



# WHAT **happens** TO **milk** AT A **dairy**

Milk and other dairy products are one of the ways we can get the important nutrients we need to live and grow. Many people enjoy the taste of a variety of dairy products.

Milk has not always been as safe to drink as it is today. Before the twentieth century, farmers did not have refrigerators and stainless steel tanker trucks to help them get food to people.

Even though early dairy farmers took great care (and still do) to ensure their animals are healthy and clean, milk can sometimes naturally contain bacteria that can make people sick.

To ensure Canadians consume safe, quality milk, Health Canada requires all milk to be pasteurized before it can be sold. Milk that is unpasteurized is called **raw milk**. Selling raw milk – or even giving it away – is illegal in Canada. This is all done to ensure the health and safety of Canadians.





## Milk Has a History



Thousands of years ago, people followed the animals they used for food. Over time, this changed as they formed and settled in communities. With settled communities 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. This also allowed milk to be stored and distributed 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.

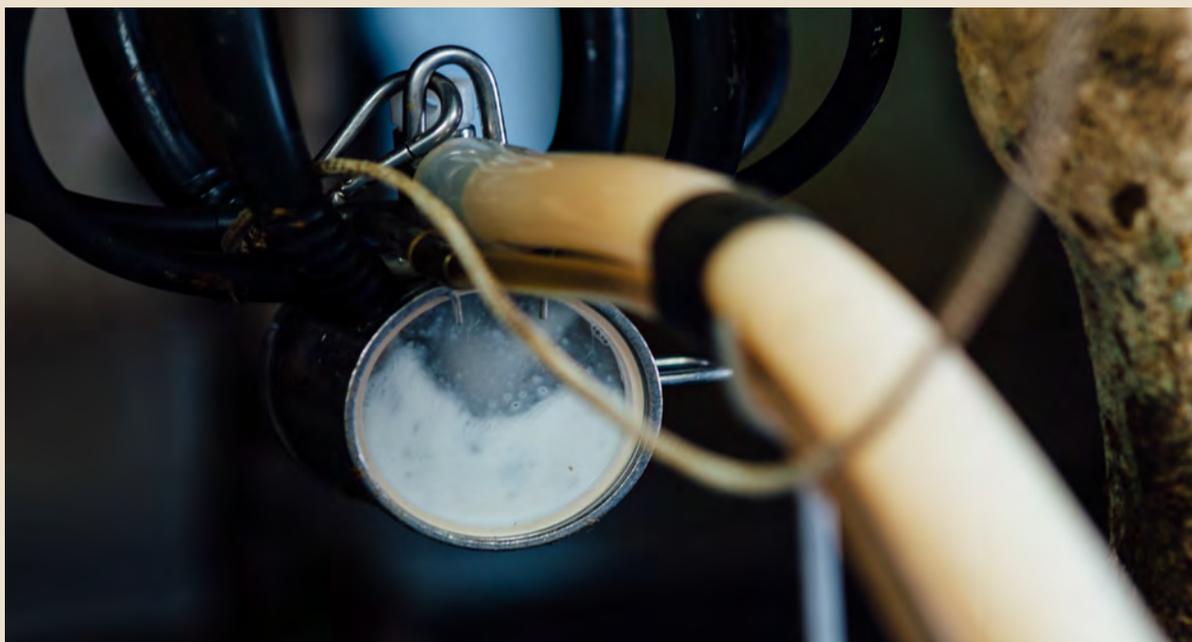
Photo Credit: **Glenbow Archives** ND-3-6981b



## Milk Tanks

Milk comes out of the cow warm, at the cow's body temperature. It is immediately transferred to a large storage tank called a **bulk tank**. These bulk tanks cool and keep the milk's temperature between 0°C and 4°C.

Milk is never touched or handled. Pipelines move the milk to the bulk tank, where it is stored until the milk truck comes to pick it up. A milk truck is like a giant thermos. It keeps milk cool on its way to the dairy processing plant. Milk is picked up either every day or every second day from each farm.



This photo shows one type of pipe that goes from the milking equipment to the storage tank. The material used for the pipes can vary from farm to farm.



Why do you think milk has to be transported so quickly? What does this have to do with the chemistry of milk?

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## More About 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 Pasteur. He was looking for a way to make foods and beverages safer for people.

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

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 and can form into chunks, but does not change colour.

Today, milk is pasteurized using the **HTST** (High Temperature, Short Time) process. In most processing plants, the milk is heated to at least 72°C for 16 seconds and then immediately cooled to 4°C. 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 4°C. This milk is almost sterilized by the high heat, which kills most bacteria. It is packaged under germ-free conditions, in a sterile environment.

Some UHT milk can be stored safely (if unopened) at room temperature for up to six months. The small, 200mL containers of Milk2Go are examples of shelf stable UHT milk. The label should always be checked to determine whether or not the UHT milk needs to be refrigerated.

No preservatives are added to UHT milk. The process used to pasteurize and package the milk determines whether or not it can be stored safely without refrigeration.

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When can liquid milk become a solid substance? How many examples of heating and cooling can you find in this description?