Understanding and controlling variability of iodine concentration in bulk-tank milk in Canada

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Introduction

Iodine is an essential micronutrient for dairy cattle and humans to maintain adequate metabolism. Feeding management practices for dairy cattle are aimed at achieving the recommended intake of micronutrients for optimal health. Testing has shown that iodine concentrations in bulk-tank milk (BTM) are highly variable between herds. While the current iodine concentration in retail milk does not present a substantial risk to human health, Health Canada has recommended an interim upper limit of 500 ppm of iodine in BTM. The objectives of this project were to determine the primary sources of variability for BTM iodine concentration and provide recommendations for best management practices to maintain BTM iodine concentrations within acceptable limits.

Materials and Methods

To understand and manage BTM iodine concentrations, Dairy Farmers of Canada, together with provincial milk boards, have implemented annual BTM testing for iodine concentration on all dairy herds in Canada. On the basis of iodine concentrations detected in BTM samples collected during the first round of testing (2010-2011), 164 herds (40 in Western Canada, 82 in Ontario, and 42 in Atlantic Canada) were selected for on-farm observation of milking practices and collection of data on general herd management. Half of the herds selected had BTM iodine concentration in the bottom 50th percentile and the other half of herds selected had BTM iodine concentration in the top 25th percentile for their respective provinces. Herds that consented to take part in the observational study were visited between May and August of 2011. Information on all iodine-containing products used on the farm and all feed components and amounts fed to lactating dairy cows was obtained. The quantity of iodine teat disinfectant products used on each farm was determined. Pre- and post-dip teat coverage were scored, and teat swabs were collected from a minimum of four randomly selected cows per herd to determine whether the amount of teat dip coverage or residue of teat dip remaining on teats prior to milking machine attachment could be correlated to BTM iodine concentration. Additional data collected regarding general herd management included herd size, barn type, iodine-containing medications or disinfectants used, annual numbers of various health events in the herd, and feeding practices, including access to pasture. Finally, BTM and feed samples were collected at the time of the herd visit for quantification of iodine concentrations. Data were analyzed with multilevel regression for clustered date by use of Stata/SE 11.2.

Results

For all herds (n=12,101), BTM iodine concentration ranged from 0 to 3,936 ppm. The median iodine concentration was 215 ppm, and data were highly skewed to the right with 93.5% of herds below the 500 ppm iodine threshold during the first round of testing. For the 164 herds selected for on-farm observation, BTM iodine concentration ranged from 25 to 2,386 ppm. Preliminary analysis of the data indicates that as iodine concentration in feed increases, BTM iodine concentration also increases ($P = 0.001$). Herd size, frequency of milking (twice daily versus three times daily), and the type of milking system were not significant predictors of BTM iodine concentration. Use of pre- or post–teat dips containing iodine were not significant predictors of BTM iodine concentration; however, the amount of pre-dip residue remaining on the teat prior to milking machine attachment was significantly ($P = 0.003$) associated with BTM iodine concentration. Post-dip teat coverage was also a significant predictor ($P = 0.003$) of BTM iodine concentration, with excess application (coverage of full teat extending onto udder) associated with higher BTM iodine concentrations, compared with that when only the teat is covered.

Significance

Feeding elevated levels of iodine in the ration is a risk factor for elevated BTM iodine concentration. The use of iodine-containing teat disinfectants was not as-

sociated with increased BTM iodine concentrations; however, failure to adequately remove pre-dip products and aggressive application of post-dip was associated with increased BTM iodine concentrations. Recommendations for maintaining BTM iodine concentration within acceptable limits should focus on maintaining proper amounts of iodine in the ration and ensuring proper application and removal of teat disinfectants prior to milking machine attachment.

Evaluation of a Petrifilm-based on-farm culture system for the detection of intramammary infections in cows with low somatic cell counts at dry-off

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Introduction

As an alternative to blanket dry-cow therapy, teat sealant-based selective dry cow therapy (SDCT) has the potential to greatly reduce the amount of antimicrobials used in dairy production. The main obstacle to SDCT is the necessity for a rapid and cost-effective method of identifying which cows have an infection at dry-off and would benefit from dry-cow antimicrobial therapy (DCT). Ideally, this method of diagnosis would be applicable to on-farm use and be simple to interpret. Because failing to treat an infected quarter at the end of lactation can have detrimental effects on the subsequent lactation, the diagnostic test should also have high sensitivity. Petrifilms are a ready-made culture media that provide results within 24 hours and are suitable for on-farm use. The presence of an indicator dye in the Petrifilm medium makes aerobic bacterial colonies appear as bright pink dots against a white background. Petrifilms have been validated as a diagnostic tool for the selective treatment of mastitis in lactating cows. The objective of this study was to determine the utility of a Petrifilm-based on-farm culture system for making treatment decisions for cows with low somatic cell counts (SCC) at dry-off.

Materials and Methods

Cows from 16 dairy herds that had low bulk-tank SCCs (<250,000 cells/ml) located in Quebec and Prince Edward Island were considered for inclusion in the study. Inclusion criteria included SCC < 200,000 cells/mL on the last three tests prior to dry-off, no evidence of clinical mastitis in the last 120 days prior to dry-off, no antimicrobial treatment within the last 14 days prior to dry-off, and an expected dry period of 30 to 90 days. On the day prior to dry-off, quarter and composite milk samples were collected. Quarter samples were cultured in a reference laboratory and composite samples were assessed using the Petrifilm-based on-farm culture system. On the scheduled day of dry-off, the Petrifilm was read by the producer and, in accordance with study protocol, cows were classified as positive if ≥ 5 colonies were present. Cows with negative Petrifilm results were treated with an internal teat sealant (ITS) alone at dry-off; cows with positive Petrifilm results were treated with DCT and an ITS. To assess the ability of producers to correctly classify cows into DCT and no DCT groups, the agreement between Petrifilm results obtained by the producer and those obtained by an au-