Immunity+™
Disease Resistant Genetics

Frequently Asked Questions

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Q What was the data set for the research?

A There have been multiple studies done in cattle over the last 22 years relating to various aspects of this research (basic, applied, market and commercial) resulting in about a dozen graduate theses and over 50 research papers in referred journals.

The first research was done using a selection experiment in pigs, where we selected lines of high and low immune responders over nine generations of selection. We followed this with beta herd testing. In the end, we tested several thousand pigs. The results for pigs were similar to that for cattle, indicating a heritability of AMIR and CMIR at about 25%; high responders had improved immunity and better growth.

Following that, we have done dozens of studies in dairy cattle in research herds (1000 head), commercial herds (a few thousand tested) and beta test herds (about 1000). Each of these independent studies confirmed the benefits of being a high immune responder (HIR).

These numbers may not seem huge in terms of quantitative genetics, like genomics, but in terms of biology and immunology these are significant numbers. Each have been independent and confirmed benefits of being HIR.

Q What is the actual process specifically involving the pathogen or antigen used to derive the immune response?

A It's a U of G patented test system that uses specific inert test systems that are used to drive type one and type two responses – the AMIR and CMIR responses involved in this test. All are Canadian Food Inspection Agency approved and of course the details of what goes into the actual preparation of the antigens is proprietary.

But, animals receive their primary immunization on Day 1. We come back two weeks later on Day 14 and take a blood sample to measure if the AMIR and CMIR is boosted, and then we come back on Day 15 to take the final skin fold measurement that gives us the final indication of cell mediated response. It is three farm visits and we spend about five minutes with each animal, so it's fairly quick. It is not a long process in terms of the time we spend with the animal.

Q How were the colostrum levels tested?

A We looked at specific antibodies – we wanted to know how much of that antibody is in colostrum and milk. The standard way to do that is with ELISA. It's the most sensitive test that we have available and we're very used to using it in our lab. The other thing that we wanted to ensure was that if the colostrum from the HIR actually has more antibodies. So when the calves actually received the colostrum do they have more antibody in their blood?

My student looked at that last year and the HIR cows have more antibody in their colostrum and when the calves receive that high quality colostrum they have more antibody. And, that's the protective feature in their blood. I think that's an added benefit of this technology. If producers want to bank colostrum they should do it from their HIR cows.

Q Have you researched calf health? If not, will you?

A The study I just talked about (above) regarding colostrum is a very interesting study in calves. It shows that when the calf receives the high quality colostrum, it gets into their blood stream. We've done four or five studies over the years both in research and commercial herds. We test animals as young as two months of age, but not sooner because we want to be sure we're free of effects of maternal antibodies. When we look at these calves we follow them through one or two lactations. The reason we did this was to make sure they maintained their immunological phenotype over their lifetime. And they do. We've done some work in calves and we've done some work in bull calves. Yes, this work has been done and we can test calves.

I can give one example of an effect on calves with pneumonia. In 2011 one of our beta herds had quite a problem with pneumonia. Those (calves) with the lower immune response had the most pneumonia and the HIR (calves) had significantly less.

Q We have heard that there is a 4-8% decrease in disease incidence in offspring of Immunity+ bulls. This doesn't sound all that impressive to my clients. How would you address this question?

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A I was surprised by that because a 4-8% decline in disease occurrence per generation is significant! It is in the exact range as the improvements that have been made for milk yield over the years. It also represents an additional $80 profit/daughter from an Immunity+ bull. We do not wish to create false expectations for this technology and producers should not expect to eliminate or cut disease in half in one generation because that is simply not realistic. Like other traits we have been selecting for in the past, genetic change for enhanced immune response will be gradual. However, the effect is cumulative and could be large after several generations of selection.

Q Does this immunity protect against bovine leucosis? If so, what other diseases?

A When examining associations between immune response and disease it is critical to have reliable disease data collected in a similar manner by trained individuals.

We have not had the opportunity to collect reliable data on bovine leucosis. Since this is a viral infection with both intra and extra-cellular phases, strong AMIR and CMIR would be predicted to have benefit. However, one would need a specific project with both leucosis and Immunity+ sires to find out for sure. The same is true for any other diseases.

Q How is Johnes linked to Immunity+?

A Johnes is caused by a facultative intracellular pathogen, Mycobacteria paratb. It is well known that mycobacterium are controlled by CMIR, specifically DTH. Therefore, cattle with the ability to make a robust CMIR/DTH would be expected to be more able to control Johnes and be low shedders. There is good data to support this finding in general immunological terms. With respect to the HIR test, a preliminary study carried out by North Florida University (n~700) indicates that individuals with high CMIR are less likely to be strongly seropositive. Additional studies could be done in the future to confirm these preliminary findings, providing the required Johnes data can be obtained.

Q Can Immunity+ genetics overcome environmental obstacles and short-comings in management? How impactful can it be?

A You are always managing your herd's genetics. If you want to reach an animals' true genetic potential, good management is the way to get there. For example, you might have a cow with great genetic potential for milk yield, but if you don't feed her properly and put her under hot, humid or stressful conditions she will not produce much milk.

The same is true for disease. Using Immunity+ sires does not mean you should or can give up on good health practices. Fighting disease requires a multi-pronged approach, and Immunity+ is one additional tool producers can use.

Q Competitors already have health branded bulls. What's the difference in using Immunity+?

A Immunity+ is the only technology that is solely based on the immune response of the animal, and relates to a diverse range of pathogens. Even Somatic Cell Score (SCS) only relates to one cell type (PMNs) and one disease (mastitis). Productive Life (PL) includes many aspects other than resistance to disease. However, we are not suggesting one should give up on PL, SCS or Daughter Pregnancy Rate (DPR) just because one uses Immunity+. Remember, Immunity+ is one additional tool that should and can be used along with existing selection tools.

Q What do we tell a customer who likes the idea of Immunity+, but thinks a 6.0 PL bull might be just as good?

A Many factors go into PL besides health traits. This is why the correlations are positive, but not 100%. Imagine that you could get even greater health benefits by selecting bulls that are both high for PL and are Immunity+!

Q Sick cows aren't a big issue on my customer's farm and they cull cows more often because of reproduction issues. Why should they use Immunity+?

A Immunity+ might be less of a priority for them. But, farms without any disease are rare today, so there is always room for improvement on most farms. One approach would be to use Immunity+ bulls that also have good fertility and DPR as there does not appear to be any antagonism between these traits.

If anything, some studies have found a positive association between HIR and some reproduction traits, such as calving ease and days open (see paper by Thompson-Crispi, Mallard et al 2012). And, beta herd studies are revealing that low responders are culled more often.

In the Florida herd, high CMIR cows had less incidence of retained placenta. This may not be entirely surprising since a strong cellular response has been suggested by reproductive biologists (eg: Dr Nino-Soto) to help with the elimination of the placenta.

Q How do you know it is 25% heritable?

A Many cattle studies by us and others report an h^2 in this range. Other species studies (ex: pigs and chickens) found similar h^2. This is moderately high and in the same range as production traits, making it quite easy to make genetic gain with this level of h^2.

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Q This sounds too good to be true. Is it?

A Is the immune system too good to be true? We know we need a functioning immune system to remain healthy. This technology simply identifies those animals able to make the most robust and balanced immune responses.

On one hand, some imply that a 4-8% decrease per generation in daughters of Immunity+ bulls is not good enough… And on the other we have questions implying this response is too good to be true! So which one is it?

It is too good to be true if you think you can improve your herd much faster for HIR than you have done for production or conformation, for example. And it is not good enough if you think the genetic progress we have made in the past for these traits has no value.

The bottom line is that this is one useful tool to be used in conjunction with other available tools. And if producers use generation after generation it will make them more money in the long run.

Q Can people get any of their females tested?

A That is the goal. We are currently continuing with testing at research herds and beta commercial herds. We also have some early adopters in Canada and this will be rolled out over the next couple of years. We envision DVMs and their animal health technologists helping with this testing. Workshops and other hands-on training are helping to increase awareness.

Q Will there be genomic testing for Immunity+?

A Preliminary studies suggest this may be possible, but likely will require at least two to three years before it is ready for commercial application.

Q What has been the most challenging element of the development of the technology?

A Getting reliable health data on a diverse set of diseases collected by highly qualified people in a wide range of herds.

Q How big is the spread between the highest and lowest tested bulls?

A There is always a significant difference between high, average and low responders. This is the important feature. The spread follows a normal distribution curve, so there are about 16% that are one standard deviation (SD) above the mean and 2.5% that are above 2 SD from the mean. The deviation from the mean is what we use to select bulls and cows. HIR cows are designated as the top 16-20% within the population, and Immunity+ bulls are the top 10% for AMIR+CMIR.

Q What's the effect if I use an Immunity+ bull on a cow that was tested to be HIR? How much benefit?

A Certainly faster genetic gain. Instead of a 4-8% relative decrease in the rate of disease, you might expect more like 8-16% if the dam also came from the top 10% of the population (it would be less if she comes only from the top 20%). At least this is what genetic theory tells us, given the large number of genes involved in immune response.

Q What particular disease do you think this will have the most rapid effect on?

A Mastitis will be a big one, and one that we have good data for, both in terms of S. aureus and E. coli. But again, it will take several generations for the effect to become large and clearly noticeable, since the relative decrease in disease incidence will only be about 4-8% per generation.

Q Do you feel there was enough research done to validate Immunity+?

A The research on HIR has been done over several years, in several species, and through several studies. About 50 refereed research papers (peer reviewed) have been published on the subject to date. Each study involves a limited number of animals, because good health data is hard to come by and it takes time and resources to do the research work. However, the results have been similar for all these studies: HIR cows tend to have less disease. Having similar results from different studies is actually a good thing and raises the confidence level in the results.

If all results came from only one big study, the evidence would be less compelling. In fact, we have more supporting evidence on the merit of HIR now than for many well-accepted technologies currently being used in the industry (vaccines, colostrum supplement and other nutritional supplements eg: cr yeast).