

Water quality and quantity is critical to dairy cow performance

by Dr Dana Tomlinson, research nutritionist, Zinpro Corporation, 10400 Viking Drive, Suite 240, Eden Prairie, MN 55344, USA.

Never underestimate the importance of good drinking water to a dairy herd. Each cow consumes 30-50 gallons of water (115-190 litres) a day – and water accounts for 87% of the milk she produces – so providing clean, safe water is critical to maximising her performance.

Following air, water is the nutrient required in the largest quantity by dairy cattle.

Common signs of poor water intake and quality in lactating dairy cows include depressed immune function (elevated somatic cell count), increased reproductive failure (conception failure, early embryonic death/abortions), and increased off-feed events and erratic eating patterns.

Any of the following symptoms could signal water quality issues on a dairy:

- Health or performance concerns in cows.
- Digestive upsets or scours in replacement animals.
- Deteriorating health status of newly arrived heifers or dry cows.
- Off-flavour, smell or colour of drinking water.

Table 2. Average water intake by dairy cows (Zinpro H₂O water analysis program, 2011).

Milk yield (lb/d)	Dry matter intake (lb)	Minimum temperature (°F)		
		40	60	80
40	36	17	20	24
75	48	23	27	30
100	56	28	31	35

Milk yield (kg/d)	Dry matter intake (kg)	Minimum temperature (°C)		
		4	16	27
18	16	64	76	91
34	22	87	102	114
45	25	106	117	132

Source	% of daily water needs supplied
Heifers, lactating and dry cows	
Metabolism	<1
Feed	25-35
Drinking water	60-80
Calves	
Milk	75-100

Table 1. Water sources (Dr Jim Linn, University of Minnesota).

- Digestive upsets in humans drinking from the same water source.

Water quantity or availability is equally as important as quality. Dairy cows spend 4-5 hours per day eating and only 20-30 minutes per day drinking water – making easy access to water a critical factor in meeting their hydration needs.

The dairy cow depends on readily available water to maintain blood volume, tissue function, rumen activity and proper flow of feed through the digestive tract.

Below are management tips for optimising water consumption:

- Provide direct access to clean water as cows exit the milking parlour.
- Ensure adequate flow rate to maintain a minimum water depth of 3in (7.6cm) in the trough.
- Provide available trough space of 3.5 linear inches (9 linear cm) per cow.

- Have at least two functioning waterers available per pen.
- Provide access to water within 50ft (15m) of feed bunk.
- Monitor stray voltage in water troughs and in the areas around them.

Drinking water provides 60-80% of dry and lactating cows' water needs, while feed provides most of the remaining water needed by these cows (Table 1). Water requirements of cattle vary with level of production and environmental temperature (Table 2).

Assessing water quality

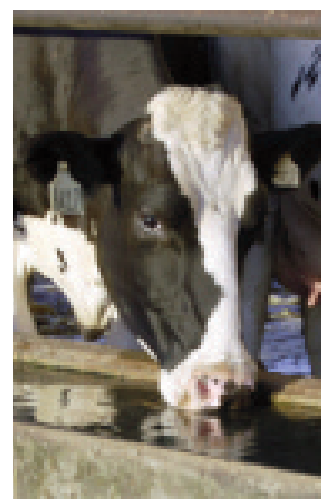
When testing for water quality, total dissolved solids is one of the first things to evaluate. This single test gives us a reading on the sum of all the dissolved/suspended inorganic matter present in the water sample.

High concentrations of dissolved solids such as sulphate, chloride, iron, manganese and nitrates are known to significantly affect animal performance.

Table 3. Desired levels for livestock.

Item	Level	Item	Level
Calcium (ppm)	<100	pH	6-8.5
Chloride	<100	Potassium (ppm)	<20
Copper (ppm)	<0.2	Sodium (ppm)	<50
Iron ^a (ppm)	<0.2	Sulphur (ppm)	<50
Magnesium (ppm)	<50	Sulphate (ppm)	<125
Manganese (ppm)	<0.05	TDS (ppm)	<960
Nitrate - N (ppm)	<20	Zinc (ppm)	<5

^aWhen analysed using total recoverable iron, cows may tolerate higher levels of iron in water



More information about appropriate levels of nutrients (in water) for livestock is shown in Table 3.

One critical component to analyse is the iron level. Ferrous iron (Fe²⁺) dissolved in water is presumed to be highly absorbable with an estimated absorption rate approaching 100%. If the concentration is >0.3ppm in drinking water, this may cause problems for cows.

A total recoverable iron test performed by a diagnostic laboratory gives an accurate look at iron levels in water. Excess iron levels have wide ranging consequences, including decreased palatability, increased oxidative stress contributing to immune dysfunction (which can lead to mastitis and metritis), and

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decreased absorption of copper, manganese and zinc from the diet.

Water testing guidelines

Testing water quality requires an understanding of the contaminants, regarding both acceptable levels and their metabolic effects on dairy cows:

- Coliform and bacterial counts.
- Excess minerals or compounds (such as sulphate, chloride, iron, manganese and nitrates).
- Total dissolved solids, pH, and hardness.
- Toxic compounds, including heavy metals, organophosphates, PCBs and hydrocarbons.

A water test is only as good as the sample and the laboratory testing it. Choose a reputable laboratory with experience testing water for live-stock and dairy operations to ensure valid results. Also, follow proper water sampling procedures to ensure an accurate water analysis.

It is recommended that producers follow these steps for best results:

- Select a reputable testing laboratory.
- Use sterile, plastic bottles supplied by the testing laboratory.
- Return water samples to the laboratory within 24 hours of collection.

- Sample the same water source as the animals drink.
- Collect samples from the stream running into the watering trough, not directly from the pool of water.
- Collect water samples from more than one pen, barn or water trough, in more than one location.
- Let water run for several minutes before beginning to collect the sample.
- Test water twice per year, in late summer and winter.

Once the analysis is complete, decisions can be made on how any problems may be corrected. Common water treatments include

disinfection, water softening, iron filtration, and reverse osmosis.

Table 4 provides additional information about common water problems and treatments.

Calves need good water

The quality of water used to make milk replacer is critical to a calf's health, and the availability of fresh water also affects nutrient intake and the calf's growth.

In addition to milk replacer, research shows that calves should be offered free-choice water along with calf

starter beginning at four days of age. Research conducted by Donna Amaral-Phillips, PhD, Extension Professor of Animal Science, University of Kentucky, shows that depriving calves of fresh water decreases starter intake by 31% and weight gain by as much as 38% when compared to calves provided with free-choice water.

Common signs of poor water intake and quality in calves include increased incidence of scours and digestive upsets, decreased immune competence, depressed daily gain and feed efficiency, and increased off-feed events and erratic eating behaviour.

Table 4. Common water problems and treatments.

Common problem	Treatment
Bacteria	Disinfection
Fuel products	Carbon filter
Hard water	Water softener
Hydrogen sulphide gas	Oxidising filter followed by carbon filter, or chlorination followed by sediment filter
Iron particles	Water softener or iron filter
Metals	Reverse osmosis or distillation
Nitrates	Reverse osmosis or distillation
Pesticides	Carbon filter
pH	Neutralising filter
Sediment	Fibre filter
Taste and odours	Carbon filter

Water analysis program

The Zinpro H₂O Water Analysis Program is a step-by-step tool that puts producers on the road to improved water quality. The program helps assess water quality by analysing and comparing water samples to water quality standards, and it can help nutritionists, producers and veterinarians evaluate water analysis results, identify areas of concern and review signs of potential toxicosis. ■

References are available from the author on request

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