

Benchmarking Health and Management across the Canadian Dairy Herd

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■ Take Home Messages

- ▶ The National Dairy Study 2015 represents the first successful attempt to benchmark health and management across the Canadian dairy industry, including herds from all 10 provinces.
- ▶ The majority of Canadian dairy farms purchase animals and add them to the herd with little in the way of pre-purchase screening, which poses a significant biosecurity risk on most farms.
- ▶ Based on bulk tank milk testing, over 85% of farms were positive for BLV, 45% were positive for Staph aureus and 20% were positive for Johne's Disease, indicating that the true prevalence of these diseases across Canada is likely even higher, and that the implementation of herd biosecurity needs to be improved.
- ▶ One in every 4 cows on Canadian dairy farms is lame, and one in 5 cows has a hock or knee injury, indicating that there is a need to improve animal care and welfare across the country.
- ▶ The adoption of best practices for milking cows is highly variable across the country and there may be opportunities to improve milk quality and improve udder health by increasing the adoption of these practices.

■ National Dairy Study 2015

The National Dairy Study (NDS) (<http://www.nationaldairystudy.ca/>) conducted in 2015 was the first attempt to benchmark the health and management on dairy farms in all 10 Canadian provinces. It was modeled after the National Animal Health Monitoring System (NAHMS) dairy studies in the USA (<https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/monitoring->

and-surveillance/nahms/nahms_dairy_studies). Phase 1 consisted of an extensive questionnaire offered to all Canadian dairy producers, covering herd demographics and farm characteristics, biosecurity and infectious disease control, clinical disease estimates, calf health and management, animal care and welfare, udder health and milking hygiene, reproductive programs, and social media use. Phase 2 consisted of visits to 374 farms to collect more detailed health and management information, assess animal care based on selected animal-based measures, and to collect biological samples for testing. Farms participating in both phases were distributed across all 10 provinces and representative of the breadth of the Canadian dairy industry. The distribution of producers and phase I and II participants can be found in Table 1. NDS herds were housed in tie-stall (59%), free-stall (38%) or bedded pack (3%) facilities; 85% were enrolled in milk recording; 12% used robotic milking systems and 3% were certified organic.

Table 1. By province, the distribution of producers, and phase I and phase II participants in the National Dairy Study 2015.

Province	# Dairy producers	# Phase I participants	# Phase II participants
British Columbia	496	48	19
Alberta	549	57	20
Saskatchewan	156	13	10
Manitoba	299	45	10
Ontario	3 232	347	132
Quebec	5 660	508	122
New Brunswick	204	30	19
Nova Scotia	225	27	18
Prince Edward Island	177	27	20
Newfoundland	27	6	4
	11 025	1,108	374

■ proAction

The proAction Initiative is a national on-farm customer assurance program developed by Dairy Farmers of Canada and implemented provincially by the respective milk boards (<https://www.dairyfarmers.ca/what-we-do/programs/the-proaction-initiative-on-farm-excellence>). Two of the six elements of proAction are Animal Care and Biosecurity. The Animal Care module includes an independent assessment of animal based-measures on a representative sample of cows in the herd. The Biosecurity element is focused on the introduction and within herd spread of infectious exotic and endemic diseases. Animal Care was implemented across the country in September 2017, while the target date for Biosecurity is September 2019. The NDS was developed to capture some key aspects of both of these components of proAction to serve as benchmarks for the dairy industry.

■ Biosecurity

A total of 1,373 dairy producers across Canada completed the Phase 1 survey between March 1 and April 30, 2015 and answered some or all of the biosecurity questions. Herds were classified as very small (< 45 cows; 21%), small (45 to 65 cows; 23%), medium (65 to 100 cows; 25%), and large (> 100 cows; 31%).

Animal Health Management

While 93% of the respondents kept an animal health record, only 45% reviewed the occurrence of diseases in their herd at least once a year. Respondents reported having protocols in place for lameness (49%), mastitis (93%), retained placenta and metritis (73%), respiratory disease (56%), pink eye (15%), and calf diarrhea (54%), but this varied substantially by geographical region. Infectious diseases that most respondents were trying to prevent from entering their herd were bovine viral diarrhea (BVD; 58%), and Johne's disease (51%). Infectious disease respondents wished to eliminate or control *Staphylococcus aureus* mastitis (69%) and digital dermatitis (48%). Forty percent of the respondents reported having at least one lactating cow that died or was euthanized for an unknown reason in 2014, and 24% of them reported having a post-mortem performed on that animal(s).

Animal Addition and Movement

Forty-one percent of the respondents indicated that they had a closed herd (no introduction or reintroduction of animals to the herd during the calendar year 2014). In herds where animals were added, 75% said they inquired about the disease status of the herd that the new animal originated from, but only 25% tested the new animal for diseases, mainly for contagious mastitis pathogens, Neospora, and bovine leucosis virus (BLV). Segregation and vaccination of a new animal was used, most of the time or always, by 24% and 40% of the respondents, respectively. Larger herds were more likely to use segregation and vaccination than smaller herds.

Sanitation

Eighty-three percent of the respondents ensured cow udders and lower legs were free of manure before calving, and 76% of them cleaned out, sanitized, and re-bedded the calving pen after each calving. Both were more common in smaller and tiestall operations than in larger and freestall operations, respectively. Sixty-four percent of the respondents never used the same equipment to handle both manure and cattle feed, and the 39% of the respondents sending their animals to pasture prevented their animals from grazing pasture where manure had been spread in the same growing season.

Human and Equipment Movement

There was very little effort to control who had access to their dairy farm: 2% of the operations had a gated main entrance, 14% had biosecurity signage, and 4% locked their doors when staff were not working in the barn. Employees were required to use boots and coveralls designated for the farm in 53%, and 37% of the operations, respectively. Consultants and visitors were required to use boots and coveralls designated for the farm, most of the time or always, in 62%, and 33% of the operations, respectively. Thirty-seven percent of the operations shared farm vehicles or equipment with a neighbor's farm, a practice which was more common on smaller operations than larger ones.

■ Disease Testing

After the Phase 2 farm visits, bulk tank samples were collected from each of the 374 farms for disease testing. These bulk tank milk samples underwent testing at three different laboratories for bovine leukosis (Maritime Quality Milk Laboratory, Charlottetown, PE), four mastitis pathogens and Johne's disease (CanWEST DHI, Guelph, ON) and *Salmonella* Dublin (Laboratoire d'épidémiologie animale, MAPAQ, Saint-Hyacinthe, QC).

Bovine Leukosis Results

Two bulk tank milk samples from each farm were tested one month apart using an indirect commercial ELISA (Nekouei et al., 2015) for leukosis antibodies, according to manufacturer's instructions. The cutoff for a positive test was >5. Herd-level prevalence was 87.2% with an average score of 59.4, indicating a high within herd prevalence in many of the positive herds.

Mastitis Results

One bulk tank milk sample from each farm was tested for *Staphylococcus aureus*, *Prototheca*, *Streptococcus agalactiae*, and *Mycoplasma bovis* using the PathProof™ Mastitis Major 4 PCR Assay (Thermo Fisher Scientific Inc. Waltham, MA, US) according to manufacturer's instructions. The overall herd-level prevalence for *S. aureus* was 44.8% (Table 2) and using a logistic regression model the following variables were identified as risk factors for being a positive herd: tie-stall (odds ratio (OR) = 2.9), not visually tagging chronically infected cows (OR = 2.1), and not fore-stripping prior to milking (OR = 1.8). The herd-level prevalence for the remaining pathogens was 6.7% for *Prototheca*, and 0.3% for *M. bovis* and *S. agalactiae*.

Table 2. Bulk tank milk testing results for *S. aureus* and *Prototheca* by province for the National Dairy Study 2015.

Province	Number of farms visited	Number <i>S. aureus</i> Positives	Number <i>Prototheca</i> Positives
British Columbia	19 (5.1%)	2 (10.5%)	2 (10.5%)
Alberta	20 (5.3%)	5 (25.0%)	1 (5.0%)
Saskatchewan	10 (2.7%)	4 (40.0%)	0 (0.0%)
Manitoba	10 (2.7%)	4 (40.0%)	1 (10.0%)
Ontario	132 (35.2%)	52 (39.3%)	8 (6.1%)
Québec	122 (32.5%)	76 (62.3%)	8 (6.6%)
New Brunswick	19 (5.1%)	12 (63.2%)	0 (0.0%)
Nova Scotia	18 (4.8%)	8 (44.4%)	0 (0.0%)
PEI	20 (5.3%)	8 (40.0%)	3 (15.0%)
Newfoundland	5 (1.3%)	2 (40.0%)	2 (40.0%)
Total	375	168 (44.8%)	25 (6.7%)

Johne's Disease Results

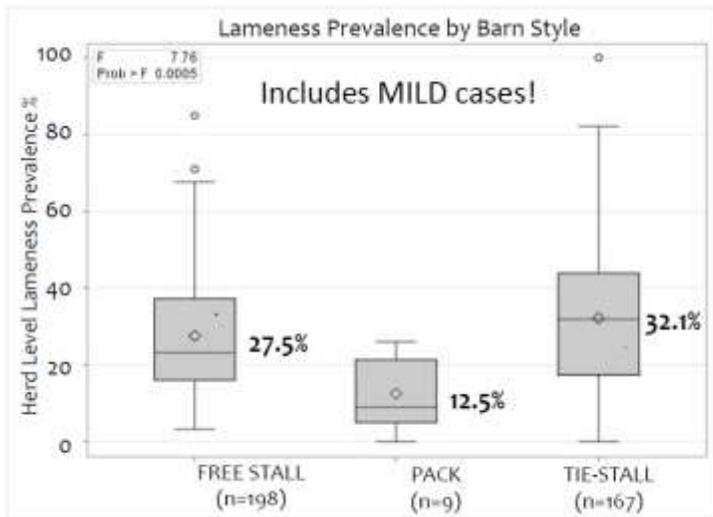
One bulk tank milk sample from each farm was tested for Johne's disease antibodies using the IDEXX indirect ELISA according to manufacturer's instructions. Herd-level prevalence was determined to be 15% (56 of 375 herd bulk tank samples were ELISA positive). Given that antibody ELISAs for Johne's disease have a low sensitivity, and that testing a bulk tank sample has a lower sensitivity than testing individual animals, this is clearly an underestimate and likely represents the proportion of herds with moderate to high within herd JD prevalence. By comparison, cultures of environmental samples collected from the lactating cow environment and the manure storage yielded positive results in one or more samples from 72 of 372 farms (19%).

Salmonella Dublin Results

One bulk tank milk sample from each farm was tested for Salmonella Dublin using a PCR-based test and a cutoff of ≥ 50 for a positive herd. The overall national herd-level prevalence was 1.1% with only 4 farms testing positive (one in Alberta and three in British Columbia). Environmental fecal samples from each farm were also cultured for Salmonella, but no farms tested positive for *S. Dublin* only. Salmonella species identified in the environmental samples included Cerro, Montevideo, Kentucky, and Rubislaw.

■ Lameness, Injury and Tail-Docking

During the Phase 2 farm visits a representative sample of cows was scored for lameness, hock injuries and body condition. The methods used were as described by the proAction program as of April, 2015. Lameness scoring in loose housing was based on the 5-point method described by Flower and Weary (2008), with cows scoring 3, 4 or 5 considered lame. Lameness in tie-stall housing was based on 4 behaviours described in detail in Gibbons et al. (2014), with cows exhibiting two or more of these behaviours categorized as lame. Results of the lameness evaluations, by housing type, are presented in Figure 1. Note that the lameness prevalence for loose housing conditions includes mildly lame cows (Score 3), which have recently been assigned to a 'monitor' category which is separate from the 'requires corrective action' (Score 4 and 5) in the proAction Animal Care program.



S. Croyle, 2016

Figure 1. Herd level lameness prevalence by barn style for Phase 2 NDS herds.

Cows were also evaluated for hock injuries and body condition as described in the proAction manual. Hock injury prevalence by housing type is presented in Figure 2. Table 3 summarizes the prevalence of lameness, hock injury and body condition score on dairy farms across Canada, with benchmark ranges based on quartiles. One interesting and controversial practice across the dairy industry is the docking of tails for non-medical reasons. Although there are many industry and professional position statements opposing this practice, 8.5% of Canadian dairy producers indicated that they had cows with tails that were docked for non-medical reasons (Table 4).

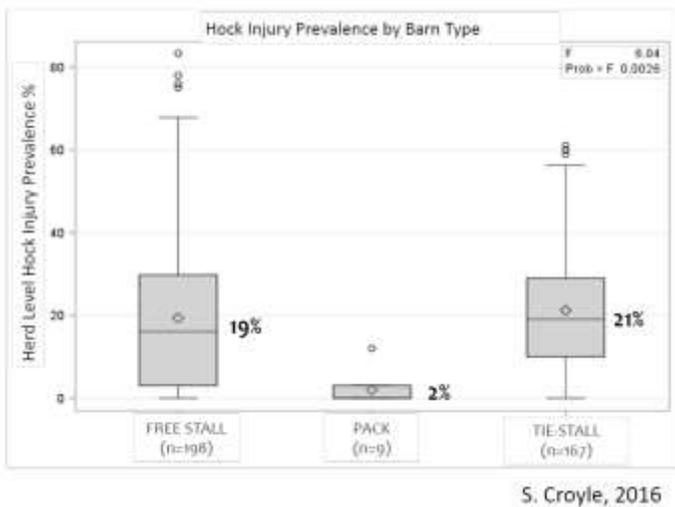


Figure 2. Herd level hock injury prevalence by barn type for NDS Phase 2 herds.

Table 3. Prevalence and benchmarks for animal-based measure evaluations on Canadian dairy farms during the Phase 2 NDS farm visits.

Animal Care Assessment Summary from National Dairy Study 2015 Herd Visits (n=375)						
Measure	# Herds Scored	Excellent Target	Excellent	Green (Best 25%)	Yellow (Middle 50%)	Red (Worst 25%)
		% of Cows Unacceptable	Met Target	% of Cows Unacceptable	% of Cows Unacceptable	% of Cows Unacceptable
Body Condition Score	372	<5%	369 herds (99.2%)	0% to 0%	0% to 0%	0% to 10%
Hock Injury	375	<10%	129 herds (34.3%)	0% to 5%	6% to 29%	30% to 83%
Lameness - Freestall	222	<10%	40 herds (18.1%)	0% to 13%	14% to 35%	35% to 100%
Lameness - Tiestall	156	<10%	4 herds (2.6%)	0% to 22%	23% to 50%	51% to 92%
Body Condition Score		A cow was deemed unacceptable if she had a body condition score less than or equal to 2 on the 5 point scale.				
Hock Injury		A cow's hock was considered to have an unacceptable injury if there was swelling of more than 1 cm and/or a bald area over the hock with a scab or broken skin.				
Lameness - Freestall		Cows were observed walking for at least 4 strides and scored as having a limp (unacceptable) or no limp (acceptable). A cow was deemed to have a limp if she was favouring one or more limbs.				
Lameness - Tiestall		Cows were scored in their stalls by observation for 1.5 minutes each. A cow was considered lame when she demonstrated 2 or more of the 4 behavioural indicators as described in the proAction manual.				

Table 4. Tail docking for non-medical reasons on Canadian dairy farms.

TAIL DOCK	AB	BC	MB	NB	NL	NS	ON	PEI	QC	SK	TOTAL
NO count	45	46	41	25	6	26	357	26	433	11	1016 91.5%
YES count	9	0	2	1	0	0	28	0	55	0	95 8.5%
% of YES	9.5	0	2	1	0	0	29.5	0	57.9	0	100%

■ Udder Health and Milk Quality

Milking management

Nationally, 61% of farms required all milkers to wear gloves, 20% had only some of the milkers using gloves, and 19% of farms did not use gloves at all during milking. Of those wearing gloves, 73% indicated that milkers cleaned the gloves during milking, however 59% of these only cleaned them when dirty, 33% cleaned gloves regularly but not between each cow and only 8% cleaned them between each cow. Only 41% of the respondents cleaning gloves cleaned them with a disinfecting solution.

Nationally 61% of the respondents reported using a pre-milking teat disinfectant, and 81% of respondents fore-stripped prior to milking unit attachment. Over 95% of farms cleaned teats before attaching the unit (pre-dip, dry wipe, udder wash, or water wash). The majority of respondents used one disposable paper towel to dry the teats of each cow prior to milking (54%), 23% used a new reusable cloth towel for each cow, 8% used the same towel to dry teats of multiple cows and 13% stated that they did not dry teats prior to milking. Overall 70% of respondents used automatic take-offs with all of their cows, while 21% did not use automatic take-offs at all. Finally, 97% of respondents reported using a post-milking teat disinfectant.

The adoption of recommended milking practices varied across farms, with markedly different adoption rates for different practices. Some of the practices, most notably the use of a post milking teat disinfectant, were reported to be widely adopted. Other practices, including cleaning gloves with disinfectant and use of a pre milking teat disinfectant are much less widely in use.

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