The science of milk and its products

Milk is a natural food produced by mammals to feed their young. Most milk consumed by humans is produced by cows.

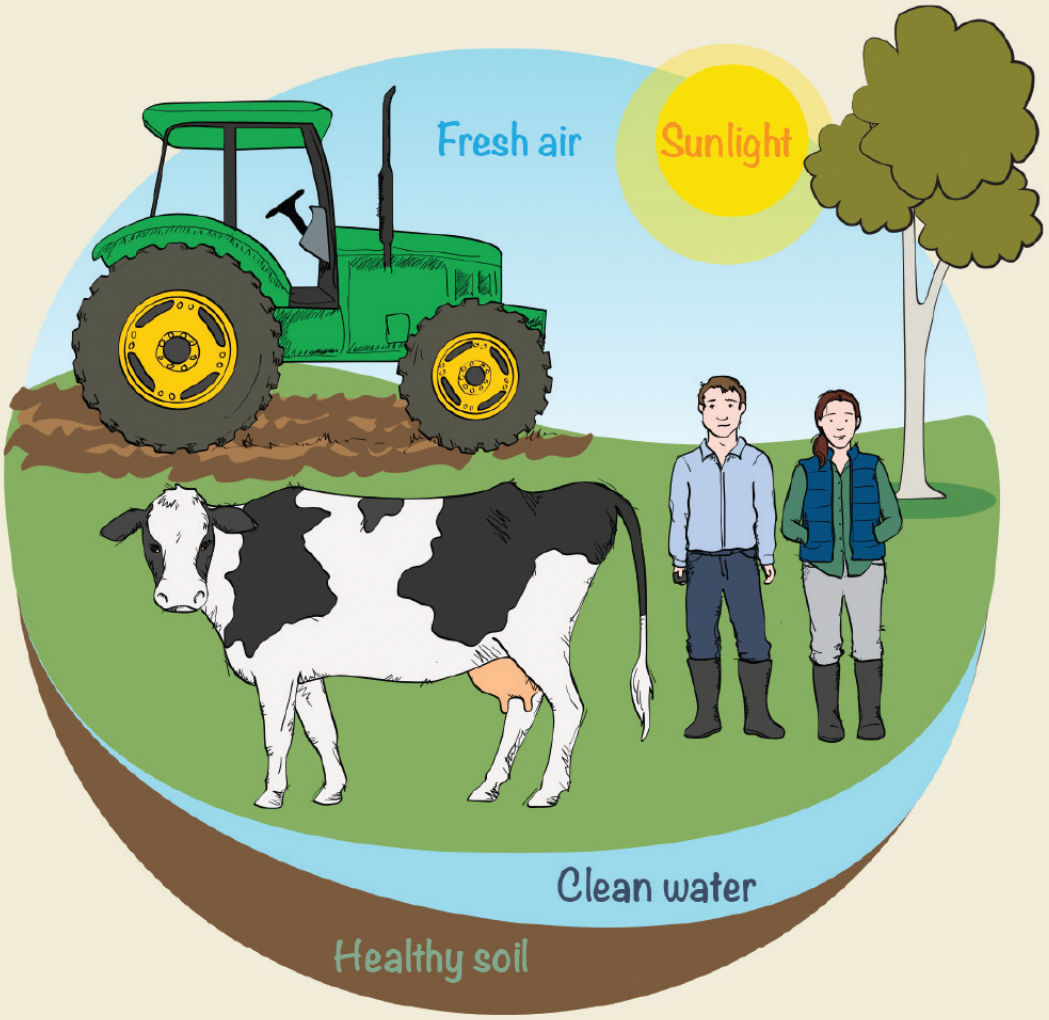
Farmers remove the calves from the cows and harvest the milk for sale. They feed the calves separately.

Cow's milk contains sugar, fat, protein, minerals and vitamins. Milk is pasteurised and homogenised to make it safe and appealing for human consumption.

Milk is made into a wide range of dairy products including cream, butter, cheese, yoghurt and ice cream.

Milk from grass, sun, soil and rain

Sunshine, rain and soil make grass grow. Cows eat grass and make milk from it to feed their calves. Farmers take the calves away from the cows and collect the milk to sell it. They look after the calves too.



What is in milk?

Milk is a natural food produced by cows and other mammals. It is made up of water, protein, carbohydrate, fat, vitamins and minerals. Typical composition of cow's milk:

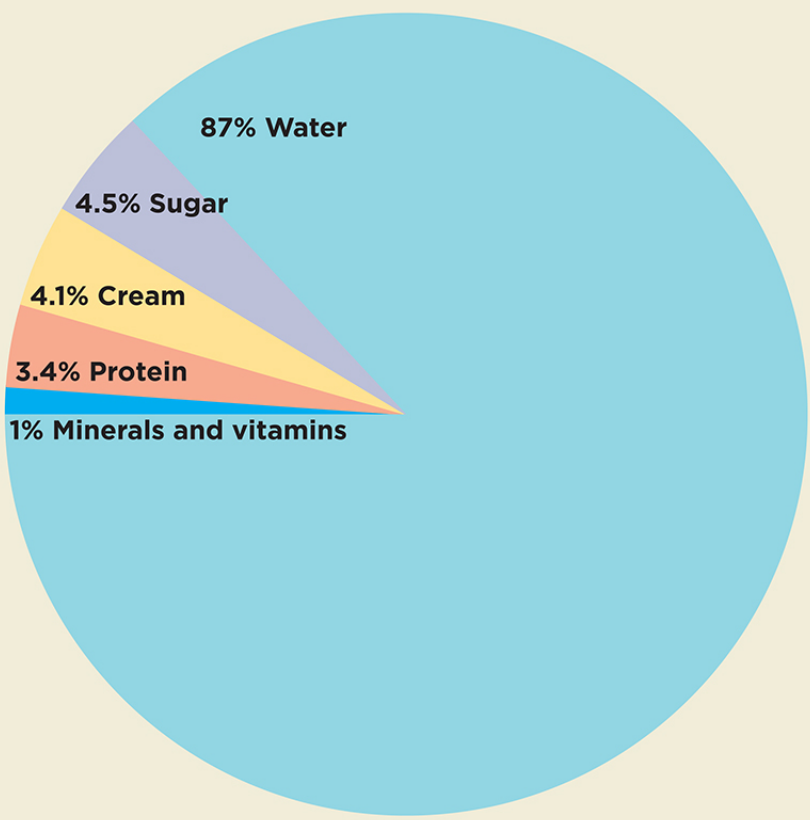
87% Water

4.5% Carbohydrate
(called lactose or milk sugar)

4.1% Fat
(called cream)

3.4% Protein
(mainly casein and whey)

1% Minerals (Ca, P, Na, Cl, S) and vitamins
(A, D, B including riboflavin, thiamine, niacin)



Milk treatment

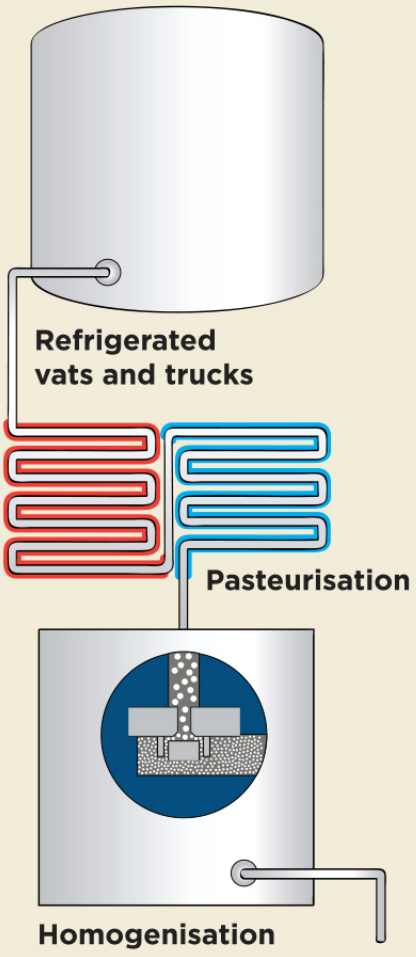
Basic treatment

Milk is commonly treated in three ways to enhance its shelf life, hygiene and consumer appeal without altering its basic composition.

Refrigeration: Milk is cooled immediately after milking and it is usually stored at or below 4°C until it is used.

Pasteurisation: Milk is partially sterilised by heating to about 71°C to kill harmful germs such as bacteria without damaging the milk. This extends the shelf life and makes it safe to drink. It is then cooled down again and kept refrigerated.

Homogenisation: Left to sit, cream separates and rises to the top of milk. Most milk is homogenised by passing it through fine nozzles under high pressure to prevent separation and to give it a smooth texture. Homogenisation does not change the nutritional value of the milk.



Other treatment

Standardisation: Milk varies with seasonal conditions and breeds of cows. The fat and protein in milk is standardised to provide a consistent product all year round. Standardisation usually involves adding or removing fat (cream) and milk protein or using fine filtration to extract permeates—though this is falling out of favour.

Long-life (UHT) milk: Ultra heat treatment (UHT) is a more powerful treatment than pasteurisation. Milk is heated to 135-150°C and held there for a few seconds. When packaged in sterile containers under strict hygiene control, it can be stored unrefrigerated until opened.

Making dairy products

Physical

Separation, churning and dehydration are physical processes. They do not use microbes or chemicals in order to work.

full cream milk

Microbiological

Fermentation and coagulation are microbiological and chemical processes that alter the chemical composition of the products.

dehydrate

separate

add bacteria

ferment with bacteria

Skim\lite milk is what is left after most of the cream has been removed. Before mechanical separators milk was left overnight for the cream to rise to the top. The cream was skimmed from the top, hence the name skim milk.

Yoghurt is made by fermenting milk with bacteria. Yoghurt is often sweetened and flavoured.

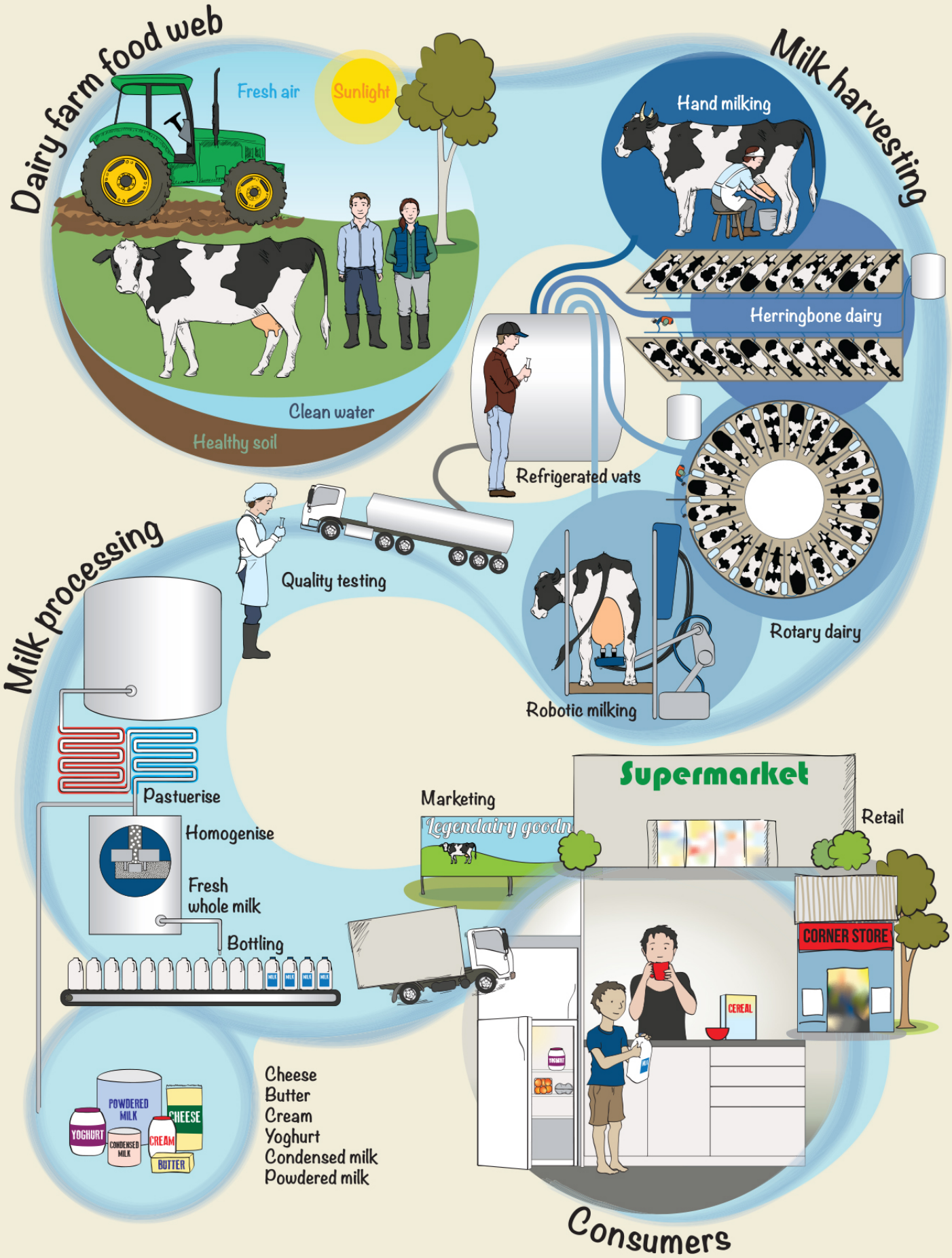
Cheese is made when starter culture (bacteria) is added to pasteurised milk and this causes coagulation (forming lumps or **curd**). The curd is cut and stirred to release **whey** and depending on the type of cheese being made, the curd is either cooked (at low temperature), salted, molded and pressed, left to mature or wrapped. Small changes in each stage of the process can makes a very different cheese.

Cream is made by spinning pasteurised, non-homogenised milk. Centrifugal force forces the fat globules out of the milk.

Butter is made by stirring (or churning) cream until it thickens into the yellow product we buy in supermarkets. This leaves buttermilk behind.

Powdered milk is the solids left behind when milk is passed through hot air to remove the water. Removing the water leaves nothing for microbes to live on so powdered milk lasts longer and is used in products like baked goods and chocolate or where refrigeration is limited.

Milk production



Raw milk can kill

Unpasteurised milk, known as ‘raw milk’, can contain microbes that make people seriously ill or even kill them.

In Melbourne in 2014, raw milk was linked to the death of a child. The incident was one of four cases of gastroenteritis in children who drank unpasteurised milk.

Pasteurisation kills harmful microbes. Milk sold for human consumption in Australia must be pasteurised by law.

NSW Food Authority

Public health warning: consumption of raw milk products

11 December 2014

The NSW Food Authority warns consumers not to drink raw or unpasteurised milk marketed as pet food or for cosmetic use as it is a potential health hazard.

Consumers are urged not to buy milk or milk products for human consumption from shops, farm stands or farmers' markets unless they can confirm that it has been pasteurised. The consumption of unpasteurised dairy products could cause severe illness particularly in pregnant women, young children, and the elderly and infirm people.

Nationally and internationally raw milk products account for a small proportion of sales but a very large proportion of outbreaks. Pasteurisation is important as it involves heating the milk to kill dangerous pathogens but has minimal effect on its nutritional value or flavour.

The sale of raw dairy products for human consumption is illegal in Australia as they could contain harmful bacteria such as E.coli, Salmonella and Listeria. The NSW Food Authority investigates any reports of retailers illegally selling raw milk for human consumption. The Food Act provides penalties of up to $275,000 for the sale of unpasteurised milk.

Raw milk: advice to consumers

Raw milk provides an ideal environment for a range of pathogenic organisms and has been associated with numerous outbreaks of disease and illness in humans

Raw milk

Raw milk is milk that has not undergone a pasteurisation process to kill any bacteria that might be present. Raw milk and raw milk products may come from a number of milking animals including cow, goat, sheep, buffalo, horse and camel.

Milk is a highly perishable product and is an ideal medium for the growth and multiplication of harmful micro-organisms that can cause disease. Unpasteurised milk presents an increased risk of contamination with bacteria and does not provide any dietary advantage compared with pasteurised milk.

The heat treatment of milk and milk products, such as pasteurisation, is required by the Australia New Zealand Food Standards Code (the Food Standards Code) with very few exceptions. It is an important public health and food safety measure supported by scientific studies around the world and in Australia.

Risks associated with drinking raw milk

People who consume raw milk are at an increased risk of infection due to several different bacteria capable of causing severe illness and potentially death.

Raw milk is known to carry several disease causing organisms including:

- *Campylobacter jejuni* (campylobacteriosis)
- *Salmonella*
- *Listeria monocytogenes* (listeriosis)
- *Escherichia coli*
- *Cryptosporidium*
- *Staphyloccocus aureus*

Complications from bacteria that can contaminate these products can be extremely severe, such as Haemolytic Uraemic Syndrome (HUS) caused by Shiga toxigenic *E. coli* which can result in renal failure and death in otherwise healthy people.

What effect does pasteurisation have on milk?

The nutrient value of milk is generally unaffected by pasteurisation. Aside from 10 percent loss in vitamin C, the rest of the vitamins in milk are not affected by pasteurisation. Also, the main milk enzymes lactoferrin, lacto-peroxidase, and lysozyme are highly active after pasteurisation.

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What are the laws in NSW for milk?

It is illegal to sell raw cows milk for human consumption in Australia. In NSW, all milk sold (except goats milk) must be pasteurised. Unpasteurised goats milk is only permitted subject to compliance with the dairy food safety scheme which includes strict licensing requirements underpinned by regulatory controls over hygienic processing, testing, appropriate recall procedures, and labelling. A warning statement that this milk is an unpasteurised product and may contain organisms that could be injurious to health is required to be included on the product.

The pasteurisation of milk and manufacturing of other dairy produce is administered by the NSW Food Regulation 2010 under the Food Act 2003.

Raw milk cheeses

Raw milk cheeses for human consumption must be approved by Food Standards Australia New Zealand (FSANZ). The maturation of the cheese must meet certain time, temperature and water content requirements, a process which has a similar effect to pasteurisation in reducing pathogens.

FSANZ conducted a risk assessment for a small number of raw milk cheese types/varieties including Extra Hard, Swiss-type, Cheddar, Blue, Feta and Camembert. The Extra Hard and selected Swiss-style cheese were determined to present a low to negligible risk to public health and safety due to high curd cooking temperature. Other types of cheese (Cheddar, Feta and Camembert) are considered a high risk due to growth and/or survival of pathogens during cheese making.

Raw milk products for cosmetic use

Raw milk is sometimes labelled and sold as 'cosmetic milk', 'bath milk or 'pet milk'. This is a niche and narrow market. These products are not produced under the strict standards or supervision that is applied to dairy food production.

Products are generally packaged in a similar way and appearance to that of pasteurised milk for human consumption and retailers sometimes display them for sale in refrigerators that house foods including pasteurised milk, cream and butter.

This can lead to consumer confusion and the inadvertent purchase of the product believing that it is a food that can be safely consumed.

Whilst the sale of these cosmetic products is not illegal, they must be clearly labelled to alert consumers they are 'not for human consumption'.

Consumers are urged to use products as per its intended use and not consume raw milk products.

More information

- visit the NSW Food Authority's website at www.foodauthority.nsw.gov.au
- phone the helpline on 1300 552 406
- visit the Food Standards Australia New Zealand (FSANZ) website at www.foodstandards.gov.au

About the NSW Food Authority: The NSW Food Authority is the government organisation that helps ensure NSW food is safe and correctly labelled. It works with consumers, industry and other government organisations to minimise food poisoning by providing information about and regulating the safe production, storage, transport, promotion and preparation of food.

Note: This information is a general summary and cannot cover all situations. Food businesses are required to comply with all of the provisions of the Food Standards Code and the *Food Act 2003* (NSW).

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NSW/FA/FI215/1412

Camden Park led the way with healthy milk

Tuberculosis or TB is a serious disease in both humans and cattle. It can be fatal.

Tuberculosis can be passed from cattle to people by drinking raw milk from infected cows.

Young children who drank contaminated milk were particularly at risk of catching TB.

In 1924 Camden Park's dairy herds were certified as tuberculosis-free. They began TB testing their cattle a decade before it became compulsory in New South Wales.

From 1926 Camden Park sold milk in bottles under their own brand: **Camden Vale Special Milk**.

Camden Vale Special Milk was promoted as safe for infants, invalids and the aged. It came from TB-free herds, milked in dust-proof conditions and immediately cool and pasteurised.

Tuberculosis has since been eradicated from cattle in Australia but people can still catch it in other ways.