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## A mini review on technique of milk pasteurization

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### Abstract

The process of pasteurization was debated in the House of Commons and the suggestion made that no raw milk should be sold for human consumption. This would mean installation of expensive machinery by every supplier, and if it should become compulsory there is little doubt that many small firms would shut down and the business pass in the hands of a few big dealers.

If we are to be compelled to drink pasteurized milk, we should at least understand what pasteurization means. It set out to accomplish two things: Destruction of certain disease carrying germs and the prevention of souring milk. These results are obtained by keeping the milk at a temperature of 145 degrees to 150 degrees F. for half an hour, at least, and then reducing the temperature to not more than 55 degrees F. Pasteurization can be done as a batch or a continuous process. A vat pasteurizer consists of a temperature controlled, closed vat. Milk bacteria like acid producers, Gas producers, ropy or stinky fermentation, proteolytic and lipolytic bacteria which are killed by process of pasteurization.

**Keywords:** Milk, pasteurization, pasteurization temperature, Bacillus, *Coliforms*

### Introduction

A process named after scientist Louis Pasteur which uses the application of heat to destroy human pathogens in foods. For the dairy industry, the terms "pasteurization", "pasteurized" and similar terms shall mean the process of heating every particle of milk or milk product, in properly designed and operated equipment, at a specific temperature and held continuously at or above that temperature for at least the corresponding specified time <sup>[1]</sup>.

Pasteurization is the process of heating every particle of milk or milk product. Pasteurization involves heating food to a temperature that kills disease-causing microorganisms and substantially reduces the levels of spoilage organisms. Pasteurization or pasteurisation kills microbes (mainly bacteria) in food and drink, such as milk, juice, canned food, and others. It was invented by French scientist Louis Pasteur during the nineteenth century. Unlike sterilization, pasteurization is not intended to kill all microorganisms in the food. Instead, it aims to reduce the number of viable pathogens so they are unlikely to cause disease (assuming the pasteurized product is stored as indicated and is consumed before its expiration date). Commercial-scale sterilization of food is not common because it adversely affects the taste and quality of the product.

### Significant events in the development of Milk Pasteurization

1765 the Italian naturalist, Spallanzani, noted that boiling preserves meat extracts.

1782 the Swedish chemist, Scheele, preserved vinegar by boiling

1810 Appert used heat treatment to preserve foods (closed container).

1861 the "germ theory" was developed

1864 Pasteur reported that heat application to wine and beer prevents acid, bitter and ropy defects in wine. (This process was termed "pasteurization".)

1867 Pasteur applies heat to milk and reports the process postponed milk souring.

1886 the heating of milk (boiled in a bottle) for infant feeding reduced illness and saved lives by eliminating pathogens was advocated by Soxhlet (Germany), Jacobi (U.S.).

1893 Straus set up facility to pasteurize milk for infants. The first medical commission was formed to oversee the production of "certified milk".

1920's "Endicott studies" occurred in Endicott, NY by dr's north and pack developing temperature destruction curves relative to mycobacterium and tuberculosis

1924 the Usphs created "the office of milk investigations" under the strong leadership of Leslie Carl frank.

1924 the state of Alabama worked closely with the Usphs to develop the first federal milk ordinance patterned after "the Alabama standard milk grading ordinance."

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1941 Pyrex heat-resistant glass piping used in dairy industry as a means of conserving critical materials during wartime.  
 1952 several states met in St. Louis to discuss the problems of reciprocity for shipping milk across state lines. This was the first national conference on interstate milk shipments. Also much recognition to Dr. C.A. Abele and Dr. Everett wallenfeldt for their early pioneering efforts in the development of the grade a milk program.  
 1953 the first 3-a standard for CIP cleaning was published.  
 1955 the first automated CIP system installed in an Ohio milk plant.  
 1956 minimum temperature for vat pasteurization was raised from 142 of to 145 of based on heat resistance of coxiella burnetii. Based on university of california-davis studies in late 1940's 1966 FDA memorandum accepts dual stem (CIP) flow diversion device to be used in htst systems.  
 1978 first u.s. uht "sterile" milk system commissioned in Georgia.  
 1979 magnetic flow meter systems found acceptable for use as replacement for conventional timing pumps.  
 1985 major salmonellosis outbreak in Chicago spawned increased emphasis on milk processing sanitation, became

known as the "dairy initiatives". Emphasis placed on in-depth FDA and state ratings involving down- time equipment inspections, product sampling, and tracing product flows to evaluate possible cross connections.  
 1986 Listeria outbreaks in California fuels further investigations on post pasteurization contamination problems in cheese and milk plants. Computer controls accepted for milk pasteurization systems  
 1994 salmonella outbreak traced to ice cream. Probable etiology was hauling of raw liquid eggs in milk tanker which was used to subsequently haul pasteurized mix. Freezing and packaging was done without re-pasteurizing the mix. Large numbers of culture confirmed cases.  
 1994 contaminated water in a plant was suspected cause of packaged milk transmitting E. coli to consumers in Montana. Failure of well disinfectant led to subsequent contamination of pasteurized milk storage tank culture confirmed cases plant closed [2]

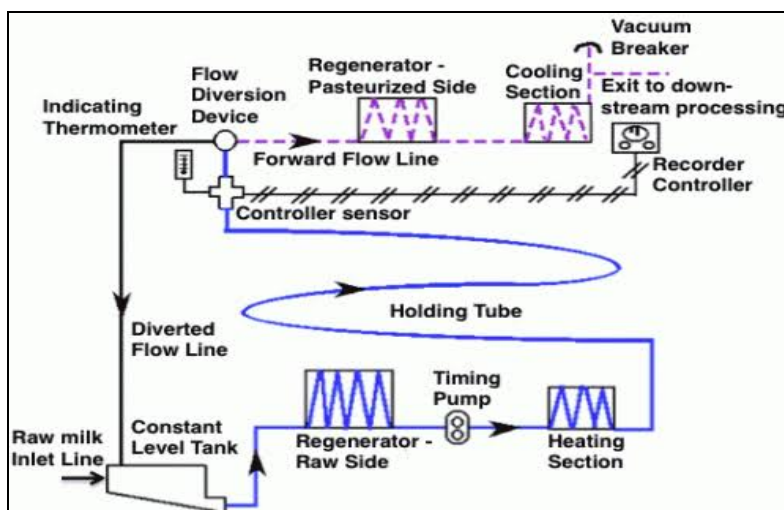
**Types of pasteurization**

**Table 1:** Types of milk pasteurization Process of pasteurization of milk [4]

Temperature	Time	Pasteurization Type
63°C (145°F)*	30 minutes	Vat Pasteurization
72°C (161°F)*	15 seconds	High temperature short time Pasteurization (HTST)
89°C (191°F)	1.0 second	Higher-Heat Shorter Time (HHST)
90°C (194°F)	0.5 seconds	Higher-Heat Shorter Time (HHST)
94°C (201°F)	0.1 seconds	Higher-Heat Shorter Time (HHST)
96°C (204°F)	0.05 seconds	Higher-Heat Shorter Time (HHST)
100°C (212°F)	0.01 seconds	Higher-Heat Shorter Time (HHST)
138°C (280°F)	2.0 seconds	Ultra Pasteurization (UP)

There are four common types of milk pasteurization that vary with temperature and time the milk is held at that temperature [5].

- Vat Pasteurization
- High Temperature/Short Time (HTST)
- Ultra-pasteurization (UP)
- Ultra-High-Temperature (UHT)



**Fig 1:** Milk Pasteurization Technique [6]

### Micro-organisms killed by pasteurization

Acid producers- *Streptococci*, *Lactobacilli*, *Microbacteria*, *Coliforms*, *Micrococci* Gas producers- *Coliforms*, *Clostridium butyricum*, *Torula cremoris* Ropy or stringy fermentation- *Alcaligenes viscolactis*, *Enterobacter aerogenes* Proteolytic organisms- *Bacillus spp.*, *Pseudomonas spp.*, *Proteus spp.*, *Streptococcus liquefaciens* Lipolytic organisms- *Pseudomonas fluorescens*, *Achromobacter lipolyticum*, *Candida lipolytica*, *Penicillium spp* <sup>[7]</sup>

### Conclusion

Pasteurization certainly has its place. But its widespread use to process most of the foods we consume, simply to improve the bottom line of large corporations (by allowing for long-term warehousing and long-distance shipping of foods, and skimping of proper cleanliness practices), is not only not necessary but harmful to our health.

It is undoubtedly beneficial to destroy dangerous germs, but pasteurization does more than this it kills off harmless and useful germs alike, and by subjecting the milk to high temperatures, destroys some nutritious constituents.

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