UNIVERSITY OF FLORIDA
Cooperative Extension Service
Institute of Food and Agricultural Sciences

VM-63

Pasteurella Disease in Beef Cattle[1]

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Secondary bacterial infections are caused by certain species of bacteria that wait around for an accident to occur. They are commonly found in the environment or in the animal, cause no problems, and only become a problem if certain tissues or functions in the animal become damaged or stressed.

The *Pasteurella* bacteria, as we know them in the United States, are just one group that fits this description. *Pasteurella haemolytica* and *Pasteurella multocida* are two bacteria that compound respiratory diseases caused by viruses and other bacteria. The two bacteria are normally found in the upper respiratory tract (nose, throat, & windpipe) of most cattle. *Pasteurella* infection of the upper respiratory is thus very common, even in normal healthy calves. *Pasteurella* infections are spread by inhalation of aerosol droplets, by direct nose to nose contact, or by ingestion of feed and water contaminated by nasal and oral discharges from infected cattle; hence the bacteria are easily spread between cattle, especially when calves are crowded (as in shipment) or closely confined (as in a dairy calf nursery). The animal's normal body defenses keep the *Pasteurella* infections in check; the bacteria reproduce at a slow rate, float around in the mucus of the nose and throat, are destroyed by locally produced antibodies, and are easily removed by a clearing mechanism that is found in healthy animals.

Pasteurellosis disease occurs when the animal's normal defenses are compromised. In this case the lining of the upper respiratory tract could be damaged by IBR, PI-3, or BRSV viruses, the clearing mechanism could be depressed by BVD virus, or the production of local antibodies against *Pasteurella* may be interrupted by environmental or nutritional stress. When the defenses are compromised, the bacteria become attached to the lining of the respiratory tract (colonize), reproduce rapidly, and spread throughout the lungs. The severity of the disease depends upon which Pasteurella organism is involved and, at least in calves, with the nature of associated infections (IBR, PI-3, BVD, BRSV, or other bacteria). *P. haemolytica* causes a more rapid and more severe disease course than *P. multocida*; however, depending upon associated infections, both can result in death of the animal.

The first clinical signs seen in calves affected by pasteurellosis are vague, often limited to a slight depression and lack of interest in eating. As the disease progresses, the calf refuses to eat, the depression worsens and is exhibited by a lowered head and ears, discharges from the nose increase and change in consistency from being thin-clear to thick-yellow, body temperatures rise to as high as 107°F, and breathing becomes rapid and labored. A cough may be noted early in the disease; however, as the lung damage increases, coughing and breathing may become very painful for the animal. In this case the calf will try to suppress a cough; it can not suppress breathing. The labored breathing and associated pain cause the calf to stand, extend its neck and tongue to suck in air and make it reluctant to move. If the disease process is not stopped, the lungs become irreversibly damaged, the body temperature drops to below normal and the animal usually dies. If it survives, the irreversible lung

1. This document is VM-63, one of a series of the College of Veterinary Medicine, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Date reviewed May 1996. Please visit the FAIRS Web site at **http://hammock.ifas.ufl.edu**.

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damage results in a poor-doing calf that will never be able to perform; these calves are referred to as chronics in the stocker and feedyard industries.

Pasteurella pneumonia develops very rapidly; if the first sign of the disease (lack of interest in food) goes unnoticed and the start of treatment is delayed, the outcome of the disease becomes much poorer. This delay in detection and treatment becomes a major factor in the severity and duration of sickness in calves.

The pneumonia caused by *Pasteurella* alone has been commonly referred to as shipping fever; the respiratory illness caused by the association of *Pasteurella* and other diseases has been called Bovine Respiratory Disease Complex (BRD or BRDC). Presently, in the scientific world, shipping fever is not talked about much; BRDC is the subject of interest; the true "shipping fever" losses are minimal compared to the BRDC losses in the cattle industry. *Pasteurella* pneumonia is present in nearly 75% of all diagnosed cases of BRD.

Treatment and Prevention

To get a better understanding of treatment of pasteurellosis, you must understand a bit more about the bacteria. The most important thing is that *Pasteurella* bacteria easily develop resistance to the antibiotics and sulfa drugs (antibacterial drugs); since the bacteria are so geographically widespread, we have ended up with widespread antibacterial resistance among *Pasteurella* bacteria throughout the United States. It is easy to find an antibacterial drug to use against pasteurellosis that occurs at the farm or ranch where the calf was raised. In contrast, to find a drug that will work against pasteurellosis in commingled calves can become difficult. Commingled calves come from many different sources and each calf may be infected with *Pasteurella* bacteria that are resistant to different antibacterial drugs. Since the *Pasteurella* bacteria are easily spread from calf to calf, calves can become infected with many different drug-resistant strains. When the defenses of such calves are compromised, the antibacterial resistance of the *Pasteurella* strain or strains causing the disease is unknown; finding a drug that works takes knowledge of disease and drugs. Some bacterial resistance is to the dose of the drug rather than to the drug itself; if we know this we (with a veterinary prescription) raise the dose or route of administration. Laboratory tests and changes in normal doctoring procedures usually give us the answer. If a drug won't work regardless of the dose, why give a sick animal a second dose? Instead, consider changing to a different drug. Just because a particular drug works at one ranch or feedyard does not necessarily mean it will work at another. The antibacterial resistance exhibited by *Pasteurella* has not been confined to just one drug or class of drugs; almost without exception, this resistance has occurred against most of the common over-the-counter antibacterial drugs.

In general, for treatment:

1) Effective antibacterial treatment must start very early in the disease process and must be continued for 1 to 2 days after the animal appears to be normal.
2) If improvement is not recognized within 24 hours following a specific antibacterial treatment, be prepared to change drugs or change the dose of the drug (raising the dose above the label directions will require a veterinary prescription). Continue changing until an effective drug is found.
3) Adequate shelter and nutrition are essential. Supportive therapy with B vitamins, drenching with liquid feeds, and pro-biotics may be indicated.

Prevention: *All you have to do is .....* Don't stress the animals and don't expose them to IBR, BVD, PI-3 or BRSV.... they won't get sick with pasteurellosis. But animals do get stressed, and these viral infections are commonplace across the United States. We try to prevent the disease pasteurellosis by keeping the resistance level in the animal above the disease challenge level. The tools we use to maintain this separation are: minimizing stress, vaccinating, and antibiotics. By minimizing stress on the animal we may keep the animal's defenses from being compromised. *Remember ....* the animal's normal body defenses keep the *Pasteurella* infections in check and since IBR, BVD, PI-3 and BRSV infections reduce the natural respiratory tract defenses, keep the animals vaccinated against these viruses.

We try to raise the animal's resistance by vaccinating against *Pasteurella*; unfortunately we are not always successful. This is because *Pasteurella* bacteria of the same species are not all the same; there are as many as 15 different strains of *Pasteurella haemolytica*. A vaccine made with one strain does not always protect against another strain. If a vaccine was made to include all strains the dose needed would be too large to use and the toxins in the vaccine, released from the bacteria while making the vaccine, would cause severe reactions in the animal. For these reasons, popularity of these particular *Pasteurella* vaccines has decreased in recent years. However, if you find a vaccine that works against the *Pasteurella* bacteria in your area, by all means use it. The *Pasteurella*

vaccines that have been on the market for many years generally contain both *Pasteurella haemolytica* and *multocida* bacteria. These vaccines are made with killed bacteria and are NON-Replicating vaccines. NON-Replicating vaccines require that two doses be given at least 14-28 days apart to initially raise the resistance level. A single annual booster is required to stimulate prolonged resistance level.

Pasteurella vaccines recently developed may overcome the problem. One specific vaccine has been developed that stimulates increased resistance against "a particular fraction" of the *Pasteurella* organism; that "particular fraction" is thought to be found in most, if not all, strains of *Pasteurella haemolytica*. In addition, because it is made from only a fraction of the bacteria, the vaccine contains fewer components that would cause reactions in cattle when vaccinated. The scientific community refers to a vaccine made from a "particular fraction" of the organism as a "subunit" vaccine. In addition to the "subunit" antigens some "new-generation" *Pasteurella* vaccines contain a leukotoxoid which will stimulate the animal to produce antibodies against the leukotoxin produced by certain *Pasteurella* organisms, thus greatly enhancing the resistance stimulated in a vaccinated animal. These particular vaccines are NON-Replicating vaccines and usually require two doses to be given at least 21-28 days apart to initially raise the resistance level.

We also have at least two live avirulent REPLICATING *Pasteurella* vaccines on the market; however, objections to their use generally include: 1) high cost; 2) adverse reactions which include injection site pain, swelling or abscesses, and muscle stiffness; 3) the administration of antibiotics or sulfa at the same time as vaccination could kill the live vaccine organisms and cause vaccination failure; and 4) in one case, the vaccine was recommended only for use in calves over three months of age. Since many shipped cattle are routinely administered antibacterial drugs on arrival, the use of these particular vaccines in recently shipped cattle has been questioned.

Often we try to keep the *Pasteurella* growth in animals under control (reduce the challenge) by using antibacterial drugs administered in the feed, in the water, by injection, or in bolus form. When antibacterial drugs are used to control *Pasteurella* or other bacteria ... keep the cattle under observation. The bacteria may be resistant to the antibacterial drug you are using. Unfortunately, many people using antibacterial drugs to keep sickness in check forget to observe the cattle closely. If the bacteria are resistant to the drug, the amount of sickness and the severity of the sickness can get out of hand before the cattle are observed. These crutches can be dangerous if the people using the drugs are not aware of the resistant strains of bacteria.

Remember, pasteurellosis disease is usually associated with stresses and other diseases; it is a major component of the bovine respiratory disease complex.