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Summer Sickness

The cause of summer pneumonia in calves is not easy to determine.

by **Heather Smith Thomas**

Pneumonia can affect calves of any age. Though most of the bacterial pathogens that cause pneumonia are already present in the calf's upper respiratory tract, they become a problem in the lungs only when immune defenses are compromised — such as by viral infections or stress.

One of the most frustrating respiratory infections in nursing calves has been called “summer pneumonia.” The cause is not always easy to determine — especially since cases may appear during good conditions when producers don't think of these calves as being stressed.

Learning more

Russ Daly, South Dakota State University; Jerry Stokka, North Dakota State University; Dale

Grotelueschen, the University of Nebraska; David Smith, Mississippi State University (previously at the University of Nebraska); and Aimee Woolums, the University of Georgia, all worked on a three-state study in Nebraska and the Dakotas comparing ranches that experienced this problem with other ranches in the same veterinary practices that have not had the disease.

Smith, an epidemiologist, spent several years investigating a number of summer pneumonia outbreaks in Nebraska herds. He consulted with Woolums to design the study since she has expertise in immunology and the use of vaccines to control respiratory disease in cattle.

“We know a lot more about weaning and post-weaning

respiratory disease in calves and how to prevent and treat it,” Daly says. “If we can minimize those calves' stress levels at weaning and do a good job of vaccinating at that age, we see fewer problems,” he says. By contrast, pneumonia in nursing calves has been challenging.

Woolums says there is very little in the veterinary-scientific literature about risk factors for summer pneumonia, compared to feedlot pneumonia.

“There is a lot of data about dairy calf pneumonia but almost nothing on pneumonia in beef calves at that age. We are trying to understand why some ranches and farms have a problem and others don't. Some have a problem with it year after year, while others never do,” she says.

Daly says it's frustrating that even with reducing stress in younger calves and using good vaccination programs, these methods are not working to prevent disease as uniformly as they do for the post-weaning respiratory problems.

“There might be some management practices in those herds that put their cattle more at risk,” Smith says. “Gathering cattle for AI (artificial insemination), sorting, exposure to dust, etc. may favor transmission of viruses or otherwise compromise the immune system. We don't always know which of these factors might be important.”

In some herds, pneumonia occurs in calves out on the range without those activities.

“We looked at a large number of farms that have had cases, and comparing them with farms that haven't had issues — in a similar location and period of time,” Daly says. “We wanted to see if we could discover factors that make things more favorable for calf health on some farms, or anything that could help producers prevent this disease. Some environmental factors are hard to control. In some instances calves are getting sick out on summer range. We don't know what's happening. We can



understand the stress of transport, weaning, dusty corrals, etc. but often this is different,” says Daly.

Some ranchers have problems in June to July, while others have sickness in very young calves soon after birth. Some have pneumonia in older calves the month before weaning.

“These calves respond to treatment, but for awhile it really knocks their weight gain. Sometimes there is scarring and permanent damage in the lungs and those calves don’t do as well later,” Daly says.

Multiple factors

The researchers looked at various factors, such as gathering cows and calves for AI synchronization programs or branding.

“The calves are apart from their mothers just a short period of time and we wouldn’t think it could be enough stress to affect the calves, but maybe this facilitates transmission of bacteria or viruses,” Daly says. There may be multiple factors working together.

On some operations, the ranchers move cattle periodically for rotational intensive grazing, or there may be sub-populations brought together at different times such as for branding or vaccinating.

“Mingling cattle from different sources is a well-known risk factor for feedlot BRD (bovine respiratory disease), but we don’t know for sure if mingling young calves from different sub-populations on the same ranch can also increase the risks for respiratory disease,” Woolums says.

Daly says, similar to scours, summer pneumonia may be multifactorial. Colostrum intake has been looked at along with calves’ ability to respond to vaccine at different ages.

Weather, like a late spring storm or a cold rainy spell in early summer, might be a contributing factor in some situations.

“A respiratory pathogen may be circulating, and perhaps there have been some inapparent mild

infections and all it takes is a little extra stress to put them over the edge,” Smith says.

There may be some genetic differences in the way calves are able to mount a good immune response. “We are just scratching the surface of that possibility,” Daly says. “We know that crossbred cattle have hybrid vigor and part of that characteristic includes more hardiness and disease resistance. There may also be some subtle genetic differences among cattle that we don’t yet know about.”

Case-control study

Part of this research was a case-control study in which researchers compared management practices of herds that were affected with summer pneumonia with practices of herds that didn’t experience this problem. Smith says, “We now have the results of this study, which were presented at the annual AABP (American Association of Bovine Practitioners) meeting in September 2015.”

The major findings were that larger herds were more likely to have problems. “If they practiced intensive grazing or used AI they were also more likely to have problems,” he says. Anything that stresses or confines the calves or separates them from their mothers more than they would be otherwise can be a factor.

“These are all practices in which cattle have more opportunity to share pathogens within the group, whether it’s being congregated more tightly during AI procedures, or other opportunity for effective contacts with other cattle during intensive grazing or mob grazing,” he says.

“Ranchers have told us anecdotally that as the industry has gotten better at grass management and intensive grazing we’ve seen more incidence of calf pneumonia. This doesn’t mean that these practices (intensive grazing, AI, etc.) are bad, but everything has a downside.

There are many good reasons to intensively manage grazing and breeding, but producers need to be aware of the fact that as they increase stocking densities, or any opportunities for one calf to have close contact with another one, it does increase the risk for disease — just like sending your kids to day care or kindergarten.”

Smith says cattlemen should pay attention to ways they can minimize that risk.

The cases in the study were herds that experienced a significant amount of pre-weaning pneumonia that were compared with nearby herds that had not experienced problems.

Daly says, “By using herds in the same location and time frame,

continued on page 76...





we hoped to remove some of the regional and environmental differences. There were neighboring ranches in which one had problems and the other didn't, so we were trying to find out if there are differences in how they manage and co-mingle cattle, move cattle, or administer vaccination programs."

For each case herd, researchers looked at two control herds. Woolum says, "At that point we were simply identifying management practices associated with summer pneumonia, and just because two things are associated doesn't necessarily mean that one thing causes the other."

In-herd comparisons

The researchers gathered additional data from some of the herds that have had problems.

"If they have individual calf treatment records, we asked them to share those with us," says Woolums. "Then we could compare characteristics of calves that get summer pneumonia with calves that don't, on ranches where summer pneumonia occurs. That's the 'calf

level' risk factor analysis. So we were working on two things — what makes a certain ranch more likely to get summer pneumonia versus a ranch that doesn't, and what makes an individual calf more likely to get this problem, versus a calf that doesn't."

Age of calves can be a factor, but one of the differences these researchers have seen is that the age of the dam plays a role. "We see this with calf scours, as well. The first calvers may not give their calves as much immunity through colostrum," says Woolums.

Their calves are more likely to get respiratory disease and/or scours, simply because there are not as many antibodies in a heifer's colostrum compared to that of an older cow that has had more chance to build stronger immunity. The older cow may also have a higher quantity of colostrum and have better maternal bonding skills that favor the calf nursing sooner.

"The other pattern is outbreaks of pneumonia — many calves getting sick," Smith says. "These tend to be older calves, 120-150 days of age. This could be because

the majority of those calves are past the age when they would be covered by maternal antibodies and have not yet mounted enough of their own immunity."

There is a gap of time between early protection from mama and the calf building its own strong immunity.

The researchers tried to find differences within that herd in terms of calf age or calves from heifers versus older cows, time of calving, time of infection, etc.

"These could be factors within a particular herd that might give clues as to why some calves got sick and others didn't," Daly explains.

This data came from only a few herds since most producers don't keep complete health records. "Ranchers often write down calving information, but when it comes to roping a calf in the pasture and giving it a shot because it's droopy, this might not always be written down. The ranchers who keep these kinds of records were really helpful to us," says Daly.

It is very beneficial to know what age the calf was when it was treated.

Age susceptibility

"The problem in sorting this out is that all the calves in well-managed herds are about the same age. They move into that window of susceptibility at about the same time. Is it something related to the season or is it something related to the age of the calf?" asks Smith.

Pneumonia in calves prior to weaning has a component of age susceptibility, like a childhood disease. From about 90 to about 150 days of age, calves are very susceptible because their maternal antibodies have essentially disappeared. The calf's own immune system is trying to come up to speed.

"This is going on in the background, regardless of anything else. If you have a good, well-managed breeding season, all those calves will be approximately the same age, within six to eight weeks of each other, then they all

Mail-survey study

The researchers studying summer pneumonia also conducted a mail survey, hoping to gain insight into the problem.

"We did an earlier study, and although it was not as strong in scientific design as the study we recently completed, it provided support for the concern that certain management practices are associated with summer pneumonia," says Woolums. "This study was a mail survey of producers in Georgia, Florida, West Virginia, Kansas, Iowa and Nebraska.

We mailed a list of questions to cow-calf producers, asking about their management and whether they had calf pneumonia. We did find some significant associations," she says.

"In that survey we looked at summer pneumonia in two different ways — whether or not the producers saw any calves with respiratory disease, and also the proportion of calves that they treated for pneumonia. Some things were associated with whether they saw respiratory disease, and different things were associated with the proportion of calves they treated for respiratory disease. For example, if a farm had calf diarrhea they were more likely to also see calves with respiratory disease. If a farm did AI (artificial insemination), they were more likely to treat a larger proportion of their calves," says Woolums.

Those calves may have experienced stress, being gathered and sorted away from their mothers.

Depending on the conditions — whether it was low stress handling, the weather was hot or inclement or corrals were dusty — there might have been factors making them more vulnerable. "It's also possible that when the calves are sorted away from their mothers and grouped together they have more opportunity to spread respiratory viruses or bacteria among themselves," she says. **HW**



lose that temporary protection at about the same time,” Smith explains. This loss of herd immunity is another component of the problem.

“This is an emerging problem in well-managed cattle operations. The downside of this management is that we set these calves up for risk, which I believe can also be managed. But we have to do it by understanding the time frame in which calves are at risk — and that the things we do to increase opportunities for contact during that time make them more vulnerable. If you can avoid other opportunities for exposure at that age we may reduce the risk. During that window of increased susceptibility, it is prudent to minimize co-mingling, and minimize stress,” he says.

Low-stress handling during AI procedures, for instance, and minimizing separation time for pairs, along with making sure the holding facilities are dust-free, can help.

“Basically our case-control study told us that there are things that affect the risk. Pneumonia in a susceptible age group is most likely when you put them in closer contact with other calves. Some producers are vaccinating those calves about that same time, and the vaccines may or may not help,” he says.

“This is probably not the time to vaccinate the calves, in some herds. For herds that are not having a lot of problems with pneumonia prior to weaning, you might vaccinate them at a slightly older age, when they are more capable of mounting good immunity. If you are having problems with pneumonia in calves prior to weaning, you probably need to start your vaccination program at an earlier age,” Smith says.

Vaccination

Some producers vaccinate calves for viral pneumonia at spring branding and feel the procedure helps. “We think it helps, too,” Smith says. “But two doses of vaccine before calves are three months of age might provide

better immunity. It’s a tough thing to figure out how to get two doses of vaccine into the calves.”

Woolums says there is some research that supports the thinking that calves 60 to 90 days of age can respond to vaccination. “In some instances they do, and sometimes they don’t, depending on different variables,” she says.

The age to vaccinate is an important question. “We address this in dogs and cats by a series of boosters,” says Smith. “A puppy might get its first shots at six to eight weeks of age and then a booster every three weeks or so until the puppy is about 16 weeks of age. That first shot, on some puppies, might be effective, but there will be a better response by the second or third one,” says Smith.

That vulnerable window is spanned by using a series of boosters, but giving boosters is easier to do with puppies and kittens than with calves.

“The other piece of that challenge is that even if you know when to vaccinate, you must have effective vaccines against the pathogen that’s involved in the disease, or you are just shooting in the dark vaccinating calves,” says Smith.

Ranchers need to consult with their herd-health veterinarian, and design a strategy to fit their individual operation regarding vaccinations. “There isn’t one formula or schedule that fits all herds,” Woolums says. It’s frustrating for producers because proper timing of vaccination is complicated, and there are also a lot of different vaccines from which to choose.

Regardless of when producers vaccinate and with what, there are some individual calves that won’t mount adequate immunity for one reason or another. Woolums says, “There is also a genetic component — not just in resistance to bovine respiratory disease, but also in response to vaccination. It’s not the same for all vaccines.” **HW**

Is a virus involved?

These researchers studying summer pneumonia also considered the involvement of a pathogen.

“We want to find out more about the pathogens involved,” says Woolums. “Some people wonder about coronavirus. We find this virus on nasal swabs in some of these calves. But the important thing to remember is that we can also find it in normal calves. Animals can shed a virus but it may not be making them sick.”

Researchers don’t know if a virus is the actual cause. Just because they find it on the nasal swab doesn’t necessarily mean it’s involved with illness.

“The fact that some herds have more trouble with pneumonia than others might mean they have some pathogens present that are not present in other herds, but we don’t know,” says Smith. “It may be something like BRSV (bovine respiratory syncytial virus) or BVD (bovine virus diarrhea).” Maybe these cattle have a virus circulating that the cattle on other ranches don’t have, making them more vulnerable to other respiratory pathogens.

Woolums would like to have a student sample calves when ranchers gather a herd to AI (artificially inseminate) the cows. “Then later if some get sick they could sample them again and see if there is a difference. One of the reasons there isn’t more research on summer pneumonia is because it’s hard to sample the calves. On a dairy I can just walk down the line of calf hutches and sample a bunch of calves,” she says.

With beef calves, there’s not always an easy way to get hands on them, except at branding time — which happens only in the Western states, where calves are routinely branded at 1 to 3 months of age. A person could possibly capture calves during an AI program, but not all producers are doing AI. “It’s also hard to sample them without changing the risk factors. If we bring them all in to sample them, we’ve grouped them in a situation where they wouldn’t ordinarily have been grouped,” she says. This in itself creates more risk factors — stress of handling and co-mingling in close quarters. **HW**



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