

REDUCING THE NEED

Good biosecurity, vaccination and nutrition are imperative to keeping cattle healthy with limited use of antibiotics.

by Heather Smith Thomas

Good health depends on many factors. Modern technology creating vaccines and antibiotics made disease prevention and treatment easier. For decades, cattle producers routinely used vaccination for prevention and antimicrobial drugs for treatment. Use of antimicrobials is being questioned today, however, due to drug-resistant pathogens. Resistance diminishes the effectiveness of some typically relied-upon drugs.

There's also the issue of residues in food animals if drugs are used inappropriately or withdrawal times are not observed. Consumers are concerned about the safety of meat products. Beef producers and veterinarians are looking at alternatives to antimicrobials in dealing with disease. Key factors in this goal include reducing exposure to disease and keeping immunity strong. Several management tools can aid us in this effort.

Minimize exposure

Veterinarian Amelia Woolums, adjunct professor in large-animal medicine for the University of Georgia, says producers can often reduce the need for antibiotics with good management, decreasing disease challenges to the animal.

A major risk factor is commingling cattle from different sources.

"Purchased livestock should be kept separate from the herd for at least two weeks to make sure the new animals are not incubating a disease that might show up in a few days," she says. "If you buy some heifers, don't just put them out with your other heifers." They might look healthy, but they could have been exposed to pathogens at the sale yard.

Another issue would be a disease like infectious bovine rhinotracheitis (IBR) that heifers may have encountered earlier in life and it shows up after they've been stressed.

"IBR is a herpes virus and can be latent, hiding in the body. A latent virus is just sitting there, but when the animal is stressed it can recrudescence (break out again after a dormant period). Then the animal will start shedding it again," says Woolums.

"This is similar to people getting a cold sore — caused by another herpes virus that can remain dormant. When

the person is healthy the virus remains latent, but when that person is stressed and tired, the virus recrudescence and a cold sore appears," she explains.

The recommended period for quarantining new animals varies depending on the disease, but for most diseases two weeks would be enough for it to appear if the animal was incubating it. For some diseases, however, even a long quarantine is inadequate. Johne's disease is an example, as is persistent infection (PI) with bovine viral diarrhea (BVD).

"Most diseases, like viruses that cause respiratory disease or GI (gastrointestinal) tract diseases that animals clear after they recover, shedding would probably occur in the two- to four-week period following stress," says Woolums.

"Biosecurity includes isolation of new animals and minimal contact with other livestock," she says. "If a neighbor doesn't observe good biosecurity, it doesn't do much good if you do, if cattle have fence-line contact or graze in community pastures."

Cleanliness is also important in reducing risk. Pathogens that cause diarrhea, for instance, will be more problematic if many animals are crowded together, concentrating those pathogens and creating a challenge to the animals' immune systems.

Andy Allen, veterinarian with Washington State University (WSU), works with the WSU Field Disease Investigation Unit. "We investigate disease outbreaks and increased incidence of disease within herds. One of the most common things associated with increased disease (and more use of antibiotics) is too many animals in too small an area."

This is particularly problematic just before and during calving. Management of cows prior to calving is crucial for keeping the environment clean and preventing sickness in baby calves. Don't calve in the same area where you fed cows through winter.

"If you leave cattle in the same area too long, there will be more bacteria, viruses and protozoa that cause calfood diseases," he points out. Calves are more vulnerable than

cows because they don't have an experienced immune system.

"There are ways to keep calving areas cleaner, such as the Sandhills Calving method. This involves moving pregnant cows to new calving grounds every seven to 10 days, leaving calved-out pairs behind in small groups according to age," Allen explains.

The most vulnerable, those young calves, won't have to contend with older calves that might be sick and shedding pathogens. The calving cows have clean ground that hasn't already been contaminated by sick calves that shed pathogens in much higher numbers.

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Immune stimulants

There are supplements and injectables aimed at improving or stimulating the immune system. One utilizes transfer factor and is made from bovine colostrum.

"There are a number of immune stimulants, used at certain times of



Amelia Woolums

stress — when the immune system is under attack, such as at weaning. I think these can be helpful, but we need more research on how reliable

they are," says Amelia Woolums, adjunct professor in large-animal medicine for the University of Georgia.

Some might help in some instances or help some groups of calves, depending on when the stimulants were given, and when the stress occurred. There are several kinds and they work in different ways.

"Some products cause inflammation. Some have bacterial components and induce response similar to that of an early bacterial infection. It basically kick-starts the immune system and stimulates a reaction, triggering the immune system into action if it isn't doing its job," she says.

HERD HEALTH

Probiotics and prebiotics

Kyle Newman, microbiologist and lab director at Venture Laboratories in Kentucky, says boosting the immune system includes recognizing beneficial effects of “good” bugs in the body, and the use of probiotics and prebiotics in animal health.



Kyle Newman

Microbes in the rumen enable cattle to process and utilize forages. It is essential that the microbial population be healthy and in balance for proper digestion and health. Newman says the gastrointestinal (GI) tract not only digests food, it is also the largest, most complex immune organ.

“Any other place in the body, if there is a foreign invader, it is attacked and killed,” Newman observes. “The GI tract, by contrast, has to sort through all the material and differentiate ‘good guy’ from ‘bad guy’ and decide when to attack.

Because of the extremely diverse microbial population, bacteria in the tract far outnumber body cells in that animal. Feeding the bacterial cells and making sure they are good ones makes sense.”

There are several types of GI tract supplements, including yeasts, probiotics and prebiotics. Probiotics help maintain healthy gut balance. Yeast cultures indirectly improve fiber digestion. Probiotics include bacterial and yeast cultures, whereas prebiotics are nondigestible sugars that aid the “good” microbes and protect against the “bad” ones.

“In a world where antibiotics are less effective, the most you can do for an animal is improve its own immunity. One way is by competitive exclusion — crowding out the bad guys by feeding good guys. Probiotics shift the balance by flooding the system with good guys. Prebiotics feed the good guys or pull out the bad guys,” says Newman.

Probiotics and prebiotics re-establish gut health when stress alters microbial populations.

“If antibiotic therapy has killed both the bad guys and the good guys, you must re-establish the good guys or readjust the balance,” he says.

“With some prebiotics you are feeding the good microbes in the gut. Another prebiotic is mannan-oligosaccharide (MOS). It improves overall immune function and beneficially alters immunoglobulin and circulating antibody levels. MOS products provide a binding site that the bad ones stick to, like flies on fly-paper, to take them on through the intestinal tract,” explains Newman.

“You can boost immunoglobulins in colostrum by supplementing the dam with MOS prior to calving. I call colostrum the ‘get out of jail free’ card. The newborn has to suckle, so the more good stuff you have in colostrum the better off he will be, as long as he suckles before gut closure, and before pathogens get into the GI tract,” says Newman.

“We did a trial here 12 years ago showing that if you fed MOS to the cow, her immune status and immunoglobulins in colostrum were greater for the calf and created better antibody titers for what you vaccinated her for before calving,” says Newman.

Lactobacillus is a popular probiotic for cattle, especially in newborns to help establish proper gut microflora.

“Lactobacillus and other microorganisms help exclude (competitively or otherwise) harmful microbes. Mindy Brashears did a trial with lactobacillus in combating *E. coli* 0157:H7 and showed these to be helpful. Lactobacillus is also being used in mature ruminants. It can help exclude *E. coli* 0157:H7 in feedlot cattle before slaughter, and also seems to help with acidosis conditions,” says Newman.

Building immunity

We now have vaccines against many common cattle diseases, but some vaccines have better proof of efficacy than others.

“Vaccines that are effective can be part of a good management program, providing a way to avoid the need for antibiotics,” says Woolums.

“Some producers don’t understand timing of vaccines, especially for calves during the first six to eight months of life. Boosters are important, especially for calves that may have maternal antibodies. You get a better effect with a booster, and those shots should be one or two months apart for maximum effect,” she explains.

“For calves, the foundation of good immunity is colostrum. The antibody molecules in colostrum can only be absorbed during the first few hours of life, however. We used to think a calf had 24 hours to obtain antibodies, but research shows absorption drops dramatically after 12 hours. Getting colostrum into the calf in the first two to four hours after birth is best,” says Woolums.

Giving the calf something to drink before it drinks colostrum can be counterproductive as it stimulates the gut to close faster. Then,

when given colostrum, it may not be able to absorb the antibodies, says Woolums, citing an example at a dairy experiencing a high incidence of calf pneumonia.

“It was a big dairy, and it wasn’t convenient to get colostrum into the calf from its own mother or even from any cow,” she reports. “They were giving colostrum replacer first, then giving the good-quality colostrum later. The calves’ guts were closing after the replacer was fed, so they couldn’t benefit from the colostrum.”

Anything that impairs the calf’s ability to ingest and absorb maternal antibodies leaves it unprotected.

“Also, anything that makes a calf acidotic at birth can be a factor,” adds Woolums, explaining that after a difficult birth, a calf may lack oxygen and acids build up in the body due to decreased metabolism. The same happens if a calf is severely chilled.

“The acidotic calf may be unable to absorb antibodies from colostrum, even if you tube him with colostrum” she says. “[The] best thing to do in that situation is stimulate the calf’s breathing and get him warmed up. This should improve metabolism and help clear the acids. Then get colostrum into him

immediately — maybe 10% to 20% more than you normally would. This might overcome that depressive effect.”

When passive transfer fails, calves may do okay if they aren’t challenged by infectious agents, she notes. “This is where cleanliness and biosecurity would be extremely important, with no room for error.”

Nutrition

Allen says the main thing a producer can do to optimize the immune system and minimize use of antibiotics is make sure cattle have good nutrition.

“This helps set up the immune system to be able to fight off infections. Diet needs to include adequate protein, energy, vitamins and trace minerals — with copper, selenium and zinc being the main ones we worry about in the Northwest,” he says. This may require testing feeds so a custom trace-mineral mix to fit a specific need can be developed.

“One mineral mix won’t fit every situation,” he adds.

You need to know what you are feeding. “Just because hay is green doesn’t mean it has enough protein and energy,” Allen says.

“You also don’t know the trace mineral levels.” Some soils are deficient in copper, and many areas are deficient in selenium, while others have too much selenium.

Sometimes other elements bind copper, making it unavailable to the body.

“Even if you provide the required amount of copper, it may not be enough if there is too much molybdenum, sulfur, iron or zinc that might bind to it. Understanding mineral relationships is important. Work with a nutritionist to determine proper levels of trace minerals for your ranch,” says Allen.

He continues, “Assessing body condition score (BCS) is crucial throughout the year, making sure your animals are in the ideal range of 5 or 6 (on a scale of 1 to 9). Producers try to find the most cost-effective way to feed cattle, but need to balance this with body condition.”

It might cost more in the long run if cattle become thin, causing higher incidence of disease and the need for more antibiotics.

“If calves have deficiencies of protein, energy, vitamins and minerals (especially vitamins A and E and trace minerals copper, zinc and selenium) for a prolonged period, they’ll have immune suppression,” says Woolums. “You can fix the immune suppression if you correct the deficit, but if calves get sick in the meantime, some of them might develop severe disease.”

If calves get pneumonia, they may end up with abscesses in their lungs, she says. This may impair their ability to grow, and they may never catch up.

A temporary deficiency, lasting only a few weeks, may have no serious effect,” Woolums says. “Nutrient deficiency doesn’t always cause problems with immune function, but if the deficiency is present for weeks to months it is more significant.”

While protein and energy are important, diets with more protein and energy may not provide extra benefit for the immune system, she notes. “The relationship between nutrition and immunity is complex. You don’t want deficiencies in important nutrients, but feeding excess won’t reliably help. Some studies showed that calves given more of a certain vitamin or mineral might have had a more rapid vaccine response, but these results are not consistent. Other studies have not shown this to be the case.”

The variable response, she says, may be partly the animals; some may have needed it and some didn’t.

“Adequate nutrition is important, but feeding excess — or feeding certain supplements — may not always improve immunity,” she says. “The important thing is

When to use antibiotics and not to

David Smith, epidemiologist with Mississippi State University, says producers probably need to use fewer antibiotics than they did traditionally. Knowledge about antibiotic use has improved.

“For instance, 30 years ago we might have relied on antibiotics to treat uterine infections (UTIs), but today we would not, unless the cow is clinically ill with a fever and enough clinical signs that suggest there is a need,” he says.



Fluid therapy is more important for most cases of scours than antibiotics, says David Smith, epidemiologist with Mississippi State University.

As in human medicine, we recognize that some infections don’t need treatment. The body’s immune system can usually take care of these, sometimes better than we can with medical intervention.

“Children with ear infections often don’t need treatment. Most cows with a uterine discharge are normal, and most uterine infections clear up on their own without antibiotics. Putting antibiotics into the uterus usually does more harm than good,” says Smith. If a producer is having problems with uterus infections (more than a sporadic case over the years), it’s time to have a veterinarian help figure out why this is happening.

Similarly, a person needs to evaluate antibiotic use in calves.

“Most pathogens that cause diarrhea in young calves are viruses or protozoa that don’t respond to antibiotics,” says Smith. The times you’d use antibiotics are when calves become septic or develop a secondary bacterial infection.

“Often when we use antibiotics for scours, we make it worse. Normal flora in the gut is already disrupted by what is causing diarrhea, and we disrupt it more by wiping out more of the good bacteria,” he explains.

This may result in taking longer to recover, or the calf ending up with a fungal infection, which is worse than the original infection.

“When we do necropsies on calves that died from scours, we often find fungal infections that we probably made worse — or we set up conditions for fungal infections because we used antibiotics. Fluid therapy is more important for most cases of scours than antibiotics,” he says.

“Many producers give antibiotics to cattle that don’t really need them,” says Andy Allen, a veterinarian with Washington State University. “We are just increasing chances for development of resistant bacteria. We want our antibiotics to work well, and for a long time, so it’s important to work with a vet and develop protocols for using antibiotics,” he says.

“Some stockmen give antibiotics for situations like retained placenta — where antibiotics are generally not needed. It’s wise to discuss things like calf diarrhea with a vet. The producer can take the calf’s temperature, monitor suckling, how dehydrated it is, etc., and use fluid therapy and determine at what point the calf might need antibiotics. Often the calf just needs good supportive care,” he says.

“It’s also important to keep records on animals treated — the conditions you treated, when and what you treated them with, and how they did. You may find you are using fewer antibiotics — only on animals that really need them. You are not wasting money or causing possibility for more antibiotic resistance,” he says.

to focus on making sure cattle have a good balanced diet without any deficiencies.”

Avoid excess stress

Stress hinders immune function. Reducing stress at weaning, during handling/working, shipping and severe weather, etc., may reduce incidence of disease. Avoid stacking too many stressors — such as weaning and shipping or weaning and working cattle in bad weather — at the same time.

However, a little stress is actually beneficial, according to Woolums.

“The body needs a little challenge to improve immune function,” she says. It’s similar to vaccination — a little antigen to stimulate the immune system into mounting a defense against future challenges. The animal that has no challenges, no stress and

no prior experience with a certain pathogen has no defenses.

“A recent study at Iowa State University looked at calves vaccinated at weaning. We generally avoid vaccinating calves the same time you wean because that’s a time of stress, and they won’t mount a good immune response,” Woolums says. “In this situation the calves were on the farm of origin and not moved. They were weaned and vaccinated, but nothing else happened to them. They’d already been castrated and dehorned. They stayed with their peer group and weren’t exposed to a new environment or different cattle.”

The researchers were looking at things that affect antibody response of calves, specifically BVD type II antibody response to vaccination.

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“They compared two groups for this study. They vaccinated one group three weeks before weaning and another group when they were weaned. The group vaccinated at the time of weaning actually had a little better immune response to the vaccine than the calves that were vaccinated before they were weaned,” she says.

“This is the opposite of what we’d expect. I think the reason this worked was that the calves did not have any other stressors at weaning. The other thing is that antibodies from the mother (passive transfer from colostrum) can sometimes block response to vaccination. Calves can respond to vaccination when they have maternal antibodies, but the higher the level of maternal antibodies, the more likely those will block the vaccine.”

The older the calf, the less likely there is a chance of interference from maternal antibodies.

“The calves vaccinated at weaning were three weeks older than those vaccinated ahead of weaning. In three weeks the maternal antibodies have dropped a little more,” she says.

This can make a difference, depending on how young the calves are at weaning, whether you wean at 9 months, 6 months or younger. The thing to realize is that not all stress is bad, she says. A short-term stress or just one kind of stress may actually improve immune response. Multiple stressors at once or stress that goes on for a long time is what generally suppresses the immune system.

Allen says there are various ways to reduce stress at weaning, such as fenceline weaning, nose flaps, etc.

It also helps to train calves to eat out of bunks and to drink from water troughs before weaning or before shipping, so they won’t be in an unfamiliar situation when they go to a feedlot, he says.

Make sure working facilities flow well. The less time cattle have to be confined, and the quieter they are moved and handled, the less stressed they will be.

“During stress their cortisol levels go up, and when that happens their immune system drops,” says Allen. “If we can keep stresses to a minimum, even practicing with a group of calves, putting them quietly through the facility without being worked, they are not as upset and stressed when you put them through again.”

Cows that don’t get upset when handled do better. They can be trained to tolerate being worked and handled if you keep stress levels low. “There are always ways to improve cattle handling to keep it less stressful,” he says.



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

Economic incentives needed

David Smith, epidemiologist with Mississippi State University, says there are many ways to keep cattle healthy without relying on antibiotics.

“When we look at the cattle industry — from cow-calf to stocker to feedlot — there are things we do that seem to make sense within each individual segment, but don’t make sense across the whole industry. If you owned the cattle all the way through, you might do things differently so the animals wouldn’t get sick,” he says.

“If fewer calves got sick, we’d spend less money on antibiotics, other medications and labor. Currently we are not efficient as an industry, because we spend (and lose) a lot of money because calves get sick, and some die. It would be useful to recoup some of that lost money and invest it in keeping cattle healthy in the first place,” he says.

Smith feels the challenges exist because of the way the beef industry has evolved.

“The sector that could implement practices that keep calves healthy isn’t the one that gets the benefit. Money saved or made from keeping calves healthy in the feedlot doesn’t often pass to the cow-calf producer who could implement those practices,” he explains.

A cow-calf producer would be more apt to do preweaning vaccinations or low-stress weaning, getting calves trained to eat from a bunk, etc., if he knew he would be rewarded. If there were a true economic signal, those things would more likely happen. Today, there is a small signal, but not enough to motivate very many people in the cow-calf sector to do things to minimize calf sickness and death in the feedlot, says Smith.

“Some feedlots are starting to background their own calves, however, or try to acquire calves from ranches that do preconditioning,” he says.

People who own the cattle from start to finish reap the benefit of preconditioning calves on the ranch. Others raise beef for niche markets like grass-fed cattle, keeping them on the home ranch until slaughter.

“There are things we know we can do to prevent respiratory disease if we could control the health program all the way through,” says Smith. We can perhaps do a better job with making sure every calf gets adequate colostrum soon after birth.

We also know low-stress weaning keeps calves healthier.

“We know that in feedlots sickness and death are a lot less common in yearling cattle coming in compared to calves. Screening for BVD PI (bovine viral diarrhea persistent infection) cattle is also useful. The industry knows these things, but we are not very good at implementing everything we know. I’d like to see more economic signal from cattle feeders to encourage cow-calf producers or stockers to provide the right kind of cattle.”

There is too much gap between these segments, and it’s been an adversarial relationship, he notes. While each sector needs the other, they tend to try to take advantage of each other, he says. “The National Beef Quality Audit of 2011 talked about the need for more transparency in the industry and having data move from one segment to the next — information about the processes the calves have gone through, for example, and whether they’ve been vaccinated. If there is a way to capture that information and use it to add value to calves as they move through the chain, there ought to be enough money to pay for those things, just in savings from not losing calves or having to treat so many of them.”

A large sector of the beef industry may not be profit-motivated, however. Some hobby farms are not depending on cattle for a living. Even if some small operations do depend on income from cattle, if they have small numbers, they may not be able to take advantage of marketing opportunities. They are often at the mercy of buyers because they don’t have enough calves to bargain with.

“Ranchers who take advantage of things like preconditioning to minimize sickness and death losses later on need to be rewarded for it. Even things like castrating and dehorning early in life result in less stress and sickness than if done later. We’re talking about lost money and inefficiency, but there are also some basic animal welfare concerns. Using more humane procedures or doing some of these things at a better time adds up. We know enough to do a better job of preventing illness, and the main barrier is the economics.”

Nutrition is a big factor as the most expensive cost of production.

“It doesn’t do any good to have suboptimal nutrition and end up with sick calves or reduced growth rates. While it’s a cost of doing business, protecting calf health is also a way we can improve the value of the product,” explains Smith.