

Article 4

What happens to milk at the dairy?



Milk and other dairy products are an important way for us to get nutrients we need to live and grow. Many people also enjoy the taste of dairy products.

But milk hasn't always been as safe to drink as it is today. Before the twentieth century, food producers did not have refrigerators and stainless steel tanker trucks to help them get food to consumers. Even though dairy farmers took great care to keep their animals clean, harmful bacteria found in the milk sometimes made people ill. Serious diseases could be contracted from drinking milk that was spoiled by coming into contact with harmful bacteria during milking or transportation.

Milk naturally contains bacteria that feed and grow on the nutrients in the milk. Some of the bacteria might make people sick, so raw milk must first be pasteurized before a dairy processor uses it to make dairy products.

Pasteurization

A French scientist, Louis Pasteur, discovered that quickly heating and then quickly cooling milk killed harmful bacteria without changing the milk's nutrient value. This process is called **pasteurization**, after the man who invented it. When Pasteur conducted his experiments, he was looking for a way to make foods and beverages safer for people.

Pasteur worked with **fermentable liquids**. These liquids are substances, such as milk, that allow bacteria to grow. The growth of bacteria causes fermentable liquids to spoil.



Did You Know?

Milk comes out of the cow warm, at the cow's body temperature. It is quickly cooled on the farm when farmers move it to refrigerated storage tanks. These tanks keep the milk's temperature at 40° C.

Milk is never touched or handled. Pipelines move the milk to the storage tank, where it is stored until the tank truck comes to pick it up. A tank truck is like a giant thermos! It keeps milk cool on its way to the dairy processing plant.

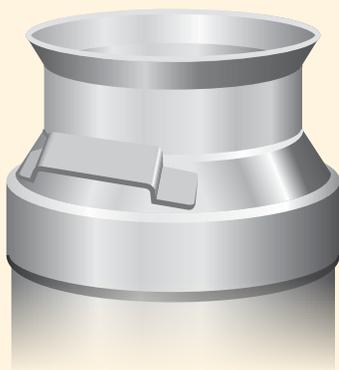
It only takes about 2 days from the time milk leaves the cow until it's on the grocery store shelves. Why do you think milk *mooves* so quickly?

Milk will spoil because bacteria breaks down the lactose. **Lactose** is a sugar molecule that is found in the milk of animals. If milk is not kept cold enough, the bacteria breaks the lactose down and forms **lactic acid**. This acid is what causes milk to sour. Soured milk smells bad but will not change colour.

Today, milk is pasteurized using the **HTST** (High Temperature, Short Time) process. In most dairies, the milk is heated to at least 72°C for 16 seconds and then cooled to 4°C. Some dairies use pasteurization processes that use different temperatures and timing. Most milk sold in Alberta has gone through HTST pasteurization.

Another way to pasteurize milk is called **UHT** (Ultra High Temperature). In this process, the milk is heated to at least 138°C for 2 seconds. Then it is quickly cooled to 2°C. This milk is almost sterilized by the high heat, which kills most bacteria. The milk is packaged under germ-free conditions, in a spotlessly clean plant. Therefore, the milk can be stored safely in the unopened container, at room temperature, for up to six months. Once opened, it too needs to be kept in the refrigerator.

Did You Know?



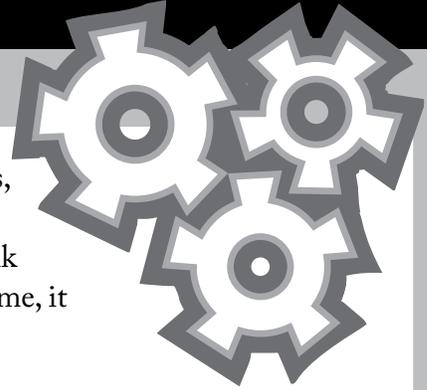
Food processors use special airtight containers to store milk and juices after they have been pasteurized by UHT. Bacteria need air to grow and cannot grow in UHT packages.

Did you know that milk has a history?

- Thousands of years ago, people changed from tribes that moved around to those who settled in communities. With this came domesticated animals and the use of products such as milk.
- In ancient Egypt, milk and other dairy products were reserved for royalty, priests, and the very wealthy.
- By the 5th century, cows and sheep in Europe were prized for their milk.
- By the 14th century, cow's milk became more popular than sheep's milk.
- European dairy cows were brought to North America in the early 1600s.
- Louis Pasteur, a French microbiologist, conducted the first pasteurization tests in 1862. Pasteur is credited with making milk safe to drink, and, in turn, the ability to store and distribute milk well beyond the farm. Commercial pasteurization machines were introduced in 1895.
- In 1884, the first milk bottle was invented in New York State.
- In the 1930s, milk cans were replaced with large on-farm storage tanks, and plastic coated paper milk cartons were invented, which allowed for wider distribution of fresh milk.



Best Before



Dairy processors use machines to put the cold milk into cartons, plastic jugs, glass bottles, or plastic bags. You will notice a “Best Before” date on containers of milk. The store cannot sell the milk after this date. If the milk has been kept refrigerated in your home, it should still be good for a few days after the best before date.

Why do all dairy products have a “Best Before” date? If you went into a grocery store today, what “Best Before” date would you expect to find on a carton of milk? Why?

Learn from Others

Find out about a student in the United States who did an experiment to compare how quickly pasteurized and ultra-pasteurized milk spoiled.

Go to **Weblinks** on www.moo2you.ca to select and explore the weblink www.selah.k12.wa.us/SOAR/SciProj2005/MichelleU.html.

What variables and constants did Michelle use in her experiment?

Variables	Constants

What were her results for pasteurized and ultra-pasteurized milk?

	Pasteurized	Ultra-Pasteurized
RESULTS		

Did you know? By law, all milk in Canada must be pasteurized. It is illegal for anyone to sell or distribute raw milk and raw milk products. Why do you think the government passed this law?



Play the *It's All in the Mix Interactive App* in the **It's All in the Mix** inquiry page or the **Game Corner** on the *Moo2You* website at www.moo2you.ca. Use the **Mix It Recipe Cards** if you need help to make different dairy products.

When is pasteurization used to process milk?
