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Diphtheria commonly occurs in calves and young adults, but it can also affect mature cattle under certain circumstances.

Recognizing Diphtheria

Calves showing labored breathing may be exhibiting symptoms of diphtheria rather than pneumonia. Here are tips for telling the difference, as well as tips for how to prevent and treat cases of diphtheria.

BY HEATHER SMITH THOMAS

When a stockman sees a calf showing signs of respiratory disease, the first assumption is generally pneumonia. According to Salmon, Idaho, veterinarian Robert Cope, this assumption is usually correct, but “sometimes the problem is actually elsewhere in the respiratory system, rather than in the lungs. It may be diphtheria, a disease more properly termed necrotic laryngitis.”

Calves, and occasionally adult cattle, sometimes develop infection in the mouth and throat caused by the gram-negative bacteria *Fusobacterium necrophorum*.

This bacteria also causes foot rot in cattle and navel infections in calves, says Cope. “It is an opportunistic organism present in the environment at all times.” Sickness only occurs when conditions are right, such as stress or injury to the membranes of the

mouth and throat that give the bacteria access to the tissues.

“As long as the inner tissue linings of the calf are intact, no problems result. If the calf chews on a sharp piece of forage, producing a small scratch on the larynx, the organism can cause infection,” he says.

Diphtheria is not contagious from animal to animal. Infection is more likely to develop if an individual has a compromised immune system, and it most commonly follows a sore mouth or throat. When an animal gets diphtheria, the infection may settle in the larynx and pharynx at the back of the throat, or it may be restricted to the mouth.

Young cattle up through 2 years of age seem most susceptible. Emerging teeth may give the bacteria entrance if the mouth is sore. Other mouth injuries or abrasions, such as from coarse, rough feed or sharp seeds (cheat grass, foxtail, barley beards, etc.) can also open the way for infection.

If the infection is confined to the mouth tissues, the animal usually doesn't get as

sick. The calf may have a mild fever and may go off feed. It may slobber and drool and have swellings in the cheek area. Examination of the mouth may reveal deep ulcers in the membrane lining the cheeks and sometimes the tongue, causing swelling and protrusion of the tongue. The calf's breath may be foul.

If the larynx and pharynx in the back of the throat become infected, the calf generally becomes more sick. Swelling in this area tends to constrict the windpipe and make it difficult for the calf to breathe. It may have a cough, and it will drool because it has a hard time swallowing. It also may have a nasal discharge and foul breath.

■ Diphtheria vs. pneumonia

“At first glance the affected animal may be thought to show obvious signs of pneumonia, because breathing is difficult and labored,” Cope explains. “A closer look will make the differences more apparent.

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"In pneumonia, the calf shows signs of overall depression. The head is hung down toward the ground, there is often a large amount of nasal discharge, and the ears usually are drooped," he continues. "In a case of diphtheria, none of these signs are commonly observed. Instead, the head is usually extended, often parallel to the ground or higher. The calf is often alert, with little or no evidence of snotty nose."

The most typical sign of diphtheria (as opposed to pneumonia) is difficulty in drawing air into the lungs due to the obstruction in the throat. By contrast, due to damaged lungs, the calf with pneumonia has trouble pushing the air out.

"Calves with pneumonia will often grunt while attempting to breathe out," Cope says. "This is most often due to trapped air within the lungs. By contrast, diphtheria does not affect the lungs at all. The entire infection occurs in the larynx. As the larynx becomes infected and inflamed, swelling of this voice box results.

"As it swells, the effect is the same as that of soaking a doughnut in milk or coffee. The outside of the doughnut becomes bigger, but the hole in the center becomes smaller. As the larynx swells and the opening through it shrinks, breathing can become very difficult."

If you watch the calf as it breathes, you will be able to tell whether it has diphtheria or pneumonia. You can often hear its wheezing from some distance away (especially if it has been exerting itself), due to the constricted air passage.

■ **Fatal consequences**

If the throat is infected, the animal may have a high fever. "The calf will often quit eating, mostly because it is spending all its time trying to breathe," says Cope. Spread of the infection to the lungs may cause a severe bronchial pneumonia.

If the calf dies, death usually occurs from toxemia (general infection in the body due to bacteria toxins circulating through the

bloodstream) or obstruction of the air passages by the second to seventh day of illness unless the animal is treated.

Terrebonne, Ore., veterinarian Heidi Smith says if the swelling in the throat shuts off the air passages, the animal will die unless you or your veterinarian performs an emergency tracheostomy to allow the animal to breathe. This involves horizontally slitting the windpipe at the front with a sharp, sterile knife, a few inches below the jaw. Be careful to cut just through the softer tissue, between the firm ribs of the windpipe, like cutting between the ribs of a vacuum-cleaner hose. The air can then go in and out through this opening, bypassing the obstruction in the throat that is pressing the windpipe shut.

If there is not time to have the veterinarian come to your place, you can perform this procedure yourself to keep the animal alive and breathing until the vet gets there, Smith says.

The slit in the windpipe should be kept open with some kind of tube or even with your fingers until the veterinarian arrives to put a tracheal tube in place. This allows the animal to breathe until the swelling in the throat can be reduced so it can breathe normally again, according to Smith. Once the swelling goes down, the opening into the windpipe can be sewed shut so it can heal. If the calf is very ill and is not eating or drinking, it may need intravenous fluids.

■ **Treating diphtheria**

Ulcers in the mouth usually will heal in a few days if swabbed regularly with tincture of iodine, but infection in the throat will need diligent treatment with antibiotics and medication to reduce the swelling.

"Treatment must be quick and aggressive, not only because the condition quickly becomes life-threatening, but because scar-tissue formation can make the condition (restriction of the airways) permanent even after the infection has been eliminated," Cope says.

Every case of diphtheria should be given systemic antibiotics, such as sulfa and tetracyclines, which work well together. Cope says that dihydrostreptomycin was the most effective drug for diphtheria when it was available, but it has not been available for a long time.

"Since its removal from the market, I have most often used LA-200®, Naxcel® and other antibiotics. None of them seem



While commonly used in protocols for treating diphtheria in calves, dexamethasone may cause abortion, especially in the last trimester of gestation.



Don't stop treatment too early, warns veterinarian Robert Cope. It may take several weeks for the animal to fully recover.

greatly superior to the others for treating diphtheria," says Cope. "I do not recommend treatment with any kind of bolus, because shoving pills down the calf's throat may actually worsen the condition."

Treatment should be continued until the animal is fully recovered. This may take several weeks in some cases.

"No matter what antibiotic is used, I highly recommend giving a corticosteroid to lessen the laryngeal swelling and to attempt to prevent formation of scar tissue," says Cope. "My personal preference is dexamethasone, and I like to see it given at least twice daily for the first three to five days of treatment."

Steroids tend to suppress the immune system if given for more than a few days, but Cope says it is safe to give dexamethasone for a while at the beginning of treatment, especially if the calf is on antibiotics.

The anti-inflammatory drugs can help reduce the swelling in the throat if the animal is having trouble swallowing or breathing.

For best results, antibiotics and anti-inflammatory drugs should be started early, as soon as you discover the problem and hopefully before the swelling is extensive and before complications such as



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pneumonia or scar tissue develop.

"Always bear in mind that any form of treatment is most effective when begun early," says Cope. If an animal gets pneumonia in addition to the diphtheria, you'll have a hard time saving its life.

Smith says that when treating diphtheria, dimethyl sulfoxide (DMSO) can also help reduce swelling in the throat. The DMSO can be used even after it's no longer safe to continue with dexamethasone if you have to treat the animal for several days. In an adult animal, if the cow is pregnant, dexamethasone also may cause abortion, especially in the last trimester of gestation.

DMSO can be given intravenously — 1 cc/100 pounds of body weight — or orally at slightly higher doses, says Smith. Either way, it is absorbed immediately and travels throughout the body. For a calf with diphtheria, Smith says that DMSO works well if given as a "gargle," mixed with a little water and squirted into the back of the mouth with a syringe a couple times a day, to help shrink the throat swelling.

If treating a calf in cold weather, always mix DMSO with a little warm water to keep it from becoming solid in your oral-dose syringe. (DMSO solidifies at a much higher temperature than does water.) If giving it intravenously, you cannot add water to it,

but you can keep your syringe warm in a jar of hot water until you are ready to inject it into the animal, she says.

In a young calf with a serious case of diphtheria, you may have to treat it diligently (twice a day) and for however long it takes for the calf to fully recover. Even after it is breathing normally again, take its temperature. Do not halt treatment until its temperature is back to normal and the calf is eating and drinking properly again and until it is no longer slobbering or rattling in its breathing.

Adult cattle sometimes develop diphtheria, says Cope, and you may not even know they are sick if they don't go off feed. Their throats and airways are so much larger than that of a calf, that a mild case won't hinder their breathing, he says. The main symptom may be a loss of voice, since the infection may affect the larynx. Some of these animals eventually regain their voice, but many will remain voiceless or have an impaired ability to bawl or moo.

Whenever an infection interferes with the ability to eat or breathe, however, or causes serious illness with fever and toxemia, prompt and diligent treatment will be necessary to save the animal's life, whether it's a calf or an adult.

