

# Clinical Reports

## Causes of Abortion in Dairy Cattle: A Diagnostic Survey

Robert F. Rowe, M.S., D.V.M.

Lois K. Smithies, Ph.D.

Central Laboratory, 6101 Mineral Point Road  
Madison, Wisconsin 53705

### Summary

All specimens from bovine abortions (fetal and placental tissues and paired blood samples) received at the Central Animal Health Laboratory, Madison, Wisconsin for a one year period of time (July 1, 1976 - June 30, 1977) were subjected to diagnostic procedures to determine the cause of the abortion.

When paired (acute and convalescent) serum samples were the only specimen, a diagnosis was reached in 21.4% of the cases (13.9% - infectious bovine rhinotracheitis (IBR) virus and 7.5% bovine virus diarrhea (BVD) virus). When tissue specimens with or without paired sera were received, 35.6% of the cases were diagnosed. IBR virus was again the most frequent diagnosis accounting for 13.5% of the cases. BVD virus (5.7%), *Corynebacterium pyogenes* (3.8%) and Leptospirosis (2.9%) accounted for the next most frequent diagnosis. Submission of aborted fetus and placenta along with paired serum samples from the aborting dam allows the greatest opportunity for successful diagnosis.

### Introduction

"Normal" incidence of bovine abortion has been reported to be 3-5% (1,2), yet the economic liabilities of this rate or higher ones are enormous. Summaries of diagnostic laboratory data (1,3) dealing mainly with cow-calf beef herds suggest that infectious bovine rhinotracheitis (IBR) virus and mycotic placentitis are the leading cause of bovine abortion. The objective of this survey is to characterize the abortion data from the Wisconsin Central Animal Health Laboratory for a one year period of time. Although Wisconsin has some beef cow-calf operations, most of these data are from dairy cattle.

### Materials and Methods

Specimens from bovine abortion cases were submitted by Wisconsin veterinary practitioners either by mail or brought directly to the laboratory by the herd owners. Practitioners were encouraged to submit complete histories when sending in the specimens which were then divided into two groups: 1) paired (acute and convalescent) serum samples alone or 2) fetal and placental tissues with or without paired serum samples. When possible, multiple case submissions from individual farms were pooled so that all data represent herd abortion problems, but in

many cases the data are from individual animals. Paired serum samples were subjected to Leptospirae serotyping and serum neutralization tests for IBR virus and bovine virus diarrhea (BVD) virus. Suitable tissue specimens were subjected to bacterial cultures, and fluorescent antibody (FA) techniques for detection of IBR and BVD virus both in frozen sections and tissue cultures. Fetal stomach contents were examined under the darkfield microscope for live leptospirae and *Campylobacter fetus* and subjected to bacterial cultures. Fresh tissues that were not autolyzed were fixed in 10% formalin and subjected to histopathologic examination.

### Criteria for Diagnosis

*Infectious bovine rhinotracheitis and bovine virus diarrhea* - paired sera, four-fold increase or decrease in neutralizing antibody; tissue examination, positive FA and/or tissue culture isolation and identification by FA.

*Leptospirosis* - microagglutination titre of  $\leq 1:800$  from aborting dam's serum or isolation of live leptospirae from fetal stomach contents.

*Fungal abortion* - grossly thickened placenta in conjunction with two of the following: 1) hyphae or fungal elements in the placenta or skin, 2) pure fungal cultures from fetal stomach contents or cotyledon, and 3) hyphae or mycotic elements associated with fetal bronchopneumonia.

*Corynebacterium pyogenes* - isolation of pure cultures of *C. pyogenes* from fetal tissues or stomach contents or isolation of *C. pyogenes* from placenta with evidence of microscopic bacterial placentitis.

*Other bacterial abortions* - bacteria were considered to be the cause of abortion when they were isolated in pure cultures in large quantity from fetal tissues and stomach contents or when microscopic lesions or inflammation were present in the placenta.

*Mummified fetus* - determined by gross observation, when no other cause was determined.

*Twins* - considered as the cause of abortion if no other cause determined; when one or both of a set of twins were received or when the history indicated a twin fetus abortion.

### Results and Discussion

The results of paired serum data are presented in Table I and those from fetal tissues with or without

paired serum in Table II. In summarizing the data only paired serum samples were considered diagnostic specimens but it is interesting to note that another 1272 abortion cases were received that involved the submission of either only acute or only convalescent blood samples. This would total 3035 herd problems of bovine abortion for one year in Wisconsin or 6.5% of the total dairy farms in the state.

IBR virus was the cause of the greatest number of diagnosed abortions. The level of diagnosis of IBR abortion was similar regardless of the specimens received (13.9% paired sera alone or 13.5% - tissues with/without paired sera). This ranking and level of incidence agrees with data from beef cow-calf data (1,3). It is important to remember that most of the IBR abortions occur in the last one-third of the gestation and the aborting dams are more readily identified and the fetuses more easily recovered regardless of management system.

The incidence of BVD induced abortion was higher than has been previously reported (1,3,4). Infection with this virus early in the gestation leads to fetal death and resorption or abortion, but infection from 150 days until term results in active immunization of the fetuses and birth of calves with demonstrable precolostral serum neutralizing antibody (5,6). Abortion of early fetuses (less than 150 days) may be overlooked in loose housing or pasture management systems, yet, in Wisconsin the majority of cows are housed in stanchion barns and a greater percentage of these fetuses were recovered, especially in the winter months, and submitted to the diagnostic laboratory.

Leptospirae were observed by direct darkfield examination of fetal stomach contents in 2 cases. The remainder of the positive leptospirosis cases were diagnosed with positive serum samples from more than 1 animal in each herd. In the past vaccination with *Leptospirae* bacterins have stimulated the development of IgG antibodies which were essentially undetected in the microscopic agglutination test used in diagnostic laboratories. Recently with the development of new vaccines which induce IgM as well IgG antibody formation vaccinal titres previously credited only to field strain infection may develop. Because serology is the major tool for diagnosis of *Leptospirae* infection more research is necessary to solve this dilemma.

Most of the bacterial causes of abortion (*Corynebacterium pyogenes*, *Listeria monocytogenes*, *Escherichia coli* and *Pasteurella multocida*) usually are responsible for sporadic abortions and are not considered contagious in the true sense of the word. With the increasing stresses of larger herds, confinement housing and higher milk production, it seems realistic that these organisms of normally low virulence would reach the fetus through the blood or ascending reproductive tract and cause placental or fetal infection.

Robert (7) has reported twinning to be positively associated with dystocia, retained placenta and a

high incidence of abortion. When no other definitive cause for abortion could be established, twin fetuses was diagnosed. Hubbert, *et al.*, (4) reported that 6% of 3797 abortions over a ten year period of time were multiple fetuses. This should be a constant rate unless the incidence of twinning changes.

*Campylobacter fetus* (vibriosis) was not diagnosed for the reported time period. Presumably this is due to the increased use of artificial insemination in the Wisconsin herds. As the average size of the dairy herd increases more and more managers are using clean-up bulls in an effort to improve reproductive efficiency. Consequently, in the following year ('77-'78) 2 cases of vibrio abortion were diagnosed in Wisconsin dairy herds.

Table I  
Diagnosis of Bovine Abortions from Paired Serum Samples\* for 1 Year\*\*

Cause	Number	%
Infectious Bovine Rhinotracheitis (IBR)	179	13.9
Bovine Virus Diarrhea (BVD)	96	7.5
No Diagnosis	1013	78.6
Total	1288	

\*Sera from aborting dams taken at abortion and 2-3 weeks later.

\*\*July 1, 1976 - June 30, 1977

Table II  
Diagnosis of Bovine Abortions from Fetal and Placental Tissues with or without Paired Serum Samples for 1 Year.\*

Cause	Number	%
Infectious Bovine Rhinotracheitis (IBR)	64	13.5
Bovine Virus Diarrhea (BVD)	27	5.7
<i>Corynebacterium pyogenes</i>	18	3.8
Leptospirosis	14	2.9
Fungus	9	1.9
Listeriosis	8	1.7
Misc. Bacteria & Bact. placentitis	14	2.9
Twins and Mummified fetus	14	2.9
Other	1	.2
No diagnosis	306	64.4
Total	475	

\*July 1, 1976 to June 30, 1977

#### Bibliography

- Kirkbride, C. A., Bicknell, E. J., Reed, D. E., Robl, M. G., Knudtsen, M. S. and Wohlgemuth, K. A Diagnostic Survey of Bovine Abortion and Stillbirth in the Northern Plains States. JAVMA Vol. 162, No. 7, 556-560, 1972. - 2. Kradel, D. C. IV, Abortion Storms and Projection for the Future. Cornell Vet. 1978, 68, Suppl. 7: 195-199. - 3. Kirkbride, C. A. Abortive Diseases of Cattle: Their Significance and Prevalence. Proceedings of Society of Theriogenology, 1977. - 4. Hubbert, W. T., Booth, G. D., Bolton, W. D., Dunne, H. W., McEntee, K., Smith, R. E., and Tourtellotte, M. E. Bovine Abortions in Five Northeastern States, 1960-1970: Evaluation of Diagnostic Laboratory Data. Cornell Vet. 1973, 63:291-316. - 5. Kendrick, J. W. Bovine Viral Diarrhea - Mucosal Disease Virus Infection in Pregnant Cows. Am. J. Vet. Res., Vol. 32, No. 4, April, 1971. - 6. Kendrick, J. W. Response of the Fetus to Infection. Proceedings of the American Association of Bovine Practitioners 1976, 58-64. - 7. Roberts, S. J. Veterinary Obstetrics and Genital Diseases. Second Edition, Dist. by Edwards Brothers, Inc., Ann Arbor, Michigan, 1971.