UPDATE ON BOVINE VIRAL DIARRHEA VIRUS DISEASE June 6, 1995

In May of 1994, the United States Department of Agriculture (USDA):Animal and Plant Health Inspection Service (APHIS), USDA:Agricultural Research Service (ARS), selected universities, and selected veterinary diagnostic laboratories participated in an investigation of outbreaks of bovine viral diarrhea (BVD) where the acute/peracute manifestation occurred. Results of the initial May investigation appeared in the Summer 1994 DxMONITOR Animal Health Report and in an internal USDA report (USDA, 1994). This summary reports on a follow-up questionnaire presented to selected veterinary diagnostic laboratories.

1. What was the 1994 distribution of diseases (including acute/peracute) associated with BVD virus in the U.S.?

In November 1994, a follow-up survey was mailed to the 28 laboratories that had responded to the laboratory questionnaire included in the initial May BVD survey. The follow-up questionnaire requested data, by month in 1994, on the total number of:

- confirmed cases of BVD associated with specific case definitions.
- specific types of bovine accessions.
- tests run for BVD associated with specific submitting complaints.

The initial May survey indicated a wide variety of tests used by the laboratories to diagnose BVD and little being done to genotype (Type 1 vs. Type 2). Therefore, the follow-up questionnaire did not request data on type of test run, or genotype data for confirmed cases. Thirteen of the 28 laboratories responded to the follow-up questionnaire, with two of the respondents indicating they were unable to provide the requested data.

Of the 11 laboratories that provided data, 10 were able to provide numbers of confirmed cases of BVD for specific manifestations. Six also provided total numbers of bovine accessions, and five provided total numbers of BVD tests. Only two of the eleven laboratories were able to break down bovine accessions by type and tests run by submitting complaint. As a result, the number of laboratories providing information for the following analyses varied.

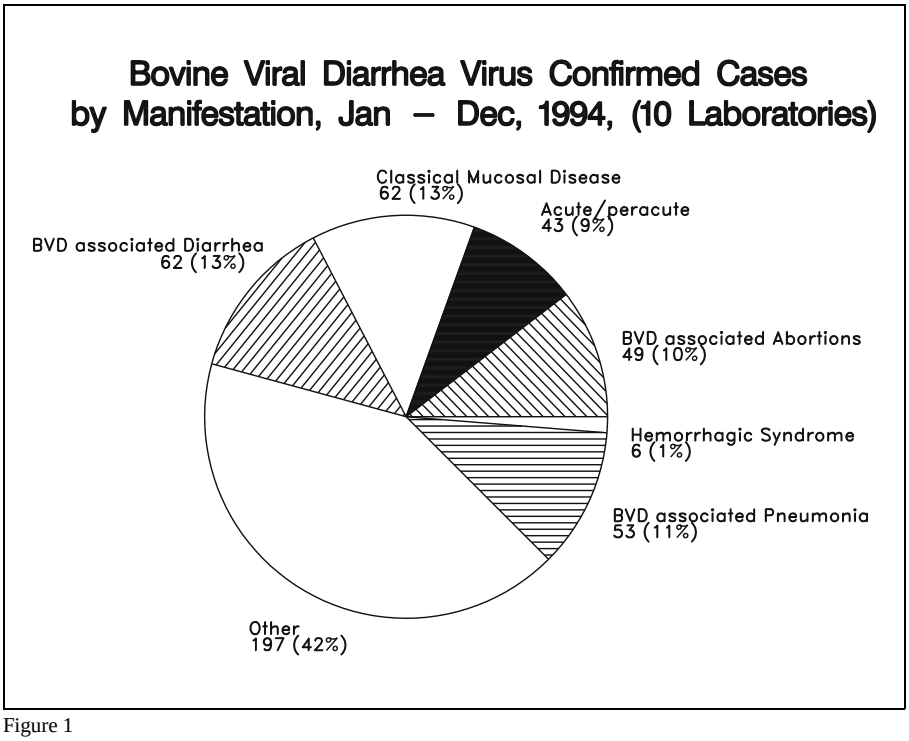

Figure 1

Of the 28 States responding to the initial May survey, California, Kentucky, Michigan, New York, Ohio, Pennsylvania, and Wisconsin reported confirmed cases of acute/peracute BVD in cattle. The follow-up study added Georgia, Oklahoma, and Tennessee, with cases in 1994. A total of 43 cases of confirmed acute/peracute BVD was reported for 1994 on the follow-up questionnaire (ten laboratories). Cases may have been individual

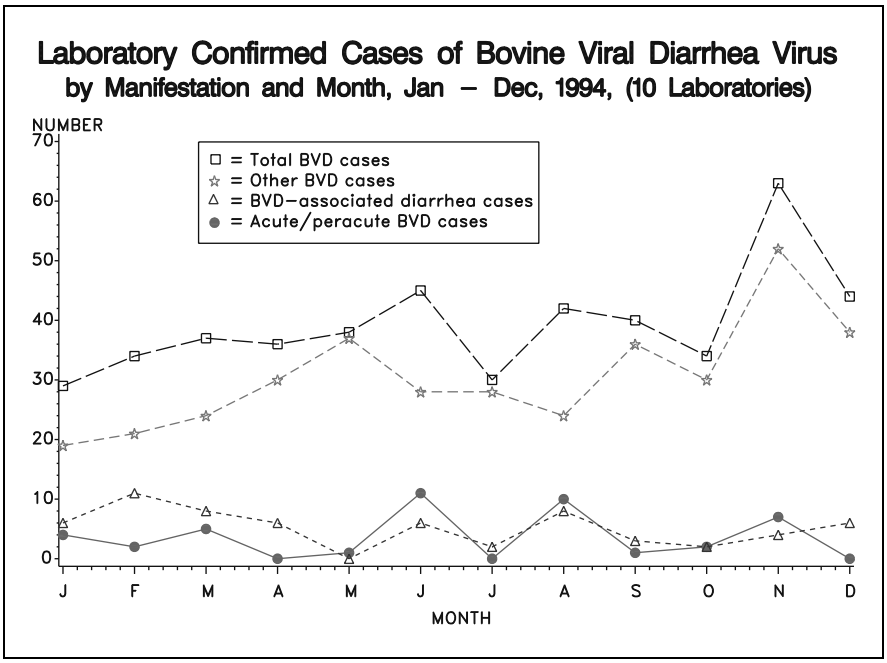

Figure 2

animals or herds, depending on laboratory coding systems.

Figure 1 shows the BVD manifestations for which data were collected. Confirmed cases of acute/peracute BVD accounted for only 9 percent (43/472) of the BVD cases in 1994 for the 10 laboratories reporting. There may have been a reporting bias because the high death loss associated with acute/peracute BVD may have led to higher reporting of this manifestation relative to less dramatic manifestations.

Case definitions used by both investigations for the BVD manifestations were:

- Hemorrhagic syndrome = fever, diarrhea, severe thrombocytopenia and death.
- Acute/peracute = high fever (107° - 110° F), anorexia, ± diarrhea, rapid progression to death (in 1-2 days).
- Classical mucosal disease = oral and interdigital lesions and diarrhea.
- BVD-associated abortions or other reproductive problems.
- BVD-associated diarrhea.
- BVD-associated pneumonia or other respiratory problems.
- Other = laboratory defined. The other category included persistently infected animals, with or without symptoms; weak calves; calves found dead; and cases where no code was available.

After plotting confirmed BVD cases by manifestation and month, BVD-associated diarrhea and acute/peracute BVD had similar patterns which were different from the other manifestations.

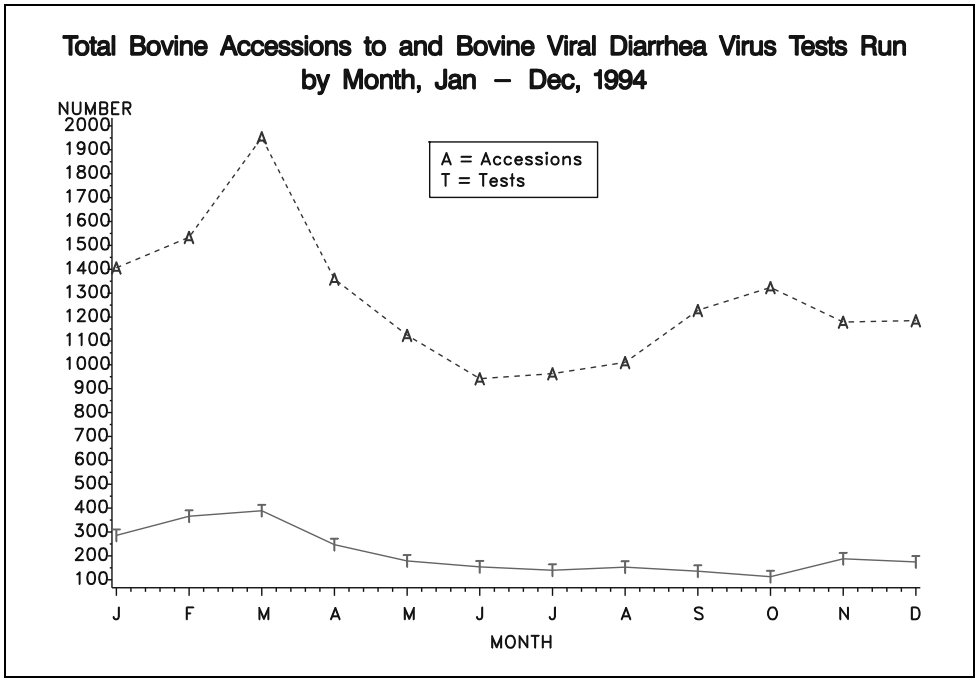

Figure 3

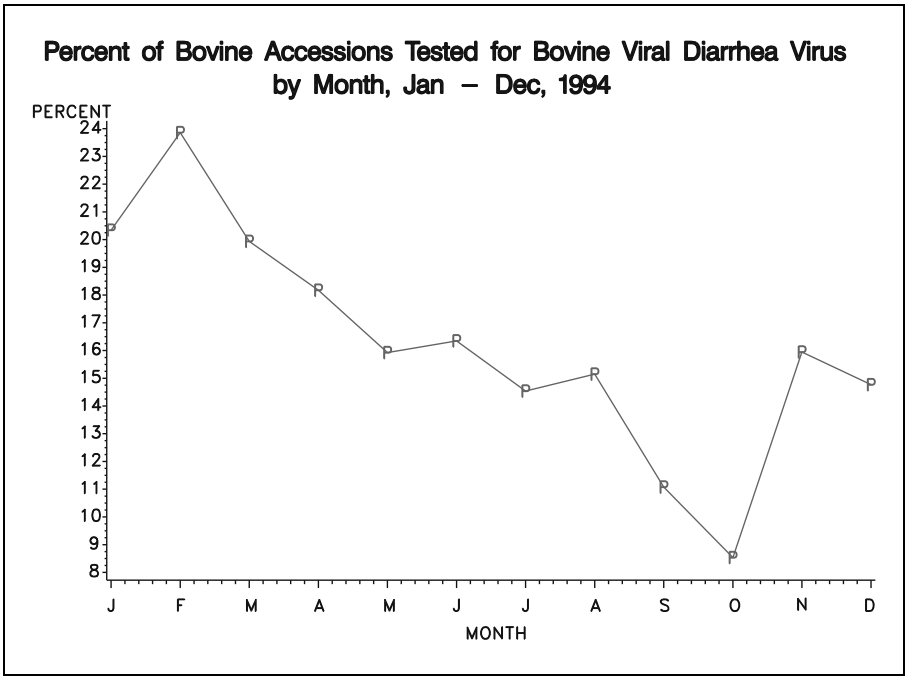

Figure 4

Therefore, BVD-associated abortions and pneumonia, classical mucosal disease, and hemorrhagic syndrome were collapsed into the 'other' category for further analysis. Figure 2 shows the number of confirmed cases in 1994, reported by 10 laboratories, for acute/peracute BVD, BVD-associated diarrhea, all other manifestations, and total BVD, by month. The number of confirmed acute/peracute BVD cases was highest in June (11) for the laboratories responding to the follow-up questionnaire.

Both the total number of bovine accessions and the total number of BVD tests, by month, showed a peak in March of 1994, a summer decline and a rise again in the fall (Figure 3). Figure 4 shows the percent of bovine accessions which were tested for BVD. The percent tested followed the same basic pattern as the number of accessions and tests, except for an increase during June, the time at which the initial reports of acute/peracute BVD began generating concern.

Figure 5 shows the percent of total bovine accessions in 1994, reported by six laboratories, which were confirmed as cases of acute/peracute BVD, BVD-associated diarrhea, all other BVD manifestations, and total BVD cases, by month. Acute/peracute BVD cases showed increases in June and October-November, and there were cases of acute/peracute BVD reported in January 1994 (prior to the May 'outbreak'). BVD-associated diarrhea cases increased in June, but were at their highest in February and August. Canadian sources in Ontario (Alves, 1995), indicate that the maximum number of positive BVD cases per 500 cattle submitted to their Veterinary Laboratory Services was 50 (10 percent) in both August and

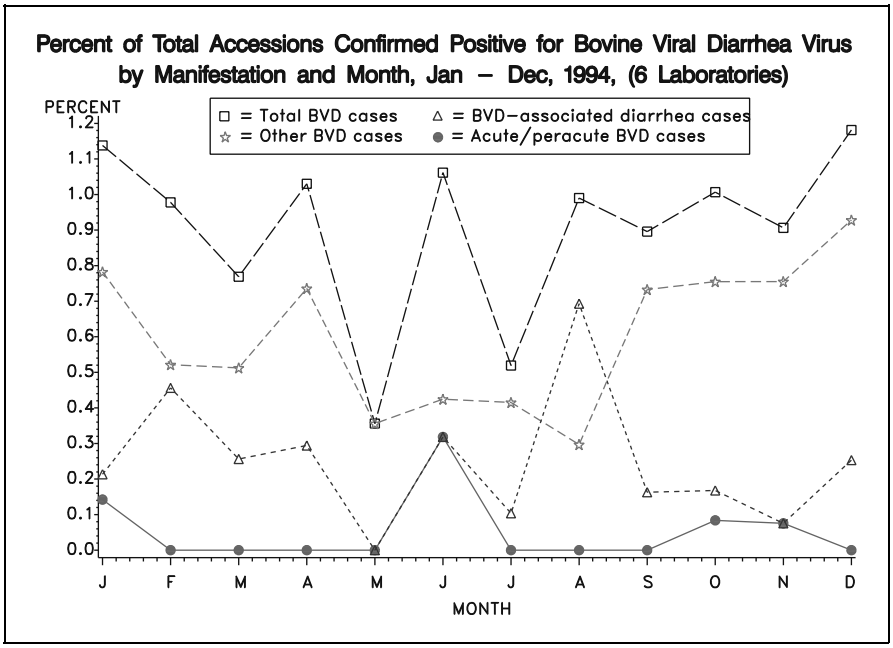

Figure 5

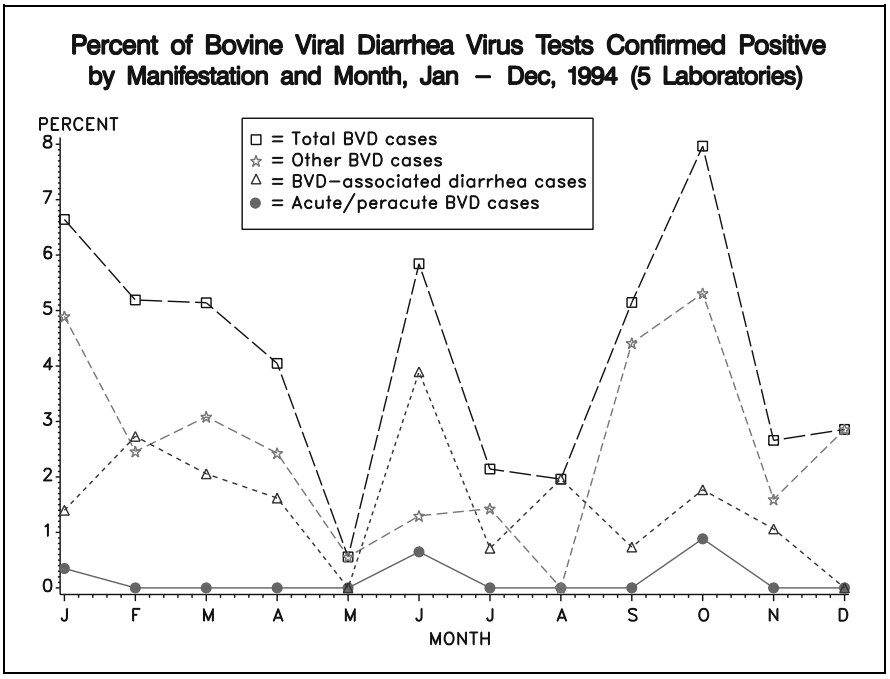

Figure 6

September 1993. For the six U.S. laboratories providing both number of positive and number of accessions for the BVD follow-up survey, the maximum number of positive BVD cases per 500 accessions was 5.9 (1.2 percent) in December 1994. The maximum number of positive acute/peracute BVD cases per 500 accessions was 1.6 (0.32 percent) in June 1994. Even at its worst, the U.S. appears to have been affected much less than was Ontario.

Figure 6 shows the percent of total tests run for BVD, by five laboratories, which were confirmed as cases of acute/peracute BVD, BVD- associated diarrhea, all other BVD manifestations, and total BVD cases, by month. Acute/peracute BVD cases had increases in June and October, and had cases reported in January (prior to the May 'outbreak'). BVD- associated diarrhea cases had increases in February, June, August and October.

Conclusions drawn from the laboratory follow-up questionnaire were that: 1) there were cases of acute/peracute BVD in the U.S. prior to the 'outbreak' in May 1994, 2) numbers of cases of acute/peracute BVD appear to have been low (11 at its height in June, for responding laboratories), 3) numbers of acute/peracute BVD cases in the U.S. appear to be lower than those reported during the Ontario outbreak, and 4) the peaks in confirmed cases of acute/peracute BVD and BVD-associated diarrhea in June and October may have been at least partially related to USDA dissemination of information on the May 'outbreak' and later publication in producer journals.

No data were collected on genotypes for the various manifestations since few laboratories have the facilities to genotype BVD virus. Researchers at the USDA:ARS:National Animal Disease Center (NADC) indicate that Type 2 BVD virus has been isolated from cases of hemorrhagic syndrome, BVD-associated diarrhea, BVD-associated abortion, and classical mucosal disease, as well as acute/peracute BVD (Bolin, 1995). Historically, Type 1 BVD virus has caused clinically severe acute disease. Therefore, it should not be held that Type 2 BVD virus always results in the acute/peracute manifestation, nor that the acute/peracute manifestation is the result only of Type 2 BVD virus.

2. What is the prevalence of Type 2 BVD Virus?

Researchers in Ontario (Carman, 1995) recently worked with NADC to determine the prevalence of Type 2 BVD virus in Ontario. Samples were virus isolates from 1981 to 1994. Type 2 virus was identified in samples from 1981 (4/14), indicating that it has been present in Ontario at least since 1981. Table 1 shows the breakdown of isolates by year. Similar information is currently unavailable for U.S. isolates, however, a study will soon be conducted using isolates from Nebraska going as far back as the 1970's.

Table 1. Isolate genotype in Ontario, Canada, 1981 to 1994. (Carman, 1995)

Year	Type 1	Type 2	% Type 2
1981	10	4	28.6
1984	12	1	7.7
1985	19	3	13.6
1986	4	0	0
1987	3	1	25.0
1988	3	1	25.0
1989	3	1	25.0
1990	5	2	28.6
1991	5	3	37.5
1992	7	1	12.5
1993	5	3	37.5
1994	4	4	50.0

3. What is the risk to U.S. beef cattle of acute/peracute BVD disease?

BVD antibody prevalence information from almost 4,000 cattle on 256 U.S. beef cow/calf operations in 1993 indicates that the risk of widespread outbreaks of peracute disease from BVD virus in the U.S. in beef cattle is relatively low (Paisley, 1995).

Serum samples from beef cattle were tested for antibodies to BVD virus as part of the Beef Cow/Calf Health and Productivity Audit (CHAPA), a national study of the beef cow/calf industry by the USDA's National Animal Health Monitoring System (NAHMS). While 46 percent of the beef herds in the CHAPA subsample reportedly were unvaccinated for BVD virus, 91 percent of these cattle operations had at least one animal with a serum neutralization BVD antibody titer of at least 1:8 (considered seropositive), and 69 percent of the individual cattle tested were seropositive (USDA, 1994). These findings indicate widespread BVD virus transmission in many BVD-unvaccinated beef herds. Since clinical evidence suggests that cattle herds most at risk of peracute BVD disease are those that are "naive" to BVD virus (without BVD antibodies), these results suggest that, despite lack of universal BVD vaccination in the U.S., many cattle herds may be "protected" from severe acute/peracute BVD disease by existing antibodies to circulating field BVD virus (Hill, 1995).

This discussion is not meant to imply that BVD vaccination should not be recommended. There are many other forms of BVD, such as BVD-associated abortion and classical mucosal disease, and the protection provided by field strains of the BVD virus for these other manifestations is unknown. Vaccination should be a part of an overall strategy which also includes good biosecurity measures and identification of persistently infected animals.

Generalization of these results to dairy cattle, while conceivable, should be done only with caution, since the BVD antibody levels in dairy cattle on a national basis are unknown.

4. Did publicity surrounding the spring 1994 acute/peracute BVD outbreaks affect changes in BVD vaccination practices?

Vaccine information collected by USDA:APHIS:Biotechnology, Biologics, and Environmental Protection (BBEP) (Hill, personal communication, 1995) indicates that the number of doses of BVD vaccine released for marketing increased in 1994, relative to 1992 and 1993. The number of doses of BVD vaccine (monovalent and combination products) released for marketing in 1992, 1993, and 1994 were 116.3 million, 119.8 million, and 134.4 million, respectively. The 1994 figure represented a 12 percent increase in doses released for marketing, compared to a 3 percent increase in doses in 1993. While doses released for marketing do not necessarily indicate doses used, vaccine handling practices, or route of administration, they are an indication of an increase in demand for BVD virus vaccines in the U.S. that could have been at least partly driven by the publicity generated after the 1994 acute/peracute BVD herd outbreaks in the U.S.

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9. R. Hill. Personal communication, APHIS:BBEP, 1995.

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