Bovine Virus Diarrhea: Infectious Bovine Rhinotracheitis Complex

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Bovine virus diarrhea (BVD) and infectious bovine rhinotracheitis (IBR) are two "new" diseases appearing within the last 25 years (6,10,12). There is serologic and clinical evidence that they may be considerably older in other forms or infecting other species (7,12). Bovine virus diarrhea has also been called mucosal disease, but this is the more severe form and the use of two names only confuses the issue. Infectious bovine rhinotracheitis has also been called infectious pustular vulvovaginitis (IPV) or coital vesicular exanthema when the vulvovaginitis form of the disease occurred, and the respiratory form is often called "red-nose." The term IBR seems to be solidly established, even though the term coital vesicular exanthema is much older and probably was the first form of the disease (7).

As the names suggest, BVD virus was first observed as a pathogen of the digestive tract, and IBR virus was most often observed as an infectious agent of the upper respiratory tract. These respective manifestations of disease are probably still the most common forms observed, but BVD virus can be involved in disease of the respiratory tract and IBR virus has been isolated from the alimentary tract of sick cattle (2). It is easy to see that the clinical disease involving one or occasionally both of these viruses can be similar to the disease caused by either virus alone in some instances. This is why there is a tendency to speak of the BVD-IBR complex.

It is these virus infections that resemble each other and may also be confused with "shipping fever" which cause the greatest diagnostic problems. Both IBR and BVD virus infections can resemble shipping fever, since both can be involved in respiratory disease either alone or with other pathogens. In addition, similarly to shipping fever both IBR and BVD may occur after exposure to cattle from other sources.

Bovine virus diarrhea and IBR viruses are not related to each other and in many infections will not create any confusion. Bovine virus diarrhea is related to hog cholera virus and IBR virus is related to many viruses, including equine rhinopneumonitis virus and Herpesvirus hominis, or the cold-sore virus of man. Serologic findings indicate that BVD virus can also infect...
The infections of other species can be without clinical disease, and the named species are undoubtedly not all that can be naturally infected.

**Bovine Virus Diarrhea**

Bovine virus diarrhea virus causes a generalized infection of cattle and can cause lesions in many organs other than the tissues of the alimentary system and the respiratory tract. This general systemic infection leads to establishment of solid active immunity in recovered animals and prevents any further systemic infection.

When BVD virus infects dairy cattle, it may go unnoticed, with only a transient fever and a slight drop in milk production. The other extreme of BVD virus infection would be an epizootic where more than half the animals become ill with enteritis, respiratory signs, and occasionally hyperkeratosis. In this latter severe form of disease several animals may die, usually after being noted ill for several days or weeks. Probably less than five per cent of the animals infected with BVD virus are noticed to be ill, but more than half of the animals may die in one epizootic, with no deaths in another.

In a mild or severe epizootic of BVD, the vast majority of apparently healthy animals will be actively immune by the time the disease has been present for two weeks or by the time the first animal has died. An occasional apparently healthy animal may not be immune by this time and may ultimately die from BVD virus infection from a week to several months later.

The exception to this rapid immunity during an epizootic occurs when calves are present. Calves often possess maternal virus neutralizing antibodies from nursing immune dams. These antibodies can persist as long as 8.5 months, but will vary from calf to calf depending at least in part on the amount of the specific antibodies consumed in the first hours of life.

This passive immunity from maternal antibodies will prevent systemic infection with BVD virus, so that an epizootic in calves from four to eight months of age may be spread out for several weeks or longer. As the maternal antibodies disappear from the calves, they will one by one become susceptible to BVD virus and may then become ill. The type of disease observed in such BVD epizootics of calves in Minnesota is most commonly characterized by respiratory disease, but cases of the enteric type have also been observed.

**Infectious Bovine Rhinotracheitis**

Infectious bovine rhinotracheitis virus infections of dairy cattle may also be subclinical, as described for BVD, or they may be severe infections of the respiratory system with high fevers and even some deaths. Death without a secondary infection by some other pathogen is not common with IBR, although rare cases of sudden death have been observed.

The mild forms of IBR may include infectious pustular vulvovaginitis or abortions that occur several weeks after unnoticed subclinical disease. For some obscure reason, pustular vulvovaginitis is never associated with abortion.

In contrast with most BVD virus infections, IBR virus will commonly take a month or more to spread through a dairy herd.

**Cause of Abortion**

Abortions can be caused by IBR virus and BVD virus, as evidenced by virus isolation from aborted fetuses and experimental induction of abortion by virus inoculation. In both diseases the abortion is probably due to virus infection of the fetus rather than to indirect causes from infection of the dam. This cause of abortion seems unequivocal with IBR virus but may leave some question with BVD virus.

Far less research has been reported with BVD virus abortion.

**Control Measures**

Similarly to management of other virus diseases, the treatment of cattle with either BVD or IBR virus infection is directed to relieve the clinical signs of disease and to prevent secondary bacterial infection. Attempts to directly destroy or to interfere with the virus are minimal. Preventive medicine by vaccination is proving to be the most effective means of controlling the two diseases.

Bovine virus diarrhea and IBR are less common in so-called closed or isolated herds. Both diseases can be introduced by apparently healthy new animals into the herd and by exposure to inanimate material from infected herds.

**References**


Role of Parainfluenza-3 in Cattle

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The occurrence of Myxovirus parainfluenza-3 (PI-3) in cattle has been well documented (1, 2, 11, 13, 18, 20, 28). This organism plays an important role in the bovine respiratory complex. Current investigations indicate that respiratory diseases of cattle are due to the interactions of viruses, bacteria, and other factors.

To date, the viruses isolated in the United States and throughout the world appear related. Some minor strain differences in immunodiffusion reactions have been observed; however, all the viruses reported have been related by cross neutralization and hemagglutination inhibition tests (23, 27). That only a single homotypic virus has been found is favorable for development of vaccines.

Parainfluenza-3 virus has been isolated from aborted fetuses (29), from milk (22), and from the testicles of an infertile bull (9). Since PI-3 virus can be involved in abortion and its occurrence in milk, its consideration as a pathogen in dairy cattle is necessary.

Epizootiology

Among the viral agents now known to be associated with respiratory diseases of cattle, Myxovirus parainfluenza-3 is one of the more important. This virus is widely distributed and results in a spectrum of clinical disease varying from subclinical to severe respiratory distress (2, 12, 16, 20, 28, 33).

Antibodies to PI-3 have been reported in cattle in Canada (20), most European countries, and many of the Asiatic nations (22). A survey of a cattle population in Nebraska (24) reported over 86%, and in New York 48% (21) of the cattle sampled had PI-3 antibodies.

In many respects the disease resembles influenza and parainfluenza in man. The severity of the disease may vary according to stress factors and secondary bacterial invaders, and the relative times the different agents become involved. In the fall of the year there is an increase in the number of cases, an increase in PI-3 antibody levels, and in the number of isolates of the virus (35).

Parainfluenza-3 may act as a triggering mechanism for other bacterial or viral agents present in the respiratory tract (17). It has been suggested that the virus multiplies in the respiratory mucosa, which it alters in some