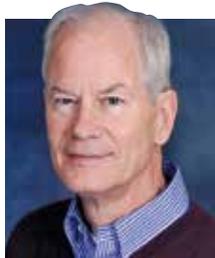


# WATER: the most essential nutrient

For every pound of additional dry matter intake, your herd consumes four more pounds of water.

by A.F. Kertz

**W**HEN I think of water, my mind dredges up the “Rime of the Ancient Mariner” by Samuel Coleridge from high school English and the fate that befell the ship’s crew as they suffered for want of drinkable water. But for our calves, heifers and cows we can remedy this need. Why is water so critical? It is



## KERTZ

The author is the principal in ANDHIL, LLC, a St. Louis-based consulting firm.

the nutrient needed in the greatest quantity, much more so than other nutrients like protein and energy.

When a calf is born, its body is approximately 70 percent water. That is the highest ratio it will ever be. Fat content is also at the lowest point — maybe 3 to 5 percent. There is a classic paper published in the *Journal of Dairy Science* (JDS) in 1955 by a Cornell professor who established that there is an inverse relationship between body water content and body fat. So, as an animal grows and deposits more fat, water is displaced.

### Essential for scouring calves

Another critical factor for young calves is, as they scour, they lose body water. If they lose about 4 percent, elevated water consumption can make up that difference. But, if that loss rises to 8 to 10 percent, electrolytes are also lost, and an electrolyte solution and further treatment may be needed to keep the calf alive during a major health event.

Then why is providing water to young calves such an issue? Here are reasons others have shared regarding why they do not provide water to calves: it causes scours, calves don’t need it, they get it through their milk replacer, it freezes in the winter and it’s a hassle.

Well, those reasons do not really “hold water.” When calves begin to scour, they will begin to drink more water. Not the other way around. Calves need water in winter, too. When you can see their breath, they are exhaling more moisture into the drier colder

winter air than they inhaled — and losing moisture with each breath.

### Clean water encourages intake

Dry matter intake is also directly related to water intake. Limit water intake, and you limit calves’ dry matter intake. Yes, they get water through their milk replacer, but that is not enough to fully facilitate calf starter intake. Calves consume four times the amount of water for every unit of dry matter intake. And if the water is dirty, calves will drink less water and, therefore, eat less, too.

If there is not a physical separation between the water and starter containers, calves will dribble between pails. This makes for wet starter and dirty water which will lead to lower consumption of both. Thirty years ago I had an “aha” moment which led to a study (table) in

Month after weaning	Separation	Adjacent
Weight gain, lbs./day	1.86	1.58
Starter intake, lbs./day	5.03	4.44
Water intake, lbs./day	18.0	13.6

which calves drank less water, ate less starter and reduced daily gain by 0.28 pound when containers were not physically separated.

At first glance, those numbers may not look like that 4:1 ratio, but remember it is 4 pounds of water per pound of dry matter intake.

A 2006 JDS study by Jim Quigley, with Provimi North America (figure), shows that, while the ratio of water to dry matter intake was only about 2:1 before weaning (which included

**KEEP THE 4:1 WATER TO DRY MATTER RATIO** in mind to predict your herd’s water needs and reach its performance potential.

water intake from milk replacer) by the end of 35 days, the ratio rose to 4:1. The different colors represent three milk replacer treatments.

### Warm water preferred

Another element in this picture is that calves like warm water, especially in winter. The main reason, I think, is because the warm water does not disturb rumen fermentation temperature and function as much. In a 1968 study from South Dakota State, it took around an hour for the rumen temperature of calves to return to near normal following a 20°F drop after calves drank 46°F water. Drinking water at 63°F, 81°F and 99°F showed less drastic rumen temperature drops, but it still required about an hour for rumen temperatures to return to near normal. Additionally, during winter, calves would have to use more energy to warm the colder water to rumen temperature.

### Ratio persists in lactation

Interestingly, heifers and cows also drink about four times more water compared to dry matter intake. There are not many heifer studies that measure water intake. But the ratio of water to dry matter intake (DMI) was about 4:1 in a 2011 study from Penn State in which heifers were fed two different levels of forage with four different levels of corn stover. In a German research database from 2009, nearly 23,000 observations from 193 Holsteins were accumulated over a year. The overall ratio of water to dry matter intake was about 4:1.

In a 1983 study from Illinois, the best estimate of water intake was related to DMI, milk production, sodium intake and minimum ambient temperature. Mike Van Amburgh of Cornell used that formula and calculated that water intakes at 45°F for six different milk production levels was 4:1 versus dry matter intake. As ambient temperatures rose to 65°F and 85°F, predicted water intake hiked by 13 and 26 percent, respectively. This rise was less pronounced with each water temperature boost when cows were producing more milk; and, of course, eating more dry matter. Water and dry matter intake go together like birds of a feather.

Why this ratio of 4:1? It may be as simple as the water to dry matter ratio in the rumen is even a bit higher than this at about 6 to 7:1. Cows cycle a lot of water through their system. They produce an average of 5 gallons of urine per day with a range of 2 to 9 gallons in an extensive Ohio State summary.

What to make of all of this? Cows, being ruminants, drink about four times more water than dry matter intake. This begins as calves are weaned and extends through the heifer growing period. This 4:1 ratio provides a simple reference point to estimate what the dietary water needs of your herd may be.

