

# Another Tool for the Toolbox



PHOTO BY KASEY BROWN

## New research will help combat bovine respiratory disease.

by Heather Smith Thomas

**B**ovine respiratory disease (BRD), also called pneumonia or shipping fever, is the most costly disease in the U.S. cattle industry, particularly in the feedlot sector. BRD costs the beef industry more than any other single disease in terms of death loss and treatment costs. More than 1 million animals are lost each year, at a financial loss to producers of more than \$700 million. Multiple research studies have shown that at least \$500 million is spent each year on drugs and vaccines that alleviate only part of the problem.

“BRD frequently occurs when calves are transported from the ranch of origin to the feedlot,” says Steve Carlson, veterinarian and researcher at Iowa State University and one of the scientists at AeroGenics LLC. “This disease is observed in about 10% of the 3 million calves that are transported each year, and about 40% of those affected calves will perish.

“This translates into a cost of about \$150 per animal across the board in production

loss, death losses, labor, vaccines and antibiotics,” says Carlson. “The sick and the dead ones take the profit away from the others.”

Carlson says it would be helpful to identify the 90% not at risk and put them right into the feedlot on arrival so efforts could be focused on the 10% that are at risk.

“It would help to know which animals are part of that 10% so they can be dealt with to minimize treatment costs and losses,” he says. AeroGenics was created to help identify those 10%.

### Research efforts

Currently, there are many research groups looking at strategies to prevent or minimize BRD losses. Now that genetic research has given us tools to select for and against certain inherited traits in cattle, several groups of researchers are looking into genetic approaches to select cattle that are less susceptible to disease.

Some studies are looking at genetic

differences in cattle that appear to have resistance to BRD. Others are looking at ways to predict which ones might be vulnerable to this disease, and some studies are looking at better ways to diagnose and treat BRD.

Holly Neiberger at Washington State University has been involved with genetic research, looking into genetic approaches to select for cattle that are less susceptible to disease. One branch of this research took samples from animals at a feedlot in Colorado.

“We collected samples from 2,000 feedlot animals and another 1,000 samples from a GrowSafe system where the individual animal’s feed intake is measured. This gave us individual data on all the animals that get sick and those that don’t, and we compared the differences in weight gained between the sick and [the] healthy animals, the treatment costs — and also how many didn’t recover. This gives us a very good estimate about the actual cost of BRD to feedlot operations,

CONTINUED ON PAGE 178

and how the illness affects the ultimate performance of these animals in the feedlot,” she explains.

These cattle were also followed through to the processing plant.

“Following the animals through processing will allow us to assess how BRD affects their carcass weight, yield and quality,” Neibergs explains. “Knowing the BRD cost at the feedlot would determine what premiums could be passed down the production chain to cow-calf producers and stocker operations to have BRD-resistant cattle.”

Breeding for animals that are genetically less susceptible to BRD is just one part of the equation, Neibergs says. “Animal selection has to be done in conjunction with best management practices to prevent the disease. The economic analyses will determine how much more could be spent on breeding, health and preconditioning programs and still break even.”

This will be valuable information for the industry.

### Targeting efforts

Another part of this project looked at the various pathogens involved.

“In previous genetic projects the researchers did not identify the specific BRD pathogens infecting the animals,” Neibergs observes. “What we are finding is that there are specific responses of the animals to specific pathogens that are associated with distinct genomic regions. If you live in California, for instance, and BRD in your area is generally caused by a certain pathogen, it would be helpful if you could select animals that are resistant to that pathogen, and also manage specifically for prevention of infection from that pathogen.”

She adds, “In New Mexico, where there is a different mix of pathogens, you might have a different strategy for selection and/or vaccination. Also, when you treat the animals that get BRD, you might have a different strategy, knowing which pathogens you are dealing with.”

Currently, sick animals are generally not tested to see which pathogen is involved. Treatment, therefore, is usually a shotgun approach targeting a broad spectrum of



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pathogens. It may be more effective to know your specific target when selecting an appropriate antibiotic.

By looking at different parts of the country, researchers are finding a different mix of pathogens and pathogen levels in different ages of cattle. Additionally, different cattle breeds are another factor, Neibergs says.

This project will possibly have some findings that in the long run will help producers reduce the prevalence of BRD. There are some differences in susceptibility among the various breeds, and in crossbred animals that benefit from hybrid vigor.

### Lung protein, a predictor of BRD

While working for PSR Genetics LLC, Carlson was instrumental in research that identified the genetics involved with resistance to salmonella and *E. coli* in

cattle and helped develop a genetic test for the responsible gene. AeroGenics LLC was created as a spinoff from PSR Genetics.

“PSR Genetics has a platform in which we can look at genetic elements, specifically single nucleotide polymorphisms (SNPs) that encode for disease resistance. We found a genotype in cattle for salmonella and *E. coli* resistance, so we decided to delve into the BRD problem. The genetic aspect for BRD

resistance did not pan out in our research, but this led us into another path where we found a specific protein that we believe some cattle overexpress during this disease,” says Carlson.

What happens in BRD is that the stress of shipping to the feedlot induces the overexpression of a lung protein in a certain population of cattle. This lung protein is involved in a hyper-inflammatory response that damages the lungs. The scientists ultimately target the overexpressed lung protein as a predictor for development of BRD. Right now they have a moderate amount of data. More data from more animals is necessary, he says.

“The bottom line is that there are some animals that overexpress this protein, and we can detect/predict this as they come off the truck, arriving at the feedlot. We’ve developed a blood-based test, and ultimately our plan is to convert it into an ELISA format in which a small amount of blood — a drop or two — could be taken from the animal and put into an on-farm test kit, such as the SNAP type of kits sold by IDEXX,” says Carlson.

There are many SNAP kits available now, for a number of different tests used in animal health. He suggests that another option could be a simple colorimetric (color change) test. Ultimately, the animal could be tested as it arrives in the feedlot and you’d get an answer within 10 minutes whether it is susceptible to BRD or not. Then the calves could be sorted and segregated.

Susceptible animals can be held in a pen

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by themselves and managed differently, monitored closely, or treated prophylactically with a drug that blocks the overexpressed protein and helps alleviate some of the signs of BRD.

### New drug for treatment

“There is a drug that we hope might be made available to the livestock industry after further research. It’s not an antibiotic, and that’s a good thing, because the FDA is really cracking down on antibiotic use in food animals. My concern is that somewhere down the line, prophylactic use of antibiotics against BRD will be prohibited,” says Carlson.

Currently, he explains, drugs like Draxxin<sup>®</sup>, Zuprevo<sup>®</sup> and Zactran<sup>®</sup> are used prophylactically, in the absence of infection, to mass-treat the animals as they come into the feedlot. This is supposed to keep the calves from getting sick. Because there is a closely related human antibiotic called azithromycin, there is concern that the anti-BRD livestock drugs will be made unavailable for prophylactic use. Thus, finding nonantibiotic alternatives would be the best way to medically address BRD in the future, he says.

“There is a drug that has great potential to serve this purpose. It’s an anti-inflammatory and has been used in humans for quite a while and has a good safety profile. So we envision that those high-risk animals could be put into a separate pen and fed this drug for a week or two in their feed. There would be no further handling of the animals to stress them; they would just be in an infirmary pen, being fed the anti-inflammatory drug,” he explains.

The human drug will likely work very well in cattle, based on the respiratory disease it treats in humans, Carlson says. “It is off patent in humans now, and freely available

to be tested, patented and approved in cattle. It’s a fairly inexpensive drug to make, so I don’t think the cost would be prohibitive.”

It might be cheaper to treat pens of cattle with this drug, rather than having to pull out sick cattle and treat them with antibiotics, he suggests. Down the line, it might be most cost-effective to feed the drug to all cattle as they arrive at the feedlot, but the cost is

currently unknown should it be approved as an anti-BRD drug.

### Economic considerations

“Regarding the prognostic ELISA test that is currently being developed, we project that it will probably cost about \$8 per calf, or less,” Carlson says. “At this point the \$8 figure is based on the approximate wholesale price that companies like IDEXX charge veterinarians for some of the SNAP tests.”

When dogs are tested for heartworm disease, for example, the veterinarian takes a blood sample from the dog and runs it through a SNAP kit to test for the presence of proteins related to heartworm infection.

“Veterinarians can usually buy these test kits from IDEXX for about \$8 each. For the BRD test, it would be a direct sale to the cattle producer, and it might sell for about the same price,” says Carlson.

What producers ultimately do will depend on how the economics on the anti-inflammatory drug evolve. It may be more economically feasible to use the drug on all the cattle entering the feedlot. Or, it may pay to use the prognostic test, followed by administration of the drug to only the cattle that need it. If the drug cost will be low, feedlots may opt to just feed it to all the cattle, he explains. Cost of the drug will be determined by what the drug company needs to charge after doing all the rigorous safety and efficacy tests, and what they have to do to satisfy all of the regulatory processes.

Carlson’s research has shown that the overexpression of the hyper-inflammatory lung protein is not based on the genetics of the animal. It may be due to factors in the environment of the animal that creates BRD susceptibility by making an overabundance of this protein during the transportation/stress process, he explains. Being able to detect this protein excess could be a valuable predictor, to know which animals need more attention to prevent BRD.

“We feel that the test will be available by 2018. The target date for the drug will be out of our hands, and its availability will be up to the drug company that we license this information to,” he explains. Ultimately this

research may dramatically help cattle producers lower the costs of BRD in feedlot cattle.

“We are now looking at whether the drug will work and we can license that information to the drug company and they can begin their process. Because this is such an important disease, and because this drug is not an antibiotic — and has

already been proven to work in humans — this should streamline the process with the drug company.”

### Using all available tools

Neibergs says approaching BRD from several angles will provide researchers a better understanding of the biology of the disease.

“It will not only help us select for animals that might stay healthier, but will also help us in diagnostics and treatment in the future,” she explains. “Genetics is only one component in the prevention of BRD, so integrating this study with best management practices, economics, diagnostics and treatment is all very important.”

It will take good genetics, improved diagnostics, specifically-targeted treatments, and good management with less stress on the animals to have the best results in reducing the incidence of BRD in cattle.

“By knowing more about these things, we can hopefully do a better job and have less sick cattle, and fewer deaths. More than a million cattle die every year from BRD in the U.S. alone,” Neibergs says.

If we can reduce this problem and get to where we don’t need to use as many antibiotics, this will also improve public perception of raising food animals.

“If we can do more on prevention and use fewer antibiotics, we don’t have to worry as much about antibiotic-resistance issues, nor the high costs of treating the animals,” she says. The cost and labor involved in treatment, and the stress on the animal, are negative aspects that the industry hopes to minimize in the future.

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**Editor’s Note:** Heather Smith Thomas is a cattlewoman and freelance writer from Salmon, Idaho.