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Dairy Foods Science Notes

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Pasteurized versus Ultra-Pasteurized Milk - Why Such Long Sell-By Dates?

Pasteurization and Ultra-Pasteurization are heat processes that are designed to kill bacteria (germs) in milk that may be harmful and/or may cause spoilage of milk products. These bacteria are sometimes found in raw milk from the farm, which is why drinking raw milk is not recommended. Milk from farms is transported to dairy processing plants and is generally heat processed within a few days after milking to prevent spoilage and to prolong its shelf-life. “*Shelf-life*” can be defined as the length of time that a food can be held under recommended or practical storage conditions and still maintain its “freshness” or acceptable quality. The anticipated shelf-life of milk is reflected in its “sell-by” or “code-date,” while many products remain fresh for a period after this date (2-5 days). Both Pasteurized and Ultra-Pasteurized milks should be held under refrigeration at all times. The major differences between Pasteurized and Ultra-Pasteurized milks are the intensity of the heat treatment and the method of packaging, both of which influence the anticipated shelf-life and sell-by dates.

Pasteurization: “Pasteurized” means that the milk has been heated to a minimum of 161°F for a minimum of 15 seconds or 145°F for 30 minutes (for equivalent kill of bacteria), and packaged under clean and sanitized conditions. Some bacteria survive pasteurization, most often in very low numbers, though they are not considered harmful and will generally not spoil milk under normal refrigerated holding conditions and times. Spoilage of pasteurized milk before its time is most often caused by bacteria that contaminate the milk after the pasteurization process and/or from improper refrigeration. Most dairy processors prevent this type of contamination, though it still occurs at times due to errors at the processing plant. Typical spoilage bacteria found in milk do not cause disease or illness, although the consumer will often find spoiled product to be offensive. A few types of bacteria that survive pasteurization can eventually spoil milk, but this generally occurs later in shelf-life (past code). The shelf-life of pasteurized milk held under proper refrigeration, defined as less than 45°F, can range from 12 to 21 days post processing. Holding pasteurized milk at temperatures above 45°F will shorten the shelf-life dramatically; the colder the milk the longer it will last, the warmer the milk, the quicker it will spoil. Ideal storage temperatures for milk and dairy products are 34-38°F. Under ideal refrigeration, most pasteurized milk will remain fresh for 2-5 days after its sell-by date. Once opened, pasteurized milk should be used as soon as possible for best quality and taste.

Ultra-Pasteurized Milk: “Ultra-Pasteurized” means that the milk is heated to a minimum of 280°F for a minimum 2 seconds. This temperature and time combination is much more lethal to bacteria, killing virtually all of concern in milk. Ultra-pasteurized milk is also packaged under near sterile conditions, which makes recontamination with spoilage bacteria unlikely and rare. Though Ultra-Pasteurized milk is processed to be free of spoilage and harmful bacteria, it is not considered sterile because it is not hermetically sealed (i.e. canned), thus, it requires refrigeration. Ultra-Pasteurization is most often used for creams and specialty dairy products though its use for milk is becoming more popular. Ultra-Pasteurized milks will often have more of a “cooked” flavor when compared to conventionally pasteurized milks. The average shelf-life of Ultra-Pasteurized milk products is 30-90 days when held under refrigeration, but only until the product is opened. Once an Ultra-Pasteurized product is opened it may become contaminated with spoilage bacteria. Thus, after opening, Ultra-Pasteurized milk should be kept well refrigerated (34-38°F) and consumed within 7-10 days for best quality and taste.

Pasteurized vs. Ultra-Pasteurized Milk

<u>Parameter</u>	<u>Pasteurized</u>	<u>Ultra-Past.</u>
heat treatment	72°C (161°F)/15 sec	138°C (280°F)/2 sec
bacterial kill	some survival	nearly “sterile”
recontamination	possible/likely	prevent/minimized
equipment	sanitized/exposed	sterilized/closed
fill equipment	limited protection	protected
package material	paper, plastic	paper, plastic
package treatment	untreated	treated with H ₂ O ₂
product storage	refrigerated	refrigerated
shelf-life	10-21 days	30-90 days

Pasteurized vs. Aseptic (UHT) Milk

<u>Parameter</u>	<u>Pasteurized</u>	<u>UHT</u>
heat treatment	72°C (161°F)/15 sec	138°C (280°F)/2 sec+
bacterial kill	some survival	nearly “sterile”
recontamination	possible/likely	prevent/minimized
equipment	sanitized/exposed	sterilized/closed
fill equipment	limited protection	sterile environ
package material	paper, plastic	hermetic seal
package treatment	untreated	sterilized
product storage	refrigerated	shelf-stable
shelf-life	10-21 days	6 months +

UHT = Ultra High Temperature