

# Comparison of Holder-pasteurized versus shelf-stable human milk

Three independent research studies have compared Holder pasteurization and shelf-stable (retort) pasteurization. The results showed a high loss of bioactive factors in shelf-stable human milk, which may contribute to different health outcomes for medically fragile infants. More research is warranted before retort-processed milk can be recommended for fragile infants. This table compares the results of those three studies.

	Meredith-Dennis (2017) <sup>1</sup>	Lima (2017) <sup>2</sup>	Lima (2018) <sup>3</sup>
Pasteurization types	Holder; shelf-stable	Raw; Holder; shelf-stable	Raw; Holder; shelf-stable
Sample size	N=3 per milk type, each type received from a different milk bank	N=36 total from the same pool	N=36 from the same pool 12 samples raw, 12 Holder, 12 shelf-stable
Study design	Cross-sectional (each milk type was from different donors and had different pool size)	Cross-over (each milk type was from the same combined milk pool of 60 donors)	Cross-over (each milk type was from the same combined milk pool of 60 donors)
Lactoferrin	*Higher in Holder vs. shelf-stable	Not measured	Not measured
Immunoglobulins	*Higher IgM and IgG in Holder vs shelf-stable	Holder retained 87% sIgA; shelf-stable retained 11% sIgA	Not measured
Lysozyme	*No difference between Holder vs. shelf-stable	Holder retained 54%; shelf-stable retained 0%	Not measured
HMO	*Higher in Holder vs. shelf-stable	Not measured	Not measured
lysine	Not measured	Not measured	Raw=0.85mg/100ml Holder=0.77mg/100ml shelf-stable=0.68mk/100ml
Thiamine	Not measured	Not measured	Raw=0.24 mg/L Holder=0.26mg/L shelf-stable=0.14mg/L; p<0.01
Bacteria levels	Not measured	B. Cereus detected in 3 Holder samples; no bacteria detected in shelf-stable	Not measured
Other	Holder was higher in protein, fat, caseins ,a-1-antitrypsin, a-lactalbumin and osteopontin, likely due to the fact that Holder milk was from preterm donors.	Not measured	Not measured
Conclusions	Differences in processing, pooling of milk, and stage of lactation may contribute to differences in nutrient and bioactive composition, warranting further research.	Significant loss of bioactive proteins in shelf-stable milk compared to Holder. Holder requires post pasteurization testing for B. Cereus. HMBANA milk bank do not dispense milk with B. Cereus or other pathogens detected.	Macronutrient content is relatively unaffected by processing. Lysine and thiamine were significantly decreased in shelf-stable milk but not by Holder. Thiamine losses are clinically significant and fortification may be necessary.

## References

1. Meredith-Dennis I. et al. (2017) Composition and variation of macronutrients, immune proteins, and human milk oligosaccharides in human milk from nonprofit and commercial milk banks. *J Human Lact*, 2018, Vol. 34 (1), 120-129.
2. Lima H. et al. (2017) Bacteria and bioactivity in Holder pasteurized and shelf-stable human milk products. *Current Developments in Nutrition*. Vol. 1 (8), <https://doi.org/10.3945/cdn.117.001438>.
3. Lima H. et al. (2018) Nutritional Comparison of Raw, Holder Pasteurized, and Shelf-stable Human Milk Products. *JPGN* Vol. 67 (5), 649-653.

	HMBANA Holder Pasteurized Milk	Retort Sterilized Milk
<b>Meredith-Dennis (2018)</b>		
Immune-protective proteins	N=3 per milk type, each type received from a different milk bank	N=36 total from the same pool
Macro Nutrient	Higher fat & nitrogen	Least fat
	Carbohydrate same	Carbohydrate same
		Lowest IgA, IgG, IgM
	Highest lactoferrin, lactalbumin, antitrypsin, casein	Lowest lactoferrin (2-3x less), 74% less lactalbumin, antitrypsin, casein
		Lowest osteopontin
Human Milk Oligosaccharides	2x higher oligosaccharides	Lowest oligosaccharides
<b>Lima (2017)</b>		
	54% More lysozyme	No detected lysozyme activity
	Retained 87% of sIgA	Retained 11% of sIgA
<b>Lima (2018)</b>		
		Less lysine & thiamine content

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### Research backs it's more than just food

- + Human Milk Banking Association of North America (HMBANA) member milk banks provide Holder Pasteurized milk which research has shown protects more nutrient and immune components of milk to better protect fragile infants.
- + Holder pasteurized milk retains more sIgA and lysozyme activity.
- + Retort sterilized milk has less immune-protective factors than Holder Pasteurized milk provided by HMBANA milk banks.
- + Lower macronutrients, bioactive proteins, and human milk oligosaccharides in retort sterilized milk.
- + Less bioactive factors in shelf-stable retort sterilized milk may impact health outcomes of medically fragile infants.

QUESTIONS?

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