

Teaching Ideas

Milk Production – Cow to Cup

An understanding of dairy production and processes can be integrated into many learning areas of the curriculum. It provides an excellent example of a food production system and is suitable for Design and Technologies: Food and fibre production and Humanities and Social Sciences: Geography. This topic is also a great introduction to exploring the primary and secondary production of dairy products.

In this teaching idea, students are required to work in groups to investigate the milk production process. The Dairy Australia website provides easy-to-understand, succinct information regarding regular farm duties and milk processing. <http://www.dairy.edu.au/discoverdairy/>

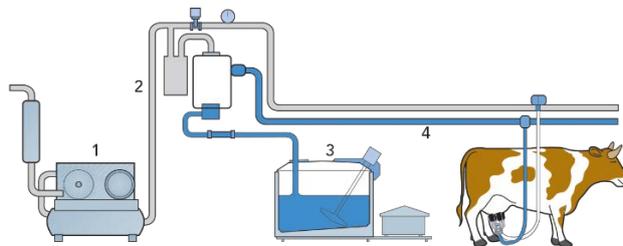
Some terminology used to describe milk processing include:

Term	Definition
Separating	A clarifier removes debris, some bacteria, and any sediment that may be present in the raw milk. A separator performs the same task, but also separates the heavier milk fat from the lighter milk to produce both cream and skim milk.
Pasteurisation	The milk is gently heated and then cooled again to make sure that the milk is germ-free.
Homogenisation	The milk is pushed through tiny holes of a machine which mixes the cream evenly into the milk.
Cold pressed	Cold milk is placed under very high pressure to destroy germs without changing the taste or texture.

1. Distribute a copy of the *Cow to Cup* Activity sheet to each student. *Cow to Cup* Fact sheet is also provided for your reference.
2. Explain using the internet or library resources, students are to research the dairy milk production process.
3. Findings are to be recorded and summarised on the *Cow to Cup* Activity sheet.
4. Explain the production process for cow's milk alternatives are quite different. Provide examples of alternatives, such as goats', camels' and sheep's milk and non-dairy alternatives such as soy, almond, oat, coconut.

Cow to Cup Facts

Milking: Lactating cows are milked twice a day using milking machines. Some milking systems rely on the dairy farmer to bring the cows in for milking; others allow the cow to walk in to be milked when she is ready. Teat cups and milking lines are attached to the cow's four teats. The lines are attached to the milking machine that applies a gentle pulsating suction to draw the milk out.



General design of pipeline milking system

1. Vacuum pump
2. Vacuum pipeline
3. Milk cooling tank
4. Milk pipeline

<http://dairyprocessinghandbook.com/chapter/primary-production-milk>

Storage at the farm: The milk travels via stainless steel pipes to refrigerated vats to be cooled to 4° Celsius. The milk is tested for freshness and quality before transportation.

Transportation: The milk is transferred from the vats to tankers (trucks with large refrigerated stainless steel tanks). The tankers transport the milk to the nearest processing plant so that it can be treated for bacteria, as well as made into other milk and dairy products. The milk is tested again for freshness, quality and the amount of protein. It is then pumped into large insulated vats at the plant in preparation for processing. The insulated vats help to keep the milk cold enough to prevent the milk from deterioration.

Testing: The milk is tested each time it is transferred and regularly during processing. It may be examined for freshness, correct smell, look, temperature, acidity, protein and fat, other chemicals and bacteria to make sure it is safe for humans to consume.

<http://www.fao.org/food/food-safety-quality/a-z-index/lactoperoxidase/en/>

<http://www.fao.org/AG/AGInfo/resources/documents/MPGuide/mpguide2.htm>

<https://www.dairyaustralia.com.au/industry/food-safety-and-regulation/dairy-food-safety>

Separation: Separators spin the milk at high speed. The heavier skim milk is pushed to the outer part of the separator and the lighter cream or butterfat is collected in the centre. From here, it is piped off for use elsewhere.

Separators also clarify the milk. Sediment and some bacteria collect in pockets on the side of the separator. Every so often, the “separation sludge” is cleared off by the machine.

<https://www.britannica.com/topic/dairy-product/Separation>

Pasteurisation: In Australia, most cows are healthy and disease-free but bacteria in the farm environment that can cause untreated, or “raw”, milk to be dangerous to humans. So the milk is gently heated to 72° Celsius for 15 minutes, or more, to kill most of the harmful bacteria. Pasteurised milk may still contain a very small amount of bacteria so it is quickly cooled again to less than 4.4° Celsius to make it safe for consumption for up to 14 days, if kept refrigerated.

<https://www.britannica.com/topic/dairy-product/Physical-and-biochemical-properties#ref50419>

Homogenisation: This process spreads the cream, or fat, evenly through the milk, making the milk uniform, whiter, richer in flavour and improve the texture. Many milk products are made with homogenised milk. If milk is not homogenised, it is still safe to consume but it will separate and the cream will float on the top. The milk is heated to make the sure the fat is in a liquid state and pumped at high-pressure valve, or breaker ring. This breaks up the fat droplets and distributes it evenly throughout the milk.

<https://www.britannica.com/topic/dairy-product/Separation>

Storage: The milk is again stored, ready for packaging, and some milk is kept for other dairy foods. The vats are refrigerated to keep the milk at 4°C. Stainless steel pipes and vats are used because stainless steel does not corrode or rust easily and resists the growth of bacteria if it is kept clean and sterile. It also protects the milk from light as sunlight can damage the milk and destroy some of the nutrients.

<http://www.legendairy.com.au/dairy-foods/dairy-products/milk/storing-milk>

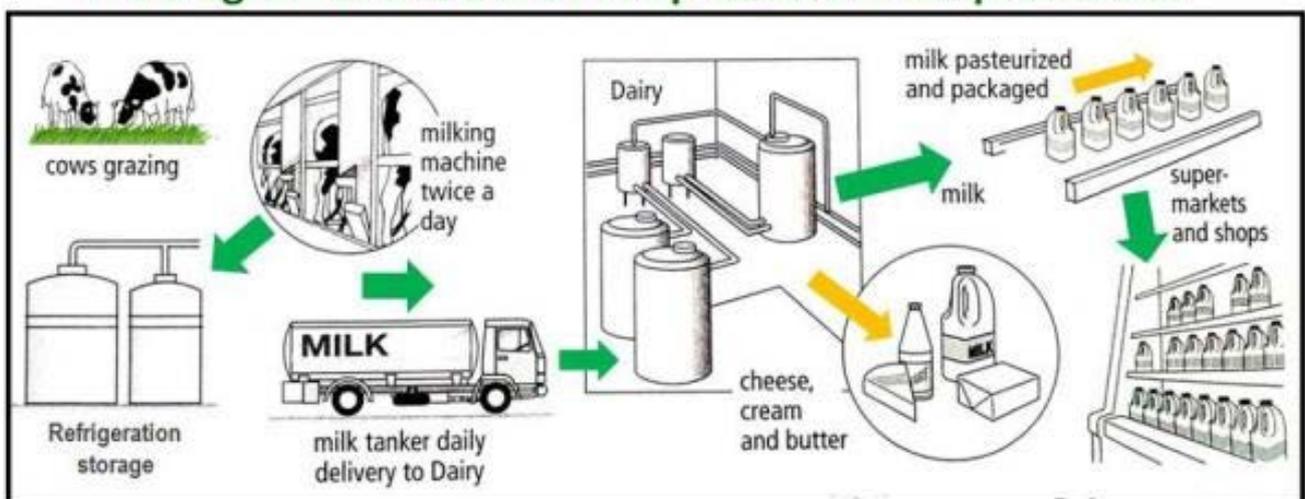
Packaging: The milk is packaged on an automatic machine into sterile (germ-free) plastic-coated cardboard cartons or “jug”, recyclable plastic or glass bottles and sealed. This reduces the chance of contamination. These are marked with the shelf life, usually 10 days, so that consumers know when it is safe and unsafe to consume the milk.

<http://www.legendairy.com.au/dairy-foods/dairy-manufacturing/dairy-packaging-and-recycling>

<https://bannisterdowns.com.au/packaging>

Delivery: The cartons or bottles are packed into crates or boxes and stored in huge cool rooms until they can be transported to shops and supermarkets in the back of refrigerated trucks. Some companies deliver milk to homes or workplaces provide fresh milk daily.

The diagram below shows the process of milk production



<http://ccuart.org/>

Additional resources:

Milk Facts Info graphic

<http://www.fao.org/resources/infographics/infographics-details/en/c/273893/>

Milk and dairy products in human nutrition

<http://www.fao.org/docrep/018/i3396e/i3396e.pdf>

Brownes Dairy School Tours

<http://schooltours.brownesdairy.com.au/>

Dairy farming in WA:

Where:

- Harvey
- Margaret River
- Denmark

Key facts:

- 160 dairy farms
- 65,000 dairy cows
- Average herd size: 406 cows
- Milk production 0.337 billion litres
- 4% of national milk production

<http://www.legendairy.com.au/dairy-farming/our-industry/our-regions>



Activity Sheet
Cow to Cup

- 1. Describe each of the milk production steps and explain why they are an important part of the milk production process.**

Milking:

Storage at the farm:

Transportation:

Testing:

Pasteurisation:



Homogenisation:

Storage:

Packaging:

Delivery:

2. Draw a flowchart illustrating the milk production process