Dairy Australia

Drinking water access and quality

Are they limiting your cows' productivity and health?

Water is often ignored in dairy herd nutrition. However, it is the first nutrient. Unrestricted access to clean, fresh drinking water is essential for dairy cow productivity, health and welfare, be that under normal conditions or during/after adverse events.

Cows are sensitive to water access and quality problems

A cow's body is between 60–80 per cent water. Milk is 87 per cent water. Water is essential for regulation of body temperature, rumen fermentation, flow of feed through the digestive tract, nutrient absorption, metabolism and waste removal. Water also has structural and functional roles in all cells and all body fluids.

Lactating dairy cows are more sensitive to drinking water access and quality problems than other production animals because:

- They require larger volumes of water per unit of body mass
- Their rumen pH needs to be maintained within a relatively narrow range for good rumen function.
- Their rumen function may be altered by water containing a high total bacteria count.

How much water do cows drink?

The amount of water a cow drinks (also known as free drinking water consumed) depends on:

- Cow size and milk yield
- Daily dry matter intake
- Percent dry matter in feed offered
- Percent protein, sodium and potassium in feed offered
- Environmental temperature and relative humidity
- Water availability, temperature and other water quality parameters.

Cows must maintain a balance between the water inputs and outputs.

Key messages

- Cows are sensitive to water access and quality problems
- Check water source(s) and see if there has been any damage to pumps or contamination of water supplying house, dairy shed and water troughs
- During hot weather, a lactating cow can drink 200+ litres of water per day
- Provide water troughs in each paddock as well as in laneways
- Give cows the opportunity to drink immediately before and after milking
- Cows on a sacrifice paddock or feedpad should have access to two water troughs at all times
- Water troughs should be easy to clean, and be cleaned regularly
- The only way to know if your farm's water is fit for your cows to drink is to get it tested by a specialist laboratory

Inputs	Outputs
Free drinking water consumed + Water in feed consumed + Metabolic water	Water losses in • urine • manure • milk • sweat • respiration

During hot weather, a lactating cow can drink 200+ litres of water per day. Water palatability, and therefore intake, may be negatively impacted if the water contains high levels of iron (Fe), manganese (Mn) and salts. Cows prefer to drink warm water.

DELIVERING for DAIRY

Cow	Daily water requirement
Non-pregnant cows in cool environment (<15°C)	About 3.5 litres of water per kg of dry matter consumed (e.g. Cow consuming 20kg DM: approx. 70 litres)
Pregnant cows in warm environment (21–25°C)	Up to 7.1 litres of water per kg of dry matter consumed (e.g. Cow consuming 20kg DM: approx. 142 litres)
Lactating cows	6 litres of water per kg of dry matter consumed + 1 litre of water per litre of milk + additional allowances for hot weather (e.g. 30 litre cow: approx. 120 + 30 litres + weather allowance)

Source: *Feeding Dairy Cows manual*, 2015

Providing drinking water to cows

Check water source(s) and see if there has been any damage to pumps or contamination of water supplying house, dairy shed and water troughs. Test water as necessary. If multiple water sources are available, use the source with the least nutrient and microbial contamination. Consult an expert for advice if necessary.

Cows should have access to fresh, clean water at all times. The most common water nutrition problem on most dairy farms, accepting that water quality is suitable, is providing cows with insufficient water troughs and/or troughs that don't re-fill at a fast enough rate during drinking. The result is that cows' opportunities to drink during their daily routine may be limited. This impacts on their milk production and health.

High flow rates are essential. Water pipes should be 75mm in diameter. There needs to be sufficient pressure to provide 20 litres per cow per hour. A cow can drink 20 litres per minute so flow rates are critical. Large volume troughs will help to maintain supply during high demand.

In paddocks and laneways

In grazing systems, providing troughs in each paddock is important. A recent study found that cows drank less water, spent less time drinking and had fewer drinking events when the trough was in a laneway up to 150m away from paddock vs. in the paddock. Subordinate cows drank less than dominant cows when their trough was in the laneway. Another study found that providing cows water in each paddock improved dry matter intake and milk production.

In hot weather, having water troughs in every paddock will help to keep cows grazing longer. The less distance cows have to walk to drink, the less chance that they will stop grazing due to the heat.

At the dairy

Providing cows with access to water near the exit from the dairy shed and in the dairy holding yard in addition to laneways and paddocks is also important, as cows may consume 30–50 per cent of their daily water intake within one hour of milking.

Water access at the dairy is particularly important if:

- Weather is hot and cows are carrying a heat load
- Cows spend more than 45 minutes waiting in the holding yard before milking
- Cows must walk a considerable distance after milking to the paddock.

On a sacrifice paddock or feedpad

When on a sacrifice paddock or feedpad, cows should have access to two water troughs at all times.

Cows appear to prefer larger, higher troughs to smaller, lower troughs. Large volume concrete troughs help keep drinking water appropriately cool during hot weather.

Look out for cows queuing up to drink, or empty troughs.

TIPS

Install an alarm on your farm's water pumps to alert you quickly if it fails

Fit a large white or yellow float ball at each paddock water trough visible from a long distance

Position water trough near exit from dairy shed on a wide section of track to minimise cow congestion

Avoid running black poly pipe along the ground as the water will become very hot

Cows drinking from water trough near dairy shed exit

Large, bright float balls make it easy to see a problem. Source: HEICC

Cleaning water troughs

Many different microorganisms can survive in drinking water supply systems and are potentially hazardous. Water troughs are of particular concern as they can become readily contaminated with cud and manure, faeces from birds, rodents, recycled water, dust, feed, bedding material, and microbes entering through the water pipe. These contaminants can provide a nutrient-rich substrate for bacterial growth and survival at the bottom of a trough.

E.coli count per 100ml is used as an indicator of faecal contamination and possible presence of pathogens in water.

Trough hygiene should therefore be an important aspect of good water management. On many dairy farms overseas, water troughs are routinely cleaned and sanitised e.g. weekly, and being able to see the bottom of trough is expected. Yet in Australia we tend to give trough hygiene little attention.

TIP

If installing or upgrading water troughs, try to use ones which have a large bung/release valve at the bottom so that regular cleaning of the trough is much easier.

Sludge in bottom of a water trough not drained and cleaned for over two years

Water quality – does it matter?

Good water may be defined as clear and colourless, with low total solids, and no disease organisms, pesticides, undesirable odours, flavours or objectionable gases.

Parameters that may impact on cows' water intake and/or health and productivity include:

- Temperature, turbidity, colour, taste, odour
- Total dissolved solids (salinity)
- Sulphur, sulphate, hydrogen sulphide
- Iron and manganese
- Nitrate
- Heavy metals
- Microbial contamination.

Parameters that may impact on water flow through farm's drinking water system:

- hardness
- pH.

The impact of high microbial contamination of drinking water on cows' health and productivity is uncertain. More research is required.

Water quality analysis

The only way to know if your farm's water is fit for your cows to drink is to get it tested by a specialist laboratory.

- If you know or suspect that your herd's water intake, feed intake, and animal performance are sub-optimal, get the water tested.
- Routinely testing your herd's drinking water every year is good practice. It will alert you to any changes in your water quality.

Collect first water sample from a trough currently being used by cows.

Expect to pay about $150–200 for a comprehensive water test which assesses levels of: total dissolved salts (TDS), pH, hardness, specific minerals/compounds, heavy metals, other toxic compounds and microbes. Your nutrition adviser can assist you in ticking the appropriate boxes on the lab submission form.

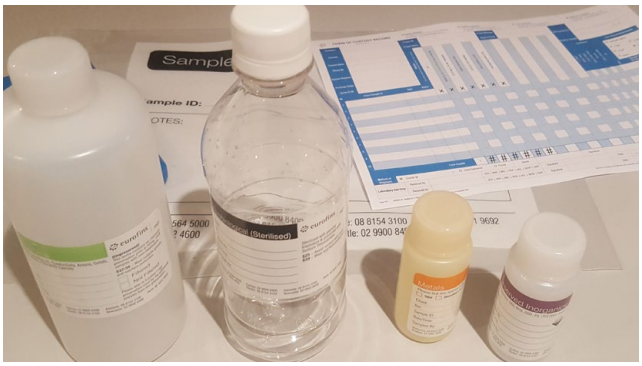
If results for some parameters are above recommended levels, collect a second sample from the water source.

If results of analysis indicate water quality problems, consider whether an alternate water source can be used or if a water treatment system may be worth installing. A range of water treatment methods are available to improve specific water quality problems. These treatment methods include chlorination with filtration, ion exchange, ozonation and reverse osmosis.

TIPS

When collecting a water sample:

- Use appropriate sample bottles provided by lab
- Use aseptic technique
- Pack bottles in cooler with ice block
- Courier to lab within 24 hours



Water sample bottles and lab form

Recommended acceptable water quality levels for dairy cattle

There is no thoroughly researched, universally agreed set of recommended acceptable water quality levels specifically for dairy cattle. However, here are four recently published sets of recommended acceptable levels which provide a guide.

Parameter tested	**Unit**	**Dairy NRC** 2001	**Socha** 2003	**Beede** 2006 **Adams & Sharpe** 1995	**Oetzel** 2008
Ammonia (as N)	mg/L				
Chlorine	mg/L	–	<100 (<300)		<250
Nitrate (as N)	mg/L	<10	<20 (<100)	<100	<25
pH	pH units	6.5–8.5	6.5–8.5	5.1–9	6–9
Sodium adsorption ratio*	mg/L				
Sulphate (as SO_4)	mg/L	<1000	<150 (<900)	<2000	<250
Total dissolved solids	mg/L	<1000	<960 (<3000)	<3000	<1000
Alkali metals					
Calcium	mg/L	–	<100 (<200)	<500	<200
Magnesium	mg/L	–	<50 (<100)	<125	<80
Potassium	mg/L	–	<20	–	<20
Sodium	mg/L	–	<50 (<300)	–	<100
Alkalinity (speciated)					
Total alkalinity (as $CaCO_3$)	mg/L	–	–	<5000	<500
Hardness set					
Hardness mg equivalent $CaCO_3$/L	mg/L	–	–	–	–
Arsenic	mg/L	<0.05	<0.2	<0.2	<0.2
Cadmium	mg/L	<0.005	<0.01 (<0.05)	<0.05	<0.05
Chromium	mg/L	<0.1	<0.1 (<1)	–	<0.1
Copper	mg/L	<1	<0.2 (<0.5)	<1	<0.5
Iron	mg/L	–	<0.2 (<0.4)	<0.3	<0.3
Lead	mg/L	<0.015	<0.05 (<0.1)	<0.1	<0.1
Manganese	mg/L	<0.05	<0.05 (<0.5)	<0.05	<0.05
Mercury	mg/L	<0.01	<0.01	<0.01	<0.01
Nickel	mg/L	<0.25	<0.25 (0.1)		<1
Zinc	mg/L	<5	<5 (<25)	<25	<25
Pathogens					
E. coli	MPN/100ml	–	–	–	–
Total coliforms	MPN/100ml	–	<0.5	<1 for calves <50 for cows	–

Acknowledgement
Dairy Australia acknowledges the funding contribution of the Commonwealth Government for eligible research and development activities.

Dairy Australia Limited ABN 60 105 227 987
E enquiries@dairyaustralia.com.au
T +61 3 9694 3777
F +61 3 9694 3701
dairyaustralia.com.au

5590.3 | Jun 2024