# Identification of the causes of waste human milk in a human milk bank.

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## Abstract

*Human Milk Banks (HMBs) are subject to reduced donations and disposal collection to processing. Objective: To identify the causes of human milk waste in HMB. Materials and methods: A descriptive, retrospective, cross-sectional study of the secondary data recorded in the medical records files in the HMB Information during the processing, so it is necessary to identify the main causes of waste from System of a public tertiary hospital, regarding to human milk donors and recipient newborns, between January and December 2000. 2017. Descriptive statistical analysis was performed by Statistic Package for Social Sciences version 25.0. Results: We selected 383 donors and 149 newborns who received human milk that had complete records in the system. From the initial volume (711,854.14 mL of human milk), the 13.74% waste was concentrated in the selection and classification phases (9.04%). The causes of human milk waste were Dornic acidity (6.98%), off-flavor condition (5.50%) and dirt (2.01%). The waste of concentrated human milk in the selection and classification phase. Conclusion: The causes of sample waste in the selection and classification phases are high Dornic acidity, off-flavor condition and dirt. The recommendation is to guide the collection by the HMB team to the donors to reduce waste in the human milk bank.*

***Keywords:*** *Human Milk; Human Milk Bank; Quality control; Lactation; Breast-feeding.*

## 1. Introduction

The Human Milk Banks (HMBs) are facilities aimed to supply human milk (HM) to newborn (NB) under special conditions, who cannot feed on their mothers' breasts. In this way, they receive milk from a donor or from their mother's own milk by a probe or a little cup[2]. It is up to the HMB to receive and process HM from various donors of different ages, economic, social, cultural and nutritional conditions[3]. Prematurity, a

condition considered less than 37 weeks, is one of the special requirements for the recipient, according to RDC no. 171[4].

With the intention of increasing the interest in human milk and breastfeeding, since 1990, a series of legal and internal measures have been created in many public health hospitals so that the infants would receive HM as long as possible since the first hours of life[5].

The repercussion of this interest was replicated in the formation of the Brazilian Network of Human Milk Banks (BNHMBs), considered the most complex in the world, with 218 HMB and 194 collection points in Brazil. The Center-West Region has five HMBs, and Maria Aparecida Pedrossian University Hospital (HUMAP) has been the medical referral center since 1995. These HMBs follow strict standardization and ensure that recipient infants consume an innocuous risk-free product, which is possible from processes and analyzes that consider the packaging, storage, temperature, transport, color, *off-flavor*, physicochemical composition and microbiological evaluation[4]. Thus, one of the challenges in optimizing the services of the Brazilian HMBs is quality control, which begins with the donation and finalises with the HM consumption by the newborn.

It must be emphasized that in order to meet a growing demand for breast milk from the milk bank, there is a need to increase the donations, and this requires capturing, donor maintenance and monitoring of each phase of processing to avoid waste. In view of this finding, this research has established the following scientific hypothesis: If the causes of human milk waste are discovered, interventions can be made, so consequently there will be a reduced waste. Thus, the purpose of this study was: to identify the causes of human milk waste in HMB.

## 2. Materials and methods

A Descriptive study of a quantitative cross-sectional retrospective approach to secondary data of human milk donors and recipients attended by the Human Milk Bank of Maria Aparecida Pedrossian University Hospital, Brazilian Hospital Services Company (HUMAP-EBSERH), Federal University of Mato Grosso do Sul (UFMS), in 2017.

Records that were available and complete were included in the Human Milk Bank Management System (HMBMSWeb) of the DataSUS Human Milk Bank Network, and the 2017 HUMAP Medical Records File Systems, Campo Grande, MS. Such cutting was given to enable the analysis of one year of assistance of the studied service. Data which presented incomplete, unavailable or with erasures were excluded.
A Descriptive statistical analysis was performed by calculating measures of central tendency, mean and standard deviation, and the *Statistical Package for Social Sciences* (SPSS), version 25, was applied. The *Shapiro Wilk* Test was employed for a significance level of 5%. for determination of normal distribution.
The ethical principles of research involving human beings were respected, according to Resolution 466/12. The research was forwarded to the UFMS Research Ethics Committee under Protocol No. 2,866,363.

## 3. Results and discussion

In order to identify the causes of human milk waste to reduce human milk losses in a reference milk bank for Mato Grosso do Sul, data were analyzed of 383 donors, of which 93.29% performed prenatal care in a health care unit (HCU), and 149 newborns (NB) admitted to the ICU.

From the initial volume of human milk collected, 711,854.14 mL after defrosting, (Table 1), the volume of HM loss in the processing phases was 97,790.00mL (13.74%). There was a higher concentration in the selection and classification phase with 64,350 mL (9.04%).

In the first phase, selection and classification, there was a higher HM loss than is allowed, due to Dornic acidity (6.98%), non-conforming *Off flavor* (5.50%) and presence of dirt (2.01%). The term nonconforming was applied to classify milk losses that had two or more causes at the same time. By analyzing the second phase, the pasteurization phase, the loss was 0.20% of the total amount of milk due to a single cause, broken vial, which removed the total of 1,400 mL (0.20%). In the third phase, the microbiological quality control (total coliform survey), the total HM waste was 31,640 mL (4.44%) and loss of 400mL by broken vial, totaled 32,040 mL (4, 50%) of the initial volume (Table 1).

**Table 1 -** Volume of human milk losses according to processing phases of Selection and Classification, Pasteurization, Determination of total coliforms, BLH HUMAP / Campo Grande, MS, Brazil - 2017

| Reason of loss | Processing time | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Selection and classification | | Pasteurization | | Determination of the total coliforms | | | |
| | Vol. loss (mL) | Loss% | Vol. loss (mL) | Loss% | Vol. loss (mL) | Loss% | Vol. loss (mL) | Loss% |
| **Durt** | 14330 | 2,01 | 0 | 0,00 | 0 | 0,00 | **14330** | **2,01** |
| ***Flavor*** | 39140 | 5,50 | 0 | 0,00 | 0 | 0,00 | **39140** | **5,50** |
| **Acidity** | 49660 | 6,98 | 0 | 0,00 | 0 | 0,00 | **49660** | **6,98** |
| **Colouring** | 5650 | 0,79 | 0 | 0,00 | 0 | 0,00 | **5650** | **0,79** |
| **Packaging** | 3150 | 0,44 | 0 | 0,00 | 0 | 0,00 | **3150** | **0,44** |
| **Breakage** | 1020 | 0,14 | 1400 | 0,20 | 400 | 0,06 | **2820** | **0,40** |
| **Total Coliforms** | 0 | 0,00 | 0 | 0,00 | 31640 | 4,44 | **31640** | **4,44** |
| **Total** | **64350** | **9,04** | **1400** | **0,20** | **32040** | **4,50** | **97790** | **13,74** |

**Initial volume: 711.854,14 mL; Final Volume: 614.064,14 mL; Loss volume: 97.790,00 mL (13,74%)**

Source: BLH/HUMAP/MS – 2017

In this research, the 383 donors were responsible for a total of 614,064L of processed HM that benefited 149 newborns treated at the HMB, in 2017. In a study carried out in a municipality of Paraná State, from

2013 to 2014, with 57 women registered in the HMB, the production from donations was 402,748 L[6].

When discussing the number of donors registered in the HMBs and the volume of donations collected and processed, divergent aspects were observed among the data presented in these two surveys, which led to questionings. Given the number of women enrolled in HMB / HUMAP in this study, should the HM production not be higher? What factors would actually be interfering? These inquiries led to the assumption that perhaps some of these registered donors would be seeking to donate only in the engorgement phase for pain relief, or only once at their discharge.

In a study with 30 women in labor at HUMAP-EBSERH, an interview was carried out to identify the knowledge and practice of parturients about HM donation. Of the 27 who wished to be donors, nine donated due to "excess milk"[7]. Among those who did not adhere to the practice of donation, the reasons given were: "I did not seek to donate; little milk; difficulty milking"[7]. In another study with 36 donors registered at the MHB/DF, the reasons cited were overproduction of milk and altruism. In the specific cases of multiparous women who first donated, they revealed that they could have donated in previous births. Therefore, the authors believe that non-donation may have occurred due to misinformation, lack of institutional support and initiative[8].

A different experience with effective actions to promote breastfeeding and donor recruitment involved multiprofessional training in a HCU located in a community of Rio de Janeiro, developed during two years. The way the actions were performed at home allowed interactions during management between the nurse and the professional of the HCU. The increase in donor recruitment and donated HM was mainly due to staff support during home visits. This privileged facility, in addition to strengthening the bond between professional and potential donor, allowed the early identification of risk situations[1].

This research revealed that of the initial volume collected of 711,854.14 mL, the total loss in processing and quality control was 97,790.00 mL (13.74%), with the highest concentration in the selection and classification phase. Higher loss was observed in a study conducted at the HMB of Maceió-AL in 2006, in which 175,470 mL of the total volume collected (345,370 mL) were discarded.[9]

The most frequent causes of HM waste during processing were high Dornic acidity, followed by *Off flavor* and dirt. However, in some situations, the loss occurred due to non-compliance of more than one criterion in the present study, which did not occur in the Rio Grande do Norte HMB, where the comparison between raw and pasteurized HM showed no significant difference[10]. Both crematocrit (which estimates fat concentration and its energy value)[11] and Dornic acidity (physicochemical control by titration) serve as classificatory parameters for HM[12].

According to DRC no. 171, the recommended Dornic acidity parameters (expressed in ºD) approved for human consumption is <8 ºD.[13] This method has been shown to be effective in evaluating bacterial growth in 200 samples of HM performed at the HMB Fernandes Figueira Institute in Rio de Janeiro[14].

*Off-flavor* was found in 5.50% of the waste samples in the selection and classification phase in this study. Human milk has the sorption capacity (absorption and adsorption) of volatile substances; the term flavor means "a physical-psychological sensation of the interaction of taste and odor of a food"[15,] while *off-flavor* designates an unsuitable milk characteristic for consumption[16]. A study of 10 samples of HM donors conducted in Taiwan to verify the rancid taste of stored frozen HM. The milk was distributed in three 50 mL glass vials, one fresh sample refrigerated for less than 24 hours, one sample frozen for seven days and the last one frozen for 30 days. Lipolysis and freezing time have been found to activate the rancid taste in HM[17].

In Minas Gerais HMB, a high HM loss was observed due to inadequate donor practices. They concluded that these were mainly due to non-compliance or total or partial non-compliance with the guidelines for biosecurity of HM extraction and stock by donors. This behavior was persistent even with the prior and continued reception of guidelines[18].

In the donors' homes, the lack of attention to monitoring the temperature of refrigerators causes a favorable condition for microbiological multiplication and consequent increase in acidity[19].

It is noteworthy that the donors in the MHB / HUMAP receive sterile glass vials for the packaging of the HM and are previously oriented about the hygienic-sanitary procedures necessary for the extraction and storage of the HM, according to the rules of the National Health Surveillance Agency and the Brazilian Network of HMB[4]. Home practice tends to differ from what is oriented and most of the problems involving the quality of the HM result from domestic extraction and storage, with frequent contamination by elements of this environment[20].

In this study, the total coliform rate identified was 4.44% (31,640 mL) after pasteurization. However, in a research conducted in 2003 at the same institution, it was shown that, from a microbiological point of view, milk collected from the HMB showed a negative rate for total coliforms after pasteurization, while externally collected milk showed a positive result[21].
From the advice on appropriate utensils, temperatures and practices followed during the procedures, there is a possibility that, through continued actions, health education can reduce process losses and establish safe and reliable habits for the preservation and processing of HM[22].

## 4. Conclusion

The total processing loss is 97,790.00 mL (13.74%), with the higher concentration in the selection and classification phase. The causes of human milk disposal during HMB processing are Dornic acidity, followed by *Off flavor* and dirt. However, in some situations, the loss occurs due to non-compliance in more than one of these criteria.
The recommendation is the ongoing training of HMB staff to ensure quality of service. In addition to proper donor monitoring and guidance to reduce losses in the human milk bank.

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