PHOTO BY ANNA MCGUIRE

Benefits of a Strong Barrier

Fostering a healthy immune system in calves can help prevent septicemia.

by ***Heather Smith Thomas***

Septicemia is a systemic infection in which bacteria or their toxins get into the bloodstream and travel throughout the body. Bacteria in the blood is called bacteremia; their toxins in the blood is called endotoxemia; when one or both of these things result in systemic clinical symptoms, it is called septicemia. One of the most common pathogens that cause septicemia is *E. coli*, but there are other bacteria that can be involved.

Some types of toxin-forming bacteria gain entrance via the GI (gastrointestional) tract, after damaging the gut lining and slipping through it, causing rapid death because the calf goes into shock when internal organs are damaged and start shutting down. Any blood-borne infection becomes life-threatening if bacteria or their toxins damage vital organs. In some instances the infection may localize, creating internal abscesses, or may settle in the joints, causing a painful arthritis.

Austin Hinds, DVM, University of Idaho, says the most common reason calves develop septicemia is their inability to fight the pathogen and this is often due to poor colostrum. If a calf didn't get colostrum or got an inadequate amount or didn't get it soon enough to absorb the antibodies, the calf has less ability to fight off infections. High-risk calves also include calves that had a difficult birth or calves delivered by C-section.

"When a calf is born he has no antibodies, so he gets these from his mother's colostrum," he says. "At birth his intestine is set up to absorb these large antibodies (IgG) for a short time; they can slip through the intestinal wall and into the bloodstream. This is his source of immunity until his own immune system kicks in," explains Hinds.

This protection is based on what the cow has come into contact with in her environment and the immunities she has developed. If a calf didn't get this protection, however, it is more at risk for systemic infection because its body is unable to fight it.

Any animal or human can develop septicemia at any time of life due to significant infection — an infected wound or some other source such as a severe intestinal infection — or if the immune system becomes compromised for some reason. But septicemia in young calves is generally due to inadequate colostrum.

"A common cause of septicemia is navel ill in the newborn calf," Hinds explains. "Infection from the umbilicus gets into the bloodstream and travels to other tissues. A healthy calf that had good colostrum may still get an infected umbilicus but will generally wall it off as a local abscess and is not as likely to get septicemia."

"When a calf is born he has no antibodies, so he gets these from his mother's colostrum."
— Austin Hinds

Navel infections occur less frequently in calves that have adequate immunity from colostrum, but if they are born in a dirty environment, they could still get a navel infection and possible septicemia in spite of good passive transfer of antibodies.

Bacterial infection may enter the body through various routes. It only becomes septicemia if the blood picks it up and takes it everywhere. A common location for blood-borne infection to localize is in the joints. These infections tend to filter into some of the smaller blood vessels like the capillaries, particularly in the joints or where the bones are growing. This problem may result in a chronic arthritis, and it is difficult to get adequate antibiotics into those areas.

"There is a lot of vasculature at the joints, and this is also a noticeable location when a calf has septicemia because the joints swell and become painful and the calf is lame," Hinds says. Antibiotic treatment might be able to stop the infection, but

the damage to the joints may be permanent.

Septicemia may develop from any serious type of infection such as pneumonia or an intestinal infection. Any type of scours, viral or bacterial, can result in damage to the intestinal lining that may allow bacteria like *E. coli* or *Salmonella* to invade the tissues or allow absorption of bacterial toxins into the bloodstream, resulting in septicemia.

In the very young calf, diarrhea is generally caused by *E. coli*. If that bacterium crosses the GI tract into the bloodstream and the calf has no immunity to fight it, the calf will become septic and is very hard to save without early and diligent treatment.

"Calves can also get meningitis from septicemia and these cases generally don't recover. Nearly any organ can be adversely affected, once the infection gets into the blood," Hinds says. The traditional term is blood poisoning.

Some calves may get septicemia in spite of good colostrum. These calves can often be saved if the producer gets antibiotics into them quickly, tries to prevent or treat shock and makes sure they have adequate fluids. This may mean IVs if the calf isn't taking in fluids or is going into shock since oral fluids can't be absorbed once the calf is in shock and the gut is shutting down.

"It is important to maintain fluid levels and body temperature. If the calf starts going into shock he will become cold, very quickly," Hinds says. "If a calf comes into our referral hospital and I think he's septic, I'll run some blood tests to see if he has adequate antibodies from colostrum. If the calf does not, I tell the owner that the chances for this calf are poor. If the calf is septic but has IgG in the bloodstream from colostrum, it has a better chance and it's definitely worth a try at treatment."

"A common cause of septicemia is navel ill in the newborn calf. Infection from the umbilicus gets into the blood stream and travels to other tissues. A healthy calf that had good colostrum may still get an infected umbilicus but will generally wall it off as a local abscess and is not as likely to get septicemia."

— Austin Hinds

Clinical signs

A calf with septicemia will be weak and dehydrated and may or may not have a fever. In later stages, its temperature will drop as the calf goes into shock and it won't be able to get up.

As stated by Robert Callan, head of livestock medicine and surgery at Colorado State University, the septic calf is usually dull, off feed and may become weak and lethargic. "Temperature may be high, normal or low, but in the later stages of septicemia the temperature will drop as the calf goes into shock," he says. Often its hydration status is good, however, compared with a calf that has scours.

"When a sick calf comes in to our clinic our first big question is whether this calf is sick because he has scours or is septic, or both? The difference is that a scours calf will have profuse diarrhea and he will also be dehydrated; his mouth will feel dry, eyes will appear sunken, and if you pinch the skin along the neck it stays tented for a moment rather than sinking right back into place. By contrast, if you have a weak calf that's not nursing but is not dehydrated, it's very likely septic," he says.

That calf hasn't lost much body fluid, but it is weak and staggering because of the septicemia or toxemia that's attacking its whole body. If this condition continues, it will go into shock and die because its internal organs will shut down.

Callan says one of the best ways to tell if a calf is septic is to look at mucus membranes and the sclera around the eye. "Mucous membranes on the gums will be dark or red, instead of pink like a normal calf," he says. "The blood vessels under the surface may also be getting bigger and standing out. We call that condition injection of the mucous membranes. This is part of the inflammatory process. The blood vessels of the sclera around the eye will become prominent and dilated, making the eye look bloodshot."

Treatment

If a veterinarian thinks there is a chance to save the calf, antibiotics can be given. The best type of antibiotic would depend on the situation and cause of infection and the stage of the disease. Producers should be working with their veterinarian to determine the appropriate antibiotic, because almost all antibiotics that would be useful are prescription drugs.

Fluid therapy is also important, and the stage of disease will determine whether it could be given orally or under the skin or by IV. Hinds says a veterinarian could determine this.

Callan explains, "Generally you'd use an injectable drug because the oral drugs may not be absorbed very well in a septic calf. The gut may be shut down. In some cases you may need a higher dose than labeled for the antibiotic — an extra-label dose." Therefore, cattlemen need to be working with their veterinarian on a case-by-case basis on choosing an appropriate antibiotic and an appropriate dosage.

"Calves that are seriously ill will benefit from low doses of Banamine, to reduce inflammation and help the animal feel better and more likely to try to nurse. The dose for this should be lower than what is recommended on the label, so you should work with your veterinarian on dosage. A low dose is less likely to cause kidney damage or GI ulcers," Callan says.

Calves that are in shock will need IV fluids as part of their treatment. "The antibiotics and Banamine will also help, and we have to get some energy into the calf. If the calf is not nursing we need to get some milk into him unless the gut is completely shut down. It's hard to know when and how much milk to feed. Usually the best course is to give the calf small volumes of milk frequently. You don't want to give more than the compromised GI tract can handle. If you distend the stomach too much, the milk won't move through and you create more problems," he says.

Callan recommends a daily amount of milk that comprises 10% of the calf's body weight and dividing this into multiple feedings — as many feedings through the day as one can. "If you can get six feedings into that 24-hour period, give 1/6 of that daily ration each feeding," he says. "If you can get eight feedings per day, that's even better — dividing it into eight portions. If you can only give two feedings, this will be a lot harder on the calf."

Septicemia in older calves, not newborn ones, may be due to things like *Salmonella* in the gut or some other toxic gut infection like *Clostridia*. If these get into the bloodstream, it becomes a serious emergency, and the calf will require intensive therapy and care. **HW**