

Is water pH limiting how much your herd drinks?

Sweet 'n' sour

Water quality – and not just quantity – is key to ensuring that your cows are drinking enough. So how do you know if your water passes the 'acid' test? We asked a leading US-based dairy nutritionist to tell us more.

text Rachael Porter

Would you drink lemon juice? What about battery acid? Two questions that US-based dairy nutritionist and consultant Dana Tomlinson often asks his dairy clients to get them thinking about borehole water pH. He's travelled the world measuring borehole water pH and says that in many cases the pH is high – above 8. "But low pH water also causes problems on some of the units I visit," he says.

The pH is dictated by mineral and trace element content. "When you increase pH by one point, say from 7 to 8, that point represents a 10-fold increase in the hydrogen ion concentration. And that's the difference between lemon juice and battery acid," he explains. "It's a big difference and it can have a huge impact on herd performance."

Water is important – it's second only to air as far as cow health and welfare is concerned, according to Dr Tomlinson.

Below neutral

"And producers tend to take it for granted, concentrating on whether cows have enough of it and tending to forget about quality – palatability and pH."

In his experience, he's found that cows prefer water with a pH below neutral – about 6.7. "Drinking encourages the cow to eat and this in turn results in more milk. High water intake increases DMI and maximises milk yield."

He says that if water is limited – either physically or for palatability reasons – then DMI is limited too. Poor water palatability, caused by an unbalanced pH, can also be

the underlying cause of herd health problems. "If you're seeing a lot of cases of retained placenta or cows are not transitioning well, check your water.

"Excessively high or low water pH will cause problems and the symptoms mimic acidosis – reduced dry matter intake, digestive upset, rough haired coat, poor quality hoof horn and lameness. So water quality is certainly something that producers with boreholes should check out when investigating any issues or health problems."

The guidelines for human drinking water stipulate a pH of between 6 and 8 with pH 7 as the standard for mains water in the UK.

'Processed' water

But cows drink much more water than humans – a cow producing between 45 and 50 litres of milk per day will drink more than 150 litres of water day. "Cows drink water – nothing else. And that's why it has to be as 'sweet' and palatable as possible," adds Dr Tomlinson.

Borehole water pH varies, but is typically between 6.5 and 7.5. How much it varies, and how this differs across the UK's regions, is unknown so Zinpro is in the process of surveying boreholes on UK dairy farms to find out.

"We do know that it is common to find dairy units in the US and South Africa, for example, with borehole water with a pH of greater than 8. And if dairy cow intakes and milk production are to be maximised, this water has to be 'processed' to reduce its pH."

A number of reverse osmosis systems have been installed on Mexican dairy units. "Borehole water there is high in bicarbonate and sulphur, so we neutralise the water by taking them out."

On dairies with a water pH above 8, he



Cows prefer water with a pH of 6.7

Are your girls getting enough?

Water is often the neglected nutrient on many UK dairy farms, according to Genus ABS' European technical director John Cook.

"Cows require between 35 and 45 litres a day for their own metabolism and another 2.5 litres of water for every litre of milk produced," he explains. "On average, modern dairy cows need 110 litres of water a day, but in high yielding herds the requirement can easily reach 160 litres a day."

Each cow will spend 30 minutes a day drinking and drink at a rate of 16 litres a minute, if circumstances allow. They drink 75% of their water requirement during daylight hours and a staggering 60% of their daily needs will be consumed within an hour of milking. So this has major consequences for the design of a water system.

"A herd of 200 cows will have a potential peak consumption of 5,700 litres immediately post-milking and this has huge implications for water supply, particularly as cows are social animals and often drink together.

"The high demand means that a large reserve of water must be available, necessitating plenty of large troughs supplied by a high flow rate. Also think about where troughs are placed and how you manage cows after milking."

"Cows should be encouraged to drink and eat as soon as possible after milking and thirsty cows will eat less," says Mr Cook. "So it is well worth looking at



John Cook

putting a trough between the parlour and the buildings so cows can drink immediately after they have been milked."

He also stresses the importance of adequate trough space.

"The recommended linear access is 80mm per cow in at least two locations within a building. A group of 80 cows would, therefore, need six metres of water access.

"Having more troughs makes it easier for cows to find somewhere to drink and can reduce bullying. If troughs run dry you need to consider installing more troughs, fitting a wide gauge feeder pipe, or both."

As well as quantity, it is important to consider water quality. "Cows have a sense of smell which is 16 times more sensitive than a human's. They will reject dirty water, so a good test is to smell the water in the trough. If you wouldn't drink it, then cows definitely won't want to."

installs in-line acidification systems with simple metering pumps. "We can add acetic or citric acid to the water as it's pumped from the borehole and this brings the pH down around 7."

Mineral status

When boreholes are installed they're tested regularly for bacterial contamination – the aim is to ensure good 'hygiene' quality. But Dr Tomlinson wants UK producers to think about pH, palatability and 'drinking' quality.

A problem that can affect palatability that's not related to pH is the water's iron content. Water that's high in iron has a strong metallic and unpleasant taste.

"So it's also important to know the mineral status of your water – what it contains and in what form. If it's

high in calcium, then is that calcium carbonate or calcium chloride? It can make a huge difference to palatability." Water mineral status varies according to region. In arid areas, for example, salt levels in water tend to be higher.

UK soils tend to be high in manganese: "And this suggests that borehole water on some units may contain high levels of manganese, which is astringent like iron and can make water unpalatable.

"That said, it's easy to remove from the water, using an ion column and filtration system. But it's vital to test the water and re-test it to confirm if there's a problem before investing in any kind of processing or filtration system.

"I advise my clients to switch to mains water for a month or two to prove that the borehole water is the issue when trying to solve a problem." |