DAIRY VETERINARY NEWSLETTER

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Water Quality Testing for Dairy Cattle Consumption, a Bacteria Gets (Another) Name Change, and a Study of Residue Risk for Bob Veal Calves fed Colostrum from Dry Treated Cows

Summer is practically here and high temperatures are coming to Utah and the intermountain West. Field work is understandably a high priority on most dairy farms now. Dairy cattle health, management and production are still of critical importance as always, and the subjects below reflect that.

Some Specific Standards for Testing Drinking Water for Dairy Cows

Most or all veterinarians have heard the saying that water is the single most important nutrient for livestock including dairy cows. Nevertheless, dairy cows and calves still often drink from substandard water supplies. Results of a recent study of dairy cattle water quality in Pennsylvania were reported in the Dairy Herd Network electronic newsletter. The article can be seen at: http://www.dairyherd.com/e-newsletters/dairy-daily/Study-suggests-dairy-herd-water-quality-linked-to-milk-production-208652081.html

The study was conducted by Bryan Swistock, extension water resources specialist at Penn State. "While most dairy farms routinely test their water supplies for bacteria, additional testing for salts, metals and other parameters that can affect herd performance is conducted less frequently", Swistok said. "In the fall of 2012, Penn State Extension offered free water testing for dairy farmers across Pennsylvania. The objective of the project was to increase awareness of various water-quality parameters that are not tested as often. These less-tested parameters may explain chronic herd performance issues."

Of 240 dairy producers who "expressed an interest" in testing, 174 (72%) from 41 counties in Pennsylvania sent water samples to Penn State's Agricultural Analytical Services Laboratory. Some interesting descriptive statistics:

- Farms covered 51,000 acres with 18,000 cows (this is an average of 103 cows per farm, somewhat more than 25% of the mean number of cows per farm in Utah)
- Private wells or springs provided the dairy cattle water source on 98% of the farms
- Herd mean milk production ranged from 20 pounds to 98 pounds of milk per cow per day
- 6 herds (3%) had water meters to record water consumed per day by the cows

"Overall, 45 of the water supplies, or 26%, had at least one water-quality issue," Swistock said. "Average milk production for these 45 farms was 56 pounds per cow per day, compared to 62 pounds on the 129 farms with good water quality."

It was also found that of farms defined as high milk production, > 75 pounds of milk per cow per day, none had existing water quality problems detected, but among farms defined as low milk production, < 50 pounds of milk per cow per day, 32% had "at least one potential water quality problem".

Some important test parameters for evaluating drinking water quality for dairy cattle

Penn State University prepared a document called "Interpreting Drinking Water Tests for Dairy Cows". It can be viewed at: http://extension.psu.edu/natural-resources/water/drinking-water/water-testing/testing/interpreting-drinking-water-tests-for-dairy-cows

The entire document should be read, but a brief listing of 11 important water tests and their recommended standards follows:

- **pH** (Recommended range 6.0 to 8.5)
- **Total Dissolved Solids (TDS)** (Recommended < 1,000 mg/L; always should be < 3,000 mg/L; test any water source > 1,000 mg/L for "major water minerals, salts and metals")
- **Nitrate-Nitrogen** More well known in feed especially in drought years like we have had recently, these are also important in water, and high levels in feed and water are additive (recommended < 20 mg/L, certainly < 100 mg/L)
- **Hardness, Calcium, Magnesium** Hard water may restrict water flow because of mineral deposits, but usually does not impact cow health directly. **(**Calcium or magnesium > 500 mg/L are high levels, should be included in ration formulation calculations)
- **Sodium** (if > 20 mg/L include in ration formulation calculations)
- **Iron and Manganese** Common where there is or has been mining activity, such as many parts of Utah, also common in groundwater. Reduced intake because of unpleasant metallic taste. (Iron recommended < 0.3 mg/L, manganese < 0.05 mg/L)
- **Chloride** Natural sources, but also gas or oil well drilling, road deicing are common sources. Too much chlorine reduces water intake, and also should be included in ration formulation calculations. (Recommended < 250 mg/L)
- **Sulfate** Conflicting results from different studies on exact levels recommended. High sulfate has been linked to reduced milk fat and the necessity to feed increased levels of selenium, vitamin E and copper. (Recommended < 500 mg/L; should always be < 1,000 mg/L)
- **Copper** Corroded plumbing, mining areas, copper sulfate algaecides in ponds are common sources. Reduced intake because of unpleasant metallic taste. "High copper levels" cause liver damage. (Recommended < 1.0 mg/L)
- **Coliform Bacteria** Coliform counts are better known for testing in milk, and the standard that cleaning water and water used for any washing of teats or udders (or mixing with teat dip concentrate or udder wash concentrate) should have zero coliforms/100 ml. Drinking water coliform counts directly reflect sanitation and frequency of cleaning drinking water containers. Daily cleaning of drinking water containers for dairy animals is recommended.
- ***E. coli* Bacteria** This one surprised me. " - - occurrence of *E. coli* bacteria is much more serious than total coliform bacterial contamination. - - Frequent cleaning of water locations can minimize exposure to *E. coli* or other fecal bacteria in water. It is recommended that *E. coli* or fecal coliform bacteria should be absent from drinking water for cattle." (I am not convinced that *E. coli* in drinking water is always any worse than for example *Klebsiella* spp. or *Enterobacter* spp. I also question how practical it is to have zero tolerance for *E. coli* in drinking water.)

There was more information in the full document, as mentioned above.

Arcanobacterium pyogenes has been Renamed (Again) as *Trueperella pyogenes*

It is a common joke in veterinary school and sometimes in other academic settings that some kinds of research do not often find anything truly new, so this necessitates renaming things that have already been discovered. This is an oversimplification, of course, but it is interesting how some organisms change names as if they are running from the law, and most do not. In veterinary medicine, one is hard pressed to think of another organism that has had more name changes in recent decades than the bacterium formerly known as *Corynebacterium pyogenes*, *Actinomyces pyogenes*, and *Arcanobacterium pyogenes*, now renamed *Trueperella pyogenes*.

The new genus *Trueperella* was proposed in 2006 and accepted in 2011. The refereed publication describing the rationale for the new genus is a paper by A. Yassin et al., International Journal of Systematic and Evolutionary Microbiology, June 2011. (The genus was named after German microbiologist Hans Georg Trűper.)

T. pyogenes by any name remains a relatively uncommon cause of bovine mastitis, which can lead to thick purulent milk and be difficult to cure, but a relatively common cause (at least according to some refereed publications) of metritis in post parturient dairy cows. It is considered a commensal on the "mucous surfaces of warm blooded animals" according to the Yassin paper cited above. It also causes abscesses in many mammals, including pigs, sheep, goats, bison, and the grey slender loris, among others. When the organism is present within abscesses, like all abscessed infections, true bacteriological elimination is difficult unless a surface abscess can be drained.

Remembering the new names of old bacteria is one of the challenges when one has been out of veterinary school for some time.

Are Bob Veal Calves at Residue Risk When Fed Colostrum from Cephapirin Benzathine Dry Treated Cows?

Also briefly summarized in the May 2013 AABP Newsletter, a study reported in the April 2013 J Dairy Sci by K. Hausler et al. investigated this practical question. What is the risk of bob veal calves for meat residue if they consume colostrum from cows dry treated with Tomorrow® dry treatment? (That specific brand of dry cow treatment was investigated in the study.)

Bob veal calves are generally defined as baby bull calves sold from dairy farms from a few days to 3 weeks old, or up to 150 pounds body weight, to be harvested for baby veal. Along with cull dairy cows, bob veal calves are much more likely to be detected with antibiotic residues in the carcass than other animals such as beef cattle or calves or other livestock species, according to the USDA FSIS (Food Safety and Inspection Service), accounting together for over 90% of all violative meat residues.

Holstein study cows at the University of Minnesota were treated with one tube per quarter of Tomorrow® (cephapirin benzathine) dry treatment when dried off, and then infused with OrbeSeal® teat sealant in each quarter. Within 30 to 90 min after calving, colostrum was harvested. Second-plus lactation cows that were not otherwise medicated during dry period, had at least a 30 d dry period, and that produced at least 4 L of colostrum were eligible for the trial. Neonatal Holstein bull calves that were born singly, weighed at least 70 pounds at birth, had no dystocia score above "moderate pull", (no "hard pull" or "C-section" births), and were born to eligible dams were enrolled in the study.

Calves (n = 6) were fed 3.8 L of fresh colostrum from their dam by esophageal feeder within 1 h of age, and one additional control calf was fed colostrum replacer (Secure Calf ®); they were humanely euthanized at 24 h old. Another group of calves (n = 5) fed colostrum and another control calf fed replacer were humanely euthanized at 48 h old. Kidneys and the diaphragm were collected from each calf, frozen and shipped on dry ice to a USDA

5600 Old Main Hill
Logan UT 84322-5600

Agricultural Research Service laboratory for tissue residue testing using the kidney inhibition swab (KIS®) commercial test, the standard USDA test. The KIS detects cephapirin in kidney tissue at a level of 100 ppb. Neither KIS nor liquid chromatography-tandem mass spectrometry detected cephapirin or desacetylcephapirin at levels $\geq$5 ng/g, the lowest spectroscopy detection level.

The authors did a good job of acknowledging some study limitations: sample size too small for numerical statistical analysis, only cows with dry treatments of 39 to 60 d were studied, and calf kidney and diaphragm samples were frozen instead of being tested chilled and fresh as the USDA does in slaughter plants. However, I agree with the authors that, " - - it is unlikely that concentrations would have decreased below detectable limits during this storage period for all samples tested. - - Potential transfer of cephapirin from cows treated on-label at dry off to calves via their colostrum may not be a significant source of cephapirin residues in veal tissues."

Please let us know your comments and also suggestions for future topics. I can be reached at (435) 760-3731 (Cell), (435) 797-1899 M-Tues, (435) 797-7120 W-F or David.Wilson@usu.edu.

David J. Wilson

David Wilson, DVM
Extension Veterinarian