

PAPER • OPEN ACCESS

## Physical Characteristics of Stored Breastmilk During Storage in Cooler Bag

To cite this article: D N Mustika *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **292** 012051

View the [article online](#) for updates and enhancements.

### You may also like

- [Modeling and analysis of transport in the mammary glands](#)  
Ana Quezada and Kambiz Vafai
- [Strontium biokinetic model for the lactating woman and transfer to breast milk: application to Techa River studies](#)  
N B Shagina, E I Tolstykh, T P Fell et al.
- [The Community Health Volunteers description in Exclusive Breastfeeding Promotion and Improved Knowledge Through Training Based on The Concept of "Insufficient Milk Supply"](#)  
A. Kartikasari, M. Dwi Anggraeni, L. Latifah et al.





**ECS** The Electrochemical Society  
Advancing solid state & electrochemical science & technology



### 242nd ECS Meeting

Oct 9 – 13, 2022 • Atlanta, GA, US

Presenting more than 2,400 technical abstracts in 50 symposia

 **ECS Plenary Lecture** featuring **M. Stanley Whittingham**, Binghamton University Nobel Laureate – 2019 Nobel Prize in Chemistry

 **Register now!**



# Physical Characteristics of Stored Breastmilk During Storage in Cooler Bag

**D N Mustika<sup>1</sup>, S Nurjanah<sup>2</sup>, Y N S Ulvie<sup>3</sup>**

1,2 Midwifery Program. 3. Nutrition Program. Faculty of Health and Nursing Sciences

Universitas Muhammadiyah Semarang

Jl. Kedungmundu Raya No. 18, Semarang, Central Java, Indonesia

Corresponding author: dian.nintya@unimus.ac.id

**Abstract.** Exclusive breastfeeding is breast milk given to babies until the baby is 6 months old without being given food and drink, except for drugs and vitamins. Breastfeeding in Indonesia has not been fully implemented. Efforts to improve breastfeeding behavior in mothers who have babies especially exclusive breastfeeding are still lacking. Some of inhibiting factor of exclusive breastfeeding is often experienced by working mothers, including knowledge and conditions that are inadequate for working mothers. Workers must be milking during working hours if they want to give exclusive breastfeeding. This research was conducted descriptively with cross-sectional design. The sample in this study was breast milk from six (6) Working Mother. The results were analyzed descriptively. The results showed that the saving age of stored breast milk which consisted of color, smell and consistency.

**Keywords:** Stored breast milk, color, smell, consistency

## 1. Introduction

Exclusive breastfeeding is breast milk that is given to babies until the baby is 6 months old without being given food and drink, except drugs and vitamins. The right to obtain ASI is stated in Law No. 36 Article 128 paragraph 1 which states that every baby has the right to get exclusive breast milk from birth until 6 (six) months, except for medical indications [1].

The National Policy for exclusive breastfeeding for 6 months has been stipulated in Ministerial Decree No. 450 / Menkes / SK / IV / 2004 [2]. Exclusive breastfeeding has also been regulated in the Joint Regulation of the Minister of State for Women's Empowerment, Minister of Manpower and Transmigration, and Minister of Health No. 48 / MEN.PP / XII / 2008, PER.27 / MEN / XII / 2008, and 1177 / MENKES / PB / XII / 2008 Year 2008 concerning Increasing Giving of Breast Milk During Working Hours at Work ("Joint Rules") [3]. In the Joint Regulation, among other things, it was stated that the increase of breastfeeding during work time in the workplace is a national program to achieve exclusive breastfeeding for 6 (six) months and continued breastfeeding until the child is 2 (two) years old. The purpose of this joint regulation is to provide opportunities for female workers to give breast milk during work time and to store dairy breast milk to be given to their children, fulfill the rights of women workers to improve the health of mothers and their children, fulfill the rights of children to get breast milk to improve nutrition and child immunity, and improve the quality of human resources from an early age.



Breastfeeding in Indonesia has not been fully implemented. Efforts to improve breastfeeding behavior in mothers who have babies especially exclusive breastfeeding are still lacking. The main problems are socio-cultural factors, awareness of the importance of breastmilk, health services and health workers who have not fully supported PP-ASI, the promotion of formula milk and working mothers [4].

Data shows that babies who received exclusive breastfeeding in Indonesia were only 15.3% [5]. One of the main causes of low breastfeeding in Indonesia in addition to socio-cultural factors, is also the lack of knowledge of pregnant women, families and communities.

Central Java Health Profile Data in 2015 showed the coverage of exclusive breastfeeding was around 61.6%, an increase compared to 2014, which was 60.7% and in 2013 that was 52.99%. District / city with the lowest percentage of exclusive breastfeeding is Semarang City with the percentage of 6.72%, followed by Kudus 13.1%, and Tegal 33.4%. There are some problems related to the achievement of exclusive breast feeding coverage. Firstly there are many companies that do not provide an opportunity for mothers who have infants 0-6 months to carry out exclusive breastfeeding, this is evidenced by the unavailability of the coping room and its supporting devices. Other problems included the fact that there are still many health workers at the service level who do not care or have not taken sides in fulfilling the rights of babies to get exclusive breastfeeding, which is still encouraging formula feeding for 0-6 months babies, and also not maximizing education, socialization, advocacy campaign related to breastfeeding [6].

Some of the things that hinder exclusive breastfeeding include, inadequate conditions for working mothers, low knowledge of mothers and families regarding the benefits of breastfeeding and the correct method of breastfeeding, lack of lactation counseling services and support from health workers, socio-cultural factors and incessant marketing of formula milk [7]. The results of Wulandari's research [8] stated that some working mothers in the Tandang Village in Tembalang District did not practice stored breast milk, while the results of the research from Wahyuni mentioned that a special policy was needed from the companies regarding the provision of stored breast milk and its storage. Workers must milking during working hours if they want to give breastmilk exclusively. However, this is not easy because the company must provide a lactation corner consisting of a sofa / seat and a fridge. The lack of facilities provided for breastfeeding mothers, makes working mothers reluctant to run exclusive breastfeeding. To stored breast milk, mothers must pay attention to the temperature level and duration of storage time to keep it safe for the baby. Stored breast milk storage at room temperature of 15 0C, safe for consumption in 24 hours. As for the room temperature of 19-22 0C stored breast milk lasts for 10 hours. Room temperature is 25 0C, you should keep stored breast milk for 4-8 hours. If stored breast milk is fresh stored in a refrigerator with a temperature of 0-4 0C, breast milk can last up to 3-8 days. While the stored breast milk storage time is fresh in the freezer depending on the device model. If stored in the freezer in a one-door refrigerator, stored breast milk is safe for consumption for up to two weeks. Whereas for the freezer in a two-door refrigerator, storage time, up to 3-4 months. If stored in a special freezer with under 18 0C, stored breast milk is safely stored for up to 6-12 months [9].

Based on the description, the researchers wanted to examine the saving age, total bacteria and acidity of pasteurized stored breast milk on working mothers based on cooler bag storage time. The results of this study are intended, so that working mothers do not hesitate to exclusively breastfeed their babies. Cooler bag is an alternative for stored breast milk if there is no refrigerator in place where the mother work. Thus, exclusive breast milk can still be run for 6 months and continued until the baby is 2 years old.

## 2. Methods

This research is experimental research. Research on the saving age of the stored breast milk was conducted at the Microbiology Laboratory of the Faculty of Nursing and Health Sciences, University of Muhammadiyah Semarang. The saving age of stored breast milk is seen based on color, smell and consistency. The material used in this study was breast milk obtained from

mothers who breastfed their babies aged 3-5 months, media Nutrient Agar (NA), physiological NaCl solution 0.85%, alcohol, aquades. The tools used in this study are ASI pumps, 15 dot bottles, 15 glass bottles, cooler bags, blue ice, pots, stoves, thermometers, petri dishes, volume pipettes, erlenmeyer, measuring cups, glass cups, test tubes, autoclaves, incubators, cotton, spirits, ice cupboards.

#### Data Collection Technique

##### 2.1. Sample Preparation

Breast milk was pumped and put on the bottle. Then sterilization was done by boiling at 100 °C for approximately 10 minutes. Breast milk was obtained from mothers who were breastfeeding their babies aged 3-5 months. Breastfeeding was initiated by cleansing the breast with warm water. Breast milk was pumped gradually and then put into a bottle up to 75 ml and then homogenized. Stored breast milk at low temperatures is carried out in a cooler bag for 8 hours. Breast milk is placed in a bottle made of glass.

Pasteurization Equipment such as stoves, pans and thermometers were prepared. The bottle was boiled in water with a temperature of 60-65 °C for 30 minutes, then each pipette 15 ml each and put it in another bottle that has been sterile and immediately closed again.

### 3. Results and Discussion

#### 3.1. Age

Saving age is a period of time when a food product will remain safe, maintain certain sensory, chemical, physical and microbiological properties, and in accordance with the information labeling nutrition data, when stored in certain conditions. Observations on color, smell and consistency in breast milk during storage are as follows :

##### 3.1.1 Color

Breast milk color testing is carried out descriptively where researchers observe what changes occur during storage. The results obtained can be seen in Table 1. Visual observation of breast milk color by the researcher obtained results that breast milk stored for 0 days did not experience changes in color either fresh breast milk, stored breast milk in the cooler bag and stored breast milk in a pasteurized cooler bag. Whereas in breast milk with 1 day storage has experienced separation of colors to yellowish white with yellow upper part clearer. This change occurs due to changes including separation of cream and liquid, cream of yellowish milk that is more dominant in the upper part of breast milk and white in the lower part.

Table 1. Descriptions of Breastmilk Color Based on The Storage Time

Respondent	Storage Place	Time of Storage	
		Day 0	Day 1
Respondent 1	<i>Fresh</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer )
	<i>Cooler bag</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer )
	<i>Cooler bag pasteurisation</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)
Respondent 2	<i>Fresh</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)
	<i>Cooler bag</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)
	<i>Cooler bag pasteurisation</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)
Respondent 3	<i>Fresh</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)
	<i>Cooler bag</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)
	<i>Cooler bag</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)

Respondent 4	<i>pasteurisation</i>		clearer)
	<i>Fresh</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)
	<i>Cooler bag</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)
Respondent 5	<i>Cooler bag pasteurisation</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)
	<i>Fresh</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)
	<i>Cooler bag</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)
Respondent 6	<i>Cooler bag pasteurisation</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)
	<i>Fresh</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)
	<i>Cooler bag</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)
	<i>Cooler bag pasteurisation</i>	Yellowish white	Yellowish white (Yellow in the upper part is clearer)

According to Aminah and Isworo [10], the color change in breast milk that occurs in breast milk storage with the appearance of a clearer yellow color appears to be associated with other parameters, namely the separation of cream and liquid so that the yellow milk cream appears to be at the top. The organoleptic yellowish color seen in breast milk indicates the presence of colostrum. According to Almatsier et al [11] the yellowish color of colostrum is caused by relatively high carotene content. Colostrum has a lower energy content than breast milk produced later. Colostrum also has a higher mineral content of sodium, potassium and chloride than ASI. The composition of colostrum nutrients changes from day to day, which is caused by unstable breast secretion patterns. According to Murti [12] normal milk color is a yellowish white turbid compound. The cloudy character is taken from irradiation which is transmitted by protein particles and fat granules. When milk contains smaller amounts of fat, milk will spread more light so the product looks whiter as in homogenized milk. Muchtadi et al [2] explained that the milk-white color is a reflection of light by fat globules, calcium caseinate and phosphate colloids.

### 3.1.2. Smell

The smell test of stored breast milk is also done descriptively, where the researcher observes any changes that occur during storage. Based on the results of the study (table 4.8) in fresh breast milk, breast milk stored in a cooler bag and pasteurized, the aroma of breast milk stored for 0 days is still a typical smell of breastmilk. Whereas in the first day of storage, there was a change in smell, namely the smell of rancid smell in breast milk with storage in a cooler bag and pasteurized. While the fresh ASI smells very rancid/sour.

**Table 2. Description of breastmilk smell based on the time of storage**

Respondent	Storage	Time of storage	
		Day 0	Day 1
Respondent 1	Fresh	Breastmilk smell	Very rancid
	Cooler bag	Breastmilk smell	Rancid
	Cooler bag pasteurization	Breastmilk smell	Rancid
Respondent 2	Fresh	Breastmilk smell	Very rancid
	Cooler bag	Breastmilk smell	Rancid
	Cooler bag pasteurization	Breastmilk smell	Rancid

Respondent 3	Fresh	Breastmilk smell	Very rancid
	Cooler bag	Breastmilk smell	Rancid
	Cooler bag <i>pasteurization</i>	Breastmilk smell	Rancid
Respondent 4	Fresh	Breastmilk smell	Very rancid
	Cooler bag	Breastmilk smell	Rancid
	Cooler bag <i>pasteurization</i>	Breastmilk smell	Rancid
Respondent 5	Fresh	Breastmilk smell	Very rancid
	Cooler bag	Breastmilk smell	Rancid
	Cooler bag <i>pasteurization</i>	Breastmilk smell	Rancid
Respondent 6	Fresh	Breastmilk smell	Very rancid
	Cooler bag	Breastmilk smell	Rancid
	Cooler bag <i>pasteurization</i>	Breastmilk smell	Rancid

According to Muctadi et al [2], if breast milk shows other abnormal smells or smells such as acidic smell, it indicates that decomposition of milk elements due to the growth of bacteria and other microorganisms, such as decomposition of lactose into lactic acid causes acid odor. While Tridjoko (2014) explained that milk contaminated with lactose decomposing bacteria will form acid because of the appearance of pyruvic acid and continued with lactic acid or acetic acid formation.

### 3.2. Consistency

breast milk consistency testing is also done descriptively, where researchers observe what changes occur during storage. The results of the consistency of breast milk during storage showed a less noticeable change on day 0 concentrated dilute consistency both in fresh breast milk, stored breast milk in a cooler bag and pasteurized. Whereas on the first day, the cream granules appear larger in fresh breast milk, and when stirred cannot be homogeneous. Whereas in stored breast milk in the cooler bag on the first day, the cream granules are clearly visible and larger in size, and cannot be homogeneous when stirred. In contrast to the first day of breast milk which was pasteurized, there were cream grains and a thin layer on the surface. Observation results can be seen in table 4.

**Table 3. Descriptions of breastmilk consistency based on the time of storage**

Respondent	Storage	Time of storage	
		Day 0	Day 1
Respondent 1	<i>Fresh</i>	Concentrated liquid	Liquid, bigger cream granules, not homogeneous when stirred
	<i>Cooler bag</i>	Concentrated liquid	Liquid, bigger cream granules, homogeneous when stirred
	<i>Cooler bag pasteurization</i>	Concentrated liquid	Thick liquid, cream granules, thin layer on the surface
Respondent 2	<i>Fresh</i>	Concentrated liquid	Liquid, bigger cream granules, not homogeneous when stirred
	<i>Cooler bag</i>	Concentrated liquid	Liquid, bigger cream granules, homogeneous when stirred
	<i>Cooler bag pasteurization</i>	Concentrated liquid	Thick liquid, cream granules, thin layer on the surface

Respondent 3	<i>Fresh</i>	Concentrated liquid	Liquid, bigger cream granules, not homogeneous when stirred
	<i>Cooler bag</i>	Concentrated liquid	Liquid, bigger cream granules, homogeneous when stirred
	<i>Cooler bag pasteurization</i>	Concentrated liquid	Liquid, bigger cream granules, homogeneous when stirred
Respondent 4	<i>Fresh</i>	Concentrated liquid	Liquid, bigger cream granules, not homogeneous when stirred
	<i>Cooler bag</i>	Concentrated liquid	Liquid, bigger cream granules, homogeneous when stirred
	<i>Cooler bag pasteurization</i>	Concentrated liquid	Liquid, bigger cream granules, homogeneous when stirred
Respondent 5	<i>Fresh</i>	Concentrated liquid	Liquid, bigger cream granules, not homogeneous when stirred
	<i>Cooler bag</i>	Concentrated liquid	Liquid, bigger cream granules, homogeneous when stirred
	<i>Cooler bag pasteurization</i>	Concentrated liquid	Liquid, bigger cream granules, homogeneous when stirred
Respondent 6	<i>Fresh</i>	Concentrated liquid	Liquid, bigger cream granules, not homogeneous when stirred
	<i>Cooler bag</i>	Concentrated liquid	Liquid, bigger cream granules, homogeneous when stirred
	<i>Cooler bag pasteurization</i>	Concentrated liquid	Liquid, bigger cream granules, homogeneous when stirred

Based on the theory of crystal damage, according to 1988 Desrosier in the research of Aminah and Isworo, 2012, the growth of ice crystals generally damages the quality of foodstuffs. Slow freezing gives crystal growth opportunities. Ice crystal growth is one of the factors that influence the quality of frozen foodstuffs. During the freezing process takes place on the subtrack there will be an increase in electrolyte levels which cause irreversible changes in the colloidal structure, the protein freezes. In this study the storage used is included in the slow freezing category.

#### 4. Conclusion

The color of stored breast milk began to change after being stored for 1 day, experiencing separation of the color to yellowish white with a clear yellow upper part. For the smell there was a change in the storage of day 1, which was the smell of rancid in breast milk with storage in the cooler bag and pasteurized. While the fresh breast milk smells very rancid / sour. In breast milk stored in the cooler bag on the first day the cream granules are clearly visible and larger in size, and cannot be homogeneous when stirred. In contrast to the first day of breast milk which was pasteurized, there were cream grains and a thin layer on the surface.

#### References

- [1] Asosiasi Ibu Menyusui Indonesia. 2012. *Hak Ibu Menyusui di Indonesia*. <http://aimi-asi.org/>.

- [2] Muchtadi, T.R, Sugiyono, F. Ayustaningwarno. 2010. Ilmu Pengetahuan Bahan. Bandung : Penerbit Alfabeta.
- [3] Peraturan Bersama Menteri Negara Pemberdayaan Perempuan, Menteri Tenaga Kerja dan Transmigrasi dan Menteri Kesehatan Nomor 48/MEN.PP/XII/2008, PER.27/MEN/XII/2008 dan 1177/MENKES/PB/XII/2008 tentang Peningkatan Pemberian Air Susu Ibu Selama Waktu Kerja di Tempat Kerja
- [4] Arimurti, Ida. 2007. *Kebijakan Departemen Kesehatan tentang Peningkatan Pemberian ASI bagi Pekerja Wanita Indonesia*.
- [5] Kementerian Kesehatan RI. 2010. Riset Kesehatan Dasar. Jakarta.
- [6] Dinas Kesehatan Provinsi Jawa Tengah. 2015. Profil Kesehatan. Semarang
- [7] Roesli, Utami. 2005. *Mengenal ASI Eksklusif*. Jakarta: Trubus Agriwidya.
- [8] Wulandari, A., Wulandari Meikawati dan Novita K. 2013. *Hubungan Tingkat Pengetahuan dan Sikap Terhadap STORED BREAST MILK dengan Praktik Pemberian STORED BREAST MILK pada Ibu Bekerja di Kelurahan Tandang Kecamatan Tembalang Kota Semarang*. Semarang: Jurnal Kebidanan Vol.2, no.2 (2013)
- [9] Fazriyati, Wardah. *Jangan Asal Menyimpan ASI, Ikuti Metodenya*. <http://female.kompas.com/read/2010/09/03/1501441/jangan.asal.simpan.asi.perah.ikuti.metodenya>. Diakses pada 3 September 2010.
- [10] Aminah, S. dan J.T. Isworo. 2012. *Pengaruh Penyimpanan Pada Suhu Rendah Terhadap Umur Simpan dan Total Bakteri Air Susu Ibu*. Prosiding Hasil Seminar Nasional. Lembaga Penelitian Universitas Muhammadiyah Semarang.
- [11] Almatsier, S., S. Soetardjo., M. Soekarti., 2011. *Gizi Seimbang Dalam Daur Kehidupan*. Jakarta : PT. Gramedia Pustaka Utama.
- [12] Murti, T. W., 2014. *Pangan, Gizi dan Teknologi Susu*. Yogyakarta : Gadjah Mada University Press