, and Attitudes Regarding the Use of Donor Human Milk in Neonatal Intensive Care

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### Abstract

**Introduction** Human milk benefits developing humans, especially vulnerable preterm infants. In this population, given lack of mother's own milk [MOM], donor human milk [DHM] has emerged as a valid alternative. In Canada, access to donor milk banks has been limited, but increasing. We surveyed the attitudes, beliefs and knowledge regarding DHM use of staff at two neonatal intensive care units [NICU's], given recent access to a provincial DHM bank.

**Methods:** A survey was developed and sent to all staff at the David Schiff and Royal Alexandra Hospital NICU's, Edmonton, Alberta. The survey addressed knowledge regarding advantages and disadvantages of DHM, attitudes and beliefs regarding use, as well as perceived barriers to use.

**Results:** Respondents agreed that DHM should be first-line alternative when MOM is not available [91%]. Perceived benefits, of DHM over formula, included reduction in both NEC [65%] and sepsis [57%], and improved feeding tolerance [83%]. 35% responded that DHM was offered as an alternative to mother's milk more than 75% of the time at their institutions. Perceived barriers to the use of DHM included cost/funding [71%], access/restrictions [66%], and parent preference [60%].

**Conclusions:** Although use of DHM appears well supported by NICU staff, its current use was not in keeping with the level of support. This is despite the availability of a donor milk bank in Alberta since April 2012. The local barriers to use that were identified, and need to be addressed, include the cost as well as current policies regarding DHM use in both NICUs.

**Keywords:** Breast milk; Feeding; Maternal; Nutrition; WHO; Premature infants

### Background

Human milk has long been recognized as the ideal form of nutrition to support the growth and development of the healthy, term infant. Exclusive breastfeeding for the first six months of life is promoted by the World Health Organization as a global public health recommendation, a recommendation also supported by the Canadian Pediatric Society [1]. Recognized benefits of human milk to infants include improved gastrointestinal [GI] maturation, enhanced cognitive and neurodevelopment, reduced sudden infant deaths, and heightened defence against certain infections including GI infections, respiratory tract infection, and acute otitis media [2]. When it comes to premature infants, a vulnerable population at risk of serious infections and poor developmental outcomes, human milk appears to be even more important. Benefits to immunological and GI maturation have led to decreased incidences of sepsis and necrotizing enterocolitis [NEC] in this population when fed human milk [3]. Unfortunately in the case of premature infants, a mother's own milk [MOM] supply may not be available or sufficient for a variety of reasons. In this scenario, using donor human milk [DHM] is a valid alternative that has been shown to significantly reduce the risk of NEC as compared to infant formula, amongst other benefits [4-6]. Despite this, donor milk banks are not widely available in North America, with currently only three locations in Canada [Vancouver, Calgary, and Toronto] and fifteen in the United States [7]. With the proximity of the milk bank in Calgary [operational as of April 2012], we anticipate the neonatal intensive care units [NICUs] in Edmonton will be making use of the DHM it provides. The aim of this research was to identify and explore the current attitudes and beliefs of NICU staff with regards to the use of DHM, including perceived advantages, disadvantages, barriers, and utilization. We hypothesized that although DHM use may be well-supported by NICU

staff, the cost of DHM will be perceived as a major barrier to its use and implementation in Edmonton NICUs.

### Methods

An online survey tool was developed by two of the study authors [GM and JT] and then checked for face and content validity independently by the remaining authors [MA and SS] who had no role in the original survey design. The survey was distributed through anonymized e-mail lists to all staff at two NICUs in Edmonton, the David Schiff [DS] NICU at the Stuller Children's Hospital and the Royal Alexandra Hospital [RAH] NICU. One reminder e-mail was sent 1-3 months after the initial invitation to participate in the survey. The entire survey population was 242 individuals. Survey questions were formulated as belief statements and respondents were asked to express their agreement on a Likert scale from strong agreement to strong disagreement. The survey questions covered five main categories: benefits of breastfeeding, benefits of DHM, disadvantages of DHM, support or concerns for the use of DHM and potential barriers. Demographic questions were also included. In addition, a free text comment box was included under each category questioned. All responses were submitted over an approximate 5-month period [May

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to October 2013]. Institutional ethics approval as well as operational approval was obtained for distributing the survey at both sites.

## Results

A total of 83 responses were collected from both site, for an overall survey response rate of 34%. Respondent demographics are shown in Table 1. The majority of respondents were female [93%] and nurses or nurse practitioners [combined 69%]. Survey responses are detailed under each of the categories questioned in Table 2. 98% of respondents agreed or strongly agreed that breastfed preterm infants have lower rates of NEC, and 80% felt that DHM carried the same benefit. 91% felt that breastfed preterm infants had improved feeding tolerance as compared to those receiving infant formula, with a similar 83% acknowledging the same benefit for DHM. In evaluating possible disadvantages, 44% respondents disagreed or strongly disagreed that growth rate was slower in preterm infants receiving DHM, and 37% were neutral. The majority of respondents were strongly supportive of DHM as a safe, first line alternative when MOM was not available. Comments are quoted as examples of the more frequently expressed themes by respondents. Comments regarding the benefits and disadvantages of DHM included: "Benefits are seen mostly with fresh breast milk. Some of the benefits of breast milk are degraded by our processing of the milk; Donor human milk is not as immunologically protective because it comes from a different mother. Also, it can never be fresh, so some of the immunological properties are destroyed by its processing. Human milk definitely needs fortification for premature babies to allow for better growth and bone mineralization". Comments regarding the use of DHM included: "More emphasis needs to be on helping the mothers get their own breast milk. The access to Donor Human Milk is limited to babies that fit a certain criteria. Its use would be of greater value if made readily available for all infants of the NICU! A regulated donor milk bank is necessary because breast milk can now be bought online! That practice has to stop for safety reasons". In order to gauge the current institutional practices related to use of DHM participants were also asked to indicate how often they observed DHM to be offered as an alternative to human milk when mother's milk was insufficient or not available. In total 78 responded, 35% indicated 75-100% of the time; 28% indicated 50-75% of the time; 22% indicated 25-50% of the time; and 15% indicated 0-25% of the time. The top three barriers to the use of DHM identified by survey participants were cost, access/policy restrictions, and parental preference [71%, 66%, and 60% respectively]. Other barriers included availability [23%], provider preference [12%] and readiness for use when required [10%]. Comments regarding barriers to the use of DHM included: "It is my understanding that delivery costs contribute significantly to the very high cost of donor human milk. Perhaps a local milk bank would help alleviate this cost? and allow us to implement less restrictive eligibility criteria? Although we have a policy in place regarding the use of donor milk there are still 'cultural' barriers to implementing widespread use within the NICU I work in. There are misconceptions regarding availability and cost and concerns about resource limitation. There are cultural and religious reasons why some families will decline donor milk - we should be aware [of] those; in the NICU there is a perception that some mothers are made to feel inadequate - because they do not have milk yet even [though] the donor milk is supposed to be temporary transition milk".

## Discussion

DHM is being used in a minority of NICUs in Canada and North America, despite strong evidence that it significantly reduces morbidity and mortality in premature infants and improves neurodevelopmental

outcomes [4]. Most significantly, it decreases the incidence of NEC, a devastating condition that is responsible for significant healthcare costs [8]. Despite this only three donor milk banks are available in Canada, with the Calgary Mothers' Milk Bank being the first new bank to open in almost four decades [9,10]. This survey found most NICU staff agrees that DHM is beneficial and the majority support the use of DHM as a first-line alternative when MOM is not available. Therefore, it does not appear from the results of this local survey that a lack of frontline support for the use of DHM is a factor for limited implementation of DHM usage. Rather it would appear that perceived barriers by frontline staff, such as the costs or institutional policy, are realistic considerations that will need to be addressed for wider implementation. One of the main benefits of DHM is being protective against developing NEC [4,6]. While 98% of participants agreed that breastfeeding [using MOM] reduces NEC, a less robust response was seen in regards to DHM, with only 80% of participants supporting the same statement. This may be in part due to knowledge of some of the alterations in the components of human milk that occur as part of the pasteurization process. Pasteurization is one of the key processes in avoiding transmission of infectious agents and is done by heating the pooled milk product to 62.5°C for 30 minutes [Holder method] [11,12]. During this process, various bioactive and immune components are affected, including elimination of all cellular components [B cells, T cells, macrophages, neutrophils] and reductions in immunoglobulin's, as well as some enzymes and growth factors [6,12]. However, it remains that numerous components contained in breast milk are involved in the prevention of NEC and the effect of pasteurization on many of these remains unknown [12]. The question associated with the most divergent responses related to the relationship between DHM and infant growth when compared to formula feeding, with an almost equal number of those disagreeing vs neutral [44% vs 37%]. While the evidence does support that very low birth weight infants fed human milk can grow more slowly, this is the case for both MOM and DHM [6]. This would be important when counselling parents about risks and benefits of using DHM for their infant. However, recent studies suggest that with appropriate/targeted fortification growth

|                                     |                             | n (%)   |
|-------------------------------------|-----------------------------|---------|
| <b>Gender</b>                       | Female                      | 77 (93) |
|                                     |                             |         |
| <b>Age</b>                          | ≤25 years                   | 5 (6)   |
|                                     | 26-35 years                 | 32 (39) |
|                                     | 36-45 years                 | 19 (23) |
|                                     | 46-55 years                 | 24 (29) |
|                                     | ≥56 years                   | 3 (4)   |
| <b>Professional Role</b>            | Neonatal staff physician    | 5 (6)   |
|                                     | Neonatal fellow/resident    | 8 (10)  |
|                                     | Neonatal nurse practitioner | 19 (23) |
|                                     | Nursing                     | 39 (47) |
|                                     | Dietician                   | 3 (4)   |
|                                     | Lactation consultant        | 3 (4)   |
|                                     | Social worker               | 2 (2)   |
|                                     | Respiratory therapist       | 1 (1)   |
|                                     | Clinical nurse educator     | 1 (1)   |
| Administration/Other                | 2 (2)                       |         |
| <b>Length of time in Profession</b> | <1 year                     |         |
|                                     | 1-5 years                   | 2 (2)   |
|                                     | 5-10 years                  | 14 (17) |
|                                     | 10-20 years                 | 20 (24) |
|                                     | >20 years                   | 17 (20) |

Table 1: Demographics of Survey Respondents.

| Survey Responses   | n(%)           |         |         |          |                   |
|--|----------------|---------|---------|----------|-------------------|
|  | Strongly Agree | Agree   | Neutral | Disagree | Strongly Disagree |
| <b>Benefits of Breastfeeding</b>   |                |         |         |          |                   |
| 1) Preterm infants who are breastfed have lower rates of necrotizing enterocolitis (NEC) than those infants who receive infant formula.                                | 56(67)         | 25(30)  | 2(2)    | 0(0)     | 0(0)              |
| 2) Preterm infants who are breastfed have lower rates of infection than those infants who receive infant formula.  | 41(49)         | 35(42)  | 7(8)    | 0(0)     | 0(0)              |
| 3) Preterm infants who are breastfed have improved feeding tolerance compared to those infants who receive infant formula  | 51(61)         | 25(30)  | 7(8)    | 0(0)     | 0(0)              |
| <b>Benefits of DHM</b>   |                |         |         |          |                   |
| 1) Preterm infants receiving donor human milk have lower rates of necrotizing enterocolitis (NEC) than those infants receiving infant formula.                         | 34(42)         | 31(38)  | 15(19)  | 1(1)     | 0(0)              |
| 2) Preterm infants receiving donor human milk have lower rates of infection than those infants receiving infant formula.   | 25(30)         | 32(29)  | 24(29)  | 2(2)     | 0(0)              |
| 3) Preterm infants receiving donor human milk have improved feeding tolerance compared to those receiving infant formula.  | 33(40)         | 36(43)  | 13(16)  | 1(1)     | 0(0)              |
| <b>Disadvantages of DHM</b>  |                |         |         |          |                   |
| 1) Preterm infants receiving donor human milk have slower rates of growth compared to those infants receiving mother's own breast milk.                                | 2 (2)          | 20 (24) | 38 (46) | 19 (23)  | 3(4)              |
| 2) Preterm infants receiving donor human milk have slower rates of growth compared to those infants receiving infant formula.  | 3 (4)          | 13 (16) | 30 (37) | 27 (33)  | 9 (11)            |
| 3) Preterm infants who are given breast milk (mother's own or donor milk) have longer hospitalizations/NICU stays compared to those infants receiving preterm formula. | 0 (0)          | 2 (2)   | 9 (11)  | 37 (45)  | 34 (41)           |
| <b>Support/Safety of DHM</b>   |                |         |         |          |                   |
| 1) Donor breast milk should be a first-line alternative when breastfeeding is indicated but mother's supply is insufficient or unavailable.                            | 51 (62)        | 24 (29) | 4 (5)   | 3 (4)    | 0 (0)             |
| 2) Donor breast milk is a safe alternative to mother's own milk.   | 40 (49)        | 35 (43) | 4 (5)   | 2 (2)    | 1 (1)             |
| 3) I would support the establishment of a donor breast milk bank in my city/region.  | 53 (65)        | 25 (30) | 4 (5)   | 0 (0)    | 0 (0)             |

Table 2: Survey responses (n%).

rates can be improved, becoming equivalent to those preterm infants receiving formula [13,14]. With regards to barriers to using DHM, as hypothesized, cost and restrictions to access were the top two identified. When compared to infant formula that is provided to hospitals free of charge, any cost associated with DHM is additional. Currently, from the Calgary Mothers' Milk Bank, the donor milk comes at a cost of \$4.25/oz [\$17 per 120 mL bottle], with an additional cost of minimum \$85 for transportation [courier and shipping material] [Personal Communication, Megan Hallam, clinical coordinator of Calgary Mother's Milk Bank]. In one of the NICUs surveyed [RAH], over the 6-month period from July to December 2013, there was an average of 13.7 patients per day on DHM diet with an average total use of 18.8 bottles per day [~2.25 L] [Personal Communication, Andrea Littlejohn, patient food services University of Alberta Hospital]. This translates into an average cost per month range from \$10,000-12,000. Given the substantial cost, policies around distributing this limited resource are in place. The current policy used by the local NICUs requires infants to meet any of the following criteria: gestational age < 33 weeks; intrauterine growth restriction < 10th percentile; multiples when one of the infants meets criteria; initiation of enteral feeds post confirmed NEC; and only more recently, late preterm infants as a bridge to MOM supply. For those infants who meet criteria, 14 days of DHM are prescribed [5 days for late preterm < 37 weeks], though this period can be extended based on physician discretion. The approximate number of preterm neonates in 2014 who received DHM were 800-850. Interestingly, the third major barrier identified was parent preference, an area of DHM use that has not been well explored to date. In previously published works, many mothers in developing countries may refuse DHM for concerns regarding safety, namely possible infection [e.g. HIV], as well as some feeling the practice to be culturally unacceptable [15,16].

Even in resource-sufficient countries, ensuring the DHM was safe and screened appropriately was among the primary concerns of parents [17]. In a recent retrospective cohort study that investigated predictors of DHM non-consent based on 113 mother-infant dyads, the authors found that race [non-white] and marital status [married] were parental factors associated with refusal to use DHM [18]. Although the aim of this current study was health care professionals, clearly parents' beliefs and attitudes towards DHM use needs to be further addressed. As some of the respondents commented, aside from cultural or religious reasons why some may refuse DHM, using DHM can potentially cause feelings of guilt and inadequacy for mothers who are not yet producing their own milk supply. This study has several limitations we acknowledge. First, the survey had a low response rate. One of the reasons for this is some staff were employed at both sites and not all of them were able to be accounted for in the final tally. As such, there was some overlap in the total number of survey recipients for the two sites. Furthermore, through the e-mail lists, approximately 60 respiratory therapists [RTs] were invited to participate though there was only one response from this group. At this institution, RTs are not exclusively employed to the NICU setting and perhaps did not individually have sufficient exposure to it. In a day-to-day setting, they would also not be directly involved in the decision-making process regarding nutrition. Another limitation in the study is the nature of the NICUs that were targeted. The RAH NICU is the centre in Edmonton where the extreme premature infants are delivered, while the DS NICU is the surgical [medical and cardiac] NICU. As such, in dealing with extreme premature infants as well as post-NEC infants, both of these will have come into contact with DHM on a more frequent basis, and therefore may not be representative of the remaining two NICUs in Edmonton. Based on the demographics, respondents were biased towards female gender and the nursing

profession. This is reflective of the current NICU staff population that was invited to participate. However, given the low number of physician responses, the survey cannot accurately reflect on practice as these individuals typically will be directly prescribing the DHM. Nevertheless, the entire body of responses remains useful for evaluating the general atmosphere and attitude regarding DHM.

## Conclusion

With the proximity of a new donor milk bank, Edmonton NICUs now have access to DHM, an alternative to MOM that has been shown to be notably protective against NEC, a devastating illness for many preterm infants, with an estimated annual cost of \$500 million to \$1 billion in the United States [19]. The Staff surveyed at these two local NICUs were strongly supportive of its use and overall recognized its benefits as compared to infant formula. The largest perceived barriers to the prescription of DHM are the associated cost, strict policies regarding its use, and parent preference. Future efforts to further evaluate the use of DHM include an upcoming quality improvement audit on current practice, as well as establishing provisional guidelines for the use of DHM. More research is needed regarding parental views of DHM in our local population, specifically those parents who may refuse DHM.

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