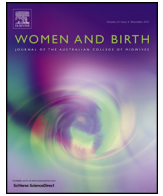




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REVIEW ARTICLE

Safe management of expressed breast milk: A systematic review

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ABSTRACT

Background: Expressed breastmilk may be contaminated by viruses and bacteria, or lose nutritional value due to maternal transmission, storage, or handling. Babies may also unintentionally receive expressed breastmilk from a different mother.

Aims: Conduct a systematic review of evidence from countries with incomes comparable to Australia to summarise the evidence around safe management of expressed breastmilk in terms of the risks of pathogen transmission, contamination and nutritional degradation from storage and transport, disinfection and cleaning procedures, and procedures to minimise misdilivery risk.

Methods: A search of the international literature sought papers published from 2008 until November 2014. The reference lists of included papers were screened for additional studies. Included papers underwent methodological appraisal and data were extracted.

Findings: Few pathogens that cause significant morbidity and mortality in developed countries had clear evidence of transmission through breastmilk. Short term storage (up to 96 h) at 6.8 °C appeared to be safe. Frozen storage was generally safe but results in immunological component degradation. Expert consensus suggests that several acceptable methods of cleaning, including using warm soapy water, or boiling. Breastmilk management policies appear to reduce misdilivery of breastmilk.

Conclusion: While there is a generally low risk of pathogen transmission via breastmilk, benefits must be considered against potential disease severity. Short-term refrigeration is generally acceptable for storage and transport. Freezing is often safe but causes degradation of immunological components. Universally, equipment used for expression and storage of breast milk should be well washed and disinfected. Effective breastmilk management policies can reduce risks of misdilivery.

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Summary of relevance:

Problem or issue

Infants may be at risk of infection due to pathogen transmission and/or mishandling of expressed breast milk. Current guidelines and recommendations for the management of expressed breast milk may require update and revision due to new evidence.

What is already known

There are a number of guidelines and recommendations for expressed breast milk management. Expressed breast milk may

contain pathogens and mishandling and/or misdilivery can put infants at risk of illness or death.

What this paper adds

This paper considered the best available, up to date evidence as well as current guidelines and recommendations to provide up to date guidance for maternity care providers.

1. Introduction

Ideally, newborn babies including those who are pre-term or ill should be fed breast milk.¹ It may be difficult for mothers to breastfeed, particularly if their baby is within a neonatal intensive care unit (NICU). Outside hospital settings, breastfeeding may not

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always be possible or practical; expressed breastmilk (EBM) may be fed as a substitute. A recent systematic review shows that feeding EBM is increasingly more common now that infant feeding equipment has become more readily available.² Mothers may transport EBM to work or day care centres for their baby to consume later.^{3–5} This paper reports upon the results of a systematic review undertaken to provide up to date evidence to underpin the development of policies for the safe management of EBM in New South Wales, Australia.

Breastmilk contains antibodies and immunologically protective factors; however it may also pose a possible risk of mother to baby postnatal bacterial and/or viral pathogen transmission. Few pathogens with clear evidence of transmission via breastmilk cause significant morbidity and mortality, however in such cases, feeding EBM should cease along with breastfeeding.⁶ Where multiple mothers may store EBM, such as a NICU or daycare centre, EBM may be unintentionally fed to the baby of different mother (the 'wrong' baby).^{7–9} This is known as 'misdelivery' and from a study conducted in the USA this occurs 0.07–0.14 times per 1000 feedings in a NICU.¹⁰ While tests following misdelivery rarely show positive results for infection, the importance of EBM misdelivery should not be undervalued as a hospital fault that may threaten the safety of babies.¹⁰ Misdelivery of even uncontaminated EBM from screened mothers may be distressing for mothers.¹¹

Expressed breastmilk may possess contamination by viruses and/or bacteria and can reduce in nutritional value from handling, transport or storage. Microorganisms may proliferate in EBM when collection or storage containers have not been disinfected or cleaned properly. Contamination can also occur if expression is not hygienically carried out. There are existing recommendations for hygienic practices around EBM expression, collection, and optimal handling.^{12,13} Breastmilk is not sterile, so storage can affect both the safety and nutritional quality of EBM. Storage at higher temperatures may lead to potentially dangerous proliferation of bacteria. Temperature also lowers the nutritional value of EBM. To preserve both nutritional content and reduce the risk of contamination it is important that the most effective ways of EBM storage and transport are understood.¹⁴ Freezing can provide protection against bacterial proliferation, however it also gradually denatures the nutritional components of EBM. While frozen storage may be helpful when long-term EBM storage is necessary, the nutritional quality of the milk is unavoidably compromised. In normal conditions, EBM contains many non-pathogenic bacteria and skin flora. These are generally safe for babies to consume and are actually beneficial to babies' developing digestive systems.^{13,15} Poor storage may, however, allow normally safe bacteria to multiply above safe levels and non-native bacteria may contaminate EBM.¹³ Immunological components are also present in EBM which are beneficial for especially pre-term infants. These immunological components are bactericidal and are adversely affected by prolonged storage at very low temperatures.

There is existing guidance in New South Wales (NSW), Australia around safe management of EBM and processes in the event of misdelivery.^{12,16} This systematic review is based upon and goes beyond an Evidence-Check conducted for the Sax Institute/NSW Kids and Families and was undertaken to locate, appraise, and synthesise the best and most up to date evidence to provide an evidence base to underpin the update and development of EBM management guidance in NSW. Four specific questions were posed by the review: (1) What are the risks of pathogen transmission from mother to baby? (2) What is the impact of storage and transport of EBM on contamination and nutritional quality? (3) What is the evidence about disinfection and cleaning procedures for handling EBM? (4) What operational procedures can to minimise the risk of EBM misdelivery?

2. Methods

This systematic review was based upon an approach specified in an a priori review protocol that pre-defined the inclusion criteria, search strategy, and approaches to methodological appraisal, extraction, and synthesis.

2.1. Inclusion criteria

Inclusion criteria were developed for the overall systematic review as well as for the individual review questions (see Table 1).

2.2. Search strategy

The PRISMA reporting guidelines were followed for the conduct of this review (see Supplementary File 1).¹⁷ The first phase of the search included searching common citation databases; including Medline (via PubMed), CINAHL, EMBASE, and the JBI Database of Systematic Reviews & Implementation Reports for papers published in or after 2008. Papers published before 2008 would be included if deemed by the authors to be a key source of evidence. The initial search terms were: *breastmilk, human milk, and express**. Indexing terms and subject headings for each of the databases were also added. Evidence from published, peer-reviewed papers was sought preferentially. Grey literature was also searched. The titles and abstracts of the articles that were retrieved were screened independently by each author against the inclusion criteria. The full text of studies selected at the title and abstract stage were then examined for inclusion. The reference lists of each included study was checked for further sources.

2.3. Assessment of methodological quality

The Joanna Briggs Institute's approach to methodological appraisal was adapted and used by the authors to develop predetermined criteria to determine the methodological quality of the identified evidence (see Supplementary File 2). The authors also assigned each paper a level of evidence using the Australian National Health and Medical Research Council (NHMRC) Levels of Evidence hierarchy (see Supplementary File 3).¹⁸

2.4. Data extraction

Details of each included study along with relevant data for each review question was extracted into tables independently by the three authors. Data were cross-checked for accuracy and completeness by all authors. Relevant information from grey literature was also extracted.

2.5. Data synthesis

Due to the heterogeneity of included studies in terms of population, study design, and outcomes, the data relevant to each question was synthesised and presented in narrative form.

3. Findings

The search identified 7093 articles for each of the four questions in total. The titles and abstracts of 2830 located studies were screened following the removal of 4263 duplicate citations. One hundred and nine potentially relevant studies were retrieved in full text for detailed examination. Ten studies were identified as a result of inspecting the reference lists of the included studies. A single paper that was published before 2008 included data relevant for Question 4.¹⁹ Five grey literature sources were included.

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