

# Do Cows Give Less Milk If Given Worse Water?

## The Answer May Change with the Seasons

In the winter, salty drinking water served about as well as fresh tap water for a test group of dairy cows in Tucson. In spring and summer tests, however, the salt water cows gave slightly less milk than their fresh water control group.

UA dairy scientists Dr. Thomas N. Wegner and Dr. James D. Schuh are now expanding their studies "to determine the limits of how brackish—how salty—drinking water can be and still be suitable for high-producing dairy cows in Arizona," Wegner said this summer.

He explained, "We started looking at this area because real estate and population pressures in the Phoenix area have been pushing some of the big dairies from locations where the livestock water was low in total salts to the more outlying areas, where the wells are deeper and the water is saltier."

The Baseline-area dairy farms that have been sold for other uses had water with about 850 parts per million (ppm) of salts (sodium chloride and other salts). Some of the new dairy sites have dissolved salt levels of 4,000 to 11,000 ppm. The dairymen reported that cows slowly got over their initial reluctance to drink the salty water, but the farmers were not sure whether or not the change had a lingering effect on milk yields.

For comparison: Phoenix's municipal water averages 551 ppm of salts; Tucson's 285 ppm. Two tablespoons of table salt added to a quart of such water adds up to about 4,000 ppm dissolved salt. Seawater rates 35,000 ppm total salts.

Earlier research had shown that beef cattle, sheep and dairy cattle stay healthy on water with 10,000 or more ppm total salts. Studies of salt water's effects on milk yield had given ambiguous results and had generally used low-producing cows—8 to 20 kilograms (kg) of milk per day per cow (1 kg = 2.2 pounds).

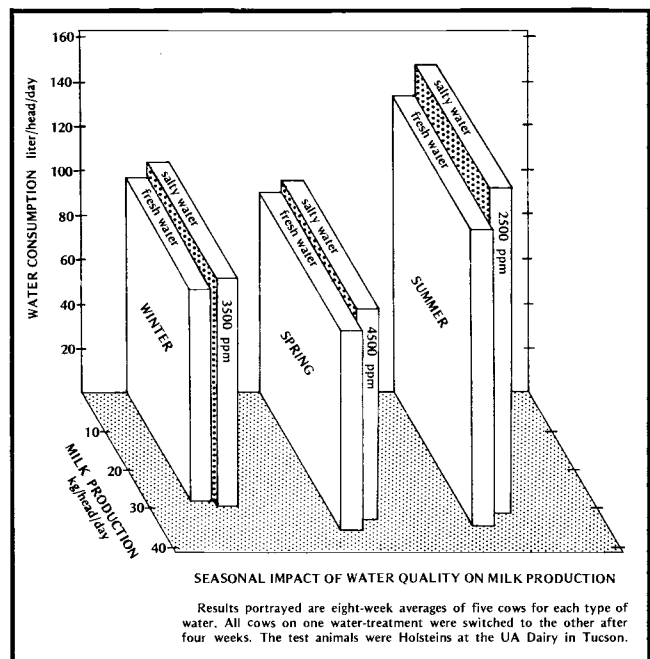
Wegner and Schuh's tests at the UA experimental dairy have used Holstein cows producing an average of 32 kg per day.

First, the scientists looked at the heifers' water preferences. Heifers had a choice between the farm's tap water, with 450 ppm salt, or tap water to which sodium chloride had been added, with the saltiness increased each week. Up to the level of 2,500 ppm added salt, they drank as much or more of the salty water as the fresh water.

To test effects of salty water on milk yield, the researchers did three experiments at different seasons and using different salt concentrations. In each experiment, five Holstein cows in early lactation drank only salty water for four weeks while five others drank only fresh water. Then the groups were switched for four more weeks of testing.

Concentrations of added sodium chloride salt were: for the December–January test, 3,500 ppm; for the April–May test, 4,500 ppm; and for the July–August test, 2,500 ppm. As illustrated in the graph, the salt water cows drank more water than the fresh water cows in each experiment. The difference was largest in the summer test.

No significant difference in milk yield appeared between the salt water group and the fresh water group in the winter (3,500 ppm) experiment. But, compared to the fresh water drinkers, the spring salt water group (4,500 ppm) gave 6 percent less milk and the summer salt water group (2,500 ppm) gave 4 percent less milk. Those differences were statistically significant at levels of  $p < .05$  and  $p < .10$ , respectively.



- So, these tests suggest a concentration of salt that begins to cut into milk production in the summer is much lower than one which does not affect winter milk production. What is the explanation?

Water is needed for milk production, and Wegner suggests that high summer temperatures place an extra water requirement on the animal's system for cooling and maintenance of body temperature. "In the past," he said, "we've probably underestimated the amount of water necessary for a cow to maintain its body temperature during hot, humid weather."

The salt water cows apparently had less water available for summer's increased needs than the fresh water cows did, even though they drank more. Wegner explains: "The extra salt load in their diet means they need more water for kidney function to eliminate the added salt load."



**Matching tanks to hold fresh water and salty water were installed for test measurements at the UA dairy farm in Tucson.**

In his experiments, the salt water cows had increased salt levels in urine and feces, but not in milk or blood. The extra salt intake did not affect milk quality.

Of the six test groups of cows—three fresh water and three salt water—the highest correlation between milk production and water consumption was for the group that drank salt water in summer. The more water these cows drank, the more milk they gave. This correlation was lower in the other salt water groups and absent in the fresh water groups. Wegner sees this as further evi-



**Cows usually head for a drink as they come out of the milking parlor.**

dence that the increased water requirements for salt excretion and for cooling limit the availability of water for milk production.

In these experiments, the researchers had to refill water tanks several times daily to keep a record of water consumption: Now, they are altering the corral and water system to make longer tests more practical.

"We want to look at the effect of salt water through a whole lactation period," said Wegner, "We'll see whether the cows adjust to the added salt. Maybe the milk yield will stay up in the summer if they've had time to adjust. We need to follow seasonal patterns of water and feed consumption, too. We'll even look at effects of the salt water on breeding efficiency and on the calves."

The new setup will ease testing of other factors related to water quality, such as metals, nitrites, nitrates or salts other than sodium chloride.

If cows on salty water do continue to give less milk in hotter months, the dairy scientists may look for ways to minimize the problem. One possibility would be manipulation of the cows' diet, such as removing supplemental mineral salts from the feed mixture.

Knowing the limits of acceptability of water quality for cows is important for future dairy management. "Owners of dairies that are relocating now know that water quality is a serious consideration," said Wegner. Even dairies that do not move may have to drill deeper wells, with saltier water, as ground water is depleted or claimed for other uses.

He continued, "If the Southwest keeps growing as people are predicting, there will be more competition for water between people and animals. That confrontation will relegate all livestock to a lower quality of water."