



# Naturally healthier

**Breeding your cows for high immune response can result in a herd less prone to mastitis**

You may have noticed some of your cows get sick less often and also respond better to therapeutics, especially vaccines. If you could identify these animals at an early age, you could significantly reduce the prevalence of diseases like mastitis and their ensuing costs, as well as help keep your bulk tank somatic cell count under control.

Dairy cattle diseases, notably mastitis, have significant costs for you and the entire industry through treatments and lost production. A mastitis case can cost \$110 to \$320, and it has been estimated mastitis-causing pathogens infect almost one out of every five dairy quarters in Canada.

Making the best use of genetics to select for healthier animals with naturally superior immune response is an attractive option to minimize disease occurrence on dairy farms. Dr. Bonnie Mallard, a professor of immunogenetics at the University of Guelph's Ontario Veterinary College, has devised a patented test to identify cows and calves with enhanced immune responsiveness—referred to as high immune responders, or HIR animals.

HIR cows have been shown to have less mastitis than cows with average or low immune responsiveness in three out of four herds previously tested. The lower somatic cell count

penalty threshold, taking effect Aug. 1, underscores the value of these animals.

Other health benefits identified for HIR cows in a large U.S. commercial dairy herd were less metritis, displaced abomasum and retained placenta. Moreover, these animals were found to respond better to commercial vaccines, including an *E. coli* J5 vaccine, compared with other cows.

HIR cows also have more antibodies in their colostrum to transmit beneficial protection to calves. These associations represent substantial benefits for herd health that translate into direct cost savings.

## Immune response tested

Most recently, in collaboration with the Canadian Bovine Mastitis Research Network, 690 cows from 58 herds across Canada were immunized in a study using Mallard's patented system to evaluate immune response. Blood samples and a simple skin test were taken to measure two types of immune responses, or the cows' ability to fight off infections.

Both types of responses—antibody and cell-mediated—contribute to protecting a cow from a diverse array of pathogens. Enhanced broad-based health is especially important to control diseases like mastitis, which can be caused by several different kinds of organisms.

High, average and low immune responders were found in each herd in all regions across Canada. Cow rank-

ings could be compared within herd, within province and across regions. About 15 per cent of cows were high immune responders, 15 per cent low and 70 per cent average.



**Enhanced health is especially important to control diseases like mastitis.**

Results to date have shown breeding for optimal HIR would not affect production. HIR cows had no differences in 305-day milk, protein and fat yields, and overall lifetime profitability compared with other cows in the CBMRN study population.

## HIR benefits highlighted

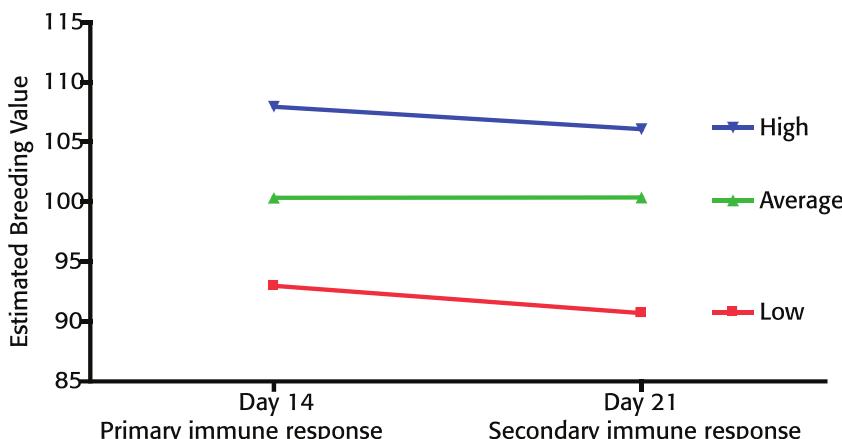
Two other immune response trials have previously demonstrated that HIR cows have the lowest disease occurrence. Now, through the CBMRN,

### Countdown to 400K

*Editor's note:* With the new penalty threshold for somatic cell counts looming on Aug. 1, *The Milk Producer* is publishing a series of articles about better udder health.



### Estimated Breeding Values of immune response for high, average and low immune responding dairy cattle in Canada



data are available on clinical mastitis cases and analysis is underway to determine the association of HIR with mastitis incidence, duration and severity. Preliminary results show cows classified as HIR had the lowest occurrence of *coagulase-negative staphylococci* among all cases of clinical mastitis in cows across Canada tested for immune response.

Since HIR cows are less likely to get sick, they need to be treated less often and have less lost production through discarded milk. Canadian consumers would benefit from an increased number of HIR cows through the production of high-quality milk from the healthiest cows. Since you would have to use fewer antibiotic treatments, you would reduce the risk of residues in milk and development of antimicrobial-resistant microbes.

By decreasing disease occurrence, you would also improve animal welfare. Mastitis can be painful, and minimizing the likelihood of sickness would increase the overall well-being of dairy cattle.

HIR cows would also likely minimize economic costs and implications of a disease outbreak. They respond better to treatment and have natural mechanisms to better control infection compared with other cows.

You could also benefit from identifying low immune responder calves or cows. This could help you make herd-level management decisions, such as which cows to cull.

overall health of dairy cattle.

Future directions of this research include genotyping HIR cows to identify the genetic profiles of these animals that contribute to their enhanced immunity. Genetic variation associated with complex traits like immune response can be used to predict the genetic merit of cows at birth.

In the future, it may be possible to include genetic disease-resistance markers in genotyping programs. They would help you select dairy cattle for enhanced immune response in subsequent generations.

### Breeding for HIR

This study's results show the heritability of the antibody and cell-mediated immune response traits are moderate to high, ranging from 0.14 to 0.56. This indicates genetics account for between 14 and 56 per cent of the immune response variation.

Using these heritability estimates, breeding values are calculated to rank cows for immune responsiveness. Since there is a significant genetic component to the variability of immune response traits, it would be feasible to include immune response in breeding indices to make genetic gains with the goal of improving the

Kathleen Thompson-Crispi is a PhD candidate in the department of pathobiology and Dr. Bonnie Mallard is a professor of immunology at the University of Guelph. Many colleagues and students have also worked with Mallard over the years, contributing to the success of this dairy cattle research. They include Ken Leslie, Filippo Miglior, Lauri Wagter-Lesperance, Armando Heriazon, Jason DeLapaz and Shannon Cartwright. Their contributions are greatly appreciated and acknowledged. Funding for this research was provided by grants from NSERC, Canadian Bovine Mastitis Research Network, Canadian Dairy Network and OMAFRA.

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