

Bovine Progressive Degenerative Myeloencephalopathy (“Weaver”) of Brown Swiss Cattle I: Epidemiology

L. D. Stuart, D.V.M. and

H. W. Leipold, D.M.V., M.S., Ph.D.

Department of Pathology

College of Veterinary Medicine

Kansas State University

Kansas Agricultural Experiment Station

Manhattan, Kansas 66506

Sex. Ratio of occurrence of BPDME by sex was calculated to determine if a sex predilection existed. An adjusted male to female (M:F) ratio was calculated by dividing the unadjusted M:F ratio by the ratio of M:F registered by the breed association over a 20 year period, from 1962 to 1982.

Breeding records: Breeding records were evaluated to determine if a common sire or sires could be implicated in the parentage of the affected population. Each sire was designated by letters of the alphabet (upper and lower cases) in order of occurrence in the data.

Population studies

Incidence of BPDME in the Brown Swiss breed was calculated from the base population and adjusted to a frequency per 100,000. Base population of the breed was determined from figures representing total numbers of animals registered by the breed association at 5 year intervals from 1962 to 1982, inclusive. Totals for these years were added and mean (\bar{x}) values calculated for males, females, and both sexes combined. These were taken as the base population of the breed during the greatest part of this study. Frequency of occurrence per 100,000 was calculated by dividing the base population (\bar{x}) into 100,000 and multiplying this factor by the number of affected animals in this study. Similar incidences were determined separately for males and females. The adjusted frequency per 100,000 for males was obtained by multiplying the unadjusted frequency by the factor obtained for M:F registered cattle.

Results

All available data accumulated from both reported and confirmed cases of BPDME, from 1957 to 1983, is presented in *Table 1*.

Case studies

Incidence. Figure 1 represents a graphic illustration of the incidence of occurrence of BPDME at 5 year intervals, from 1957-1983 (to date). A dramatic increase in cases of BPDME

is noted from 1972 thereafter.

Origin. Table 2 presents the distribution of cases of BPDME by geographic origin in the U.S. Cases were recorded from 18 states with 81.6% (71 cases) occurring in only 6 of the 18 states. One state (Wisconsin) accounted for 32.2% (28) of the total cases. Only two cases were reported from states in the southern half of the U.S. Common environmental factors specific for high incidence states were not identified.

Sex. The M:F ratio for the occurrence of BPDME was 1:3.35. The adjusted M:F ratio was 1:0.4486.

Breeding records. Sires incriminated in cases of BPDME were listed by letter in Table 1. Table 3 presents figures for the frequency of occurrence of all sires in 87 cases evaluated. Thirty-nine bulls were involved in 85 cases, while in two cases, knowledge of the sire involved was not available. Of these 39 bulls, 5 bulls (H,I,Y,R,S) were incriminated in over half of the cases (54%; 47 cases), while a single bull (I) was incriminated in 30 cases of 34.5% of the total cases recorded.

Population studies

Data used in population studies is presented in Table 4. Base population for the Brown Swiss breed in the U.S. for the period 1962 to 1982 was found to be 15430.4. Of this total, 13608.2 were female and 1822.2 were male, yielding a M:F ratio of 1:7.468. Frequency of occurrence of BPDME was found to be 563.82 per 100,000. Corresponding reflect the probable total numbers of each sex born (assuming the birth of an equal number of males and females), compared to the total numbers of each sex registered in the U.S., males may be even more frequently affected overall, further assuming nearly all purebred females are registered. Because of the nature of dairy farming, female cattle are obviously more important to the producer. Male dairy animals are usually fed as veal calves and slaughtered early in life, or fed as feedlot steers, of which a gait abnormality might not be detected or simply neglected until such time that the animal could be marketed. Few males are retained for breeding and

TABLE 1
Epidemiological Data for BPDME*

Case No.	Animal No.	Sex	Sire	Year	Origin	Reported(R)-Confirmed(C)
1	NR**	M	A	1957	Minnesota	R
2	NR	F	B	1957	Oklahoma	R
3	B67	M	C	1964	North Dakota	R
4	B71	F	D	1966	North Dakota	R
5	B100	F	E	1966	North Dakota	R
6	B98	M	C	1966	North Dakota	R
7	B167	F	F	1968	North Dakota	R
8	B270	F	G	1972	North Dakota	R
9	B284	F	H	1974	North Dakota	R
10	752	F	I	1975	Iowa	R
11	V132	F	J	1976	Idaho	R
12	41-7	M	H	1978	Wisconsin	C
13	21-8	F	K	1978	South Dakota	C
14	22-8	F	L	1978	South Dakota	C
15	23-8	F	I	1978	North Dakota	C
16	833	F	M	1978	Iowa	R
17	NR	F	N	1979	Minnesota	R
18	H100	F	G	1979	Wisconsin	C
19	12-9	F	I	1979	Wisconsin	C
20	40-7	M	H	1979	Wisconsin	C
21	C811	F	NR	1979	Wisconsin	C
22	20-8	M	I	1979	North Dakota	C
23	18-8	F	O	1979	Iowa	C
24	37-9	M	I	1979	North Dakota	C
25	F145	M	I	1979	South Dakota	C
26	K704	F	I	1979	Illinois	C
27	019	F	I	1979	Wisconsin	C
28	55-9	F	P	1979	Wisconsin	C
29	G135	F	Q	1979	Iowa	R
30	474	F	I	1980	North Dakota	C
31	69	F	R	1980	Wisconsin	C
32	291	M	H	1980	Iowa	C
33	G-14	F	S	1980	Iowa	C
34	NR	F	T	1980	Iowa	R
35	6D2	F	H	1980	Minnesota	R
36	9376	M	H	1980	Washington	R
37	TE77	F	I	1980	Oregon	R
38	D1	F	U	1980	Oregon	R
39	5148	F	V	1980	Texas	C
40	NR	M	I	1980	Illinois	R
41	J26	F	I	1980	Wisconsin	R
42	NR	M	I	1980	North Dakota	R
43	NR	M	I	1980	Illinois	R
44	Y308	F	I	1980	Illinois	C
45	H325	F	S	1980	Nebraska	C
46	NR	F	I	1980	Wisconsin	R
47	NR	F	I	1980	Wisconsin	R
48	K081	F	I	1981	Illinois	C
49	MS061	F	I	1981	Illinois	C
50	F182	F	T	1981	Wisconsin	C
51	2179	F	W	1981	Wisconsin	C
52	F416	F	X	1981	Wisconsin	C
53	139	M	I	1981	Iowa	C
54	NR	F	I	1981	South Dakota	R
55	140	M	I	1981	Iowa	C
56	141	F	I	1981	Iowa	C
57	217	F	I	1982	Ohio	C
58	216	F	R	1982	Wisconsin	C
59	218	M	Y	1982	Wisconsin	C
60	219	F	Y	1982	Wisconsin	C
61	220	F	Y	1982	Wisconsin	C
62	326	F	J	1982	Oregon	C
63	152	M	Z	1982	Kansas	C
64	F15	F	I	1982	Wisconsin	C
65	226	F	a	1982	North Dakota	C
66	F203	F	b	1982	Wisconsin	C
67	F115	F	R	1982	Wisconsin	C
68	NR	F	c	1982	Colorado	R
69	NR	F	I	1982	Wisconsin	R
70	H406	F	I	1982	Wisconsin	R
71	663	F	d	1982	Pennsylvania	R

TABLE 1 (cont.)

Case No.	Animal No.	Sex	Sire	Year	Origin	Reported(R)-Confirmed(C)
72	F650	F	e	1982	Iowa	C
73	107	F	I	1982	Indiana	C
74	134E	F	f	1982	Minnesota	C
75	NR	F	I	1982	Indiana	R
76	T562	F	H	1982	Minnesota	R
77	NR	F	Y	1982	Wisconsin	R
78	NR	F	g	1982	Kentucky	R
79	596	F	I	1982	Washington	R
80	241	F	h	1982	Minnesota	C
81	9271	F	i	1983	Wisconsin	C
82	151	F	j	1983	Wisconsin	C
83	W4	M	k	1983	Wisconsin	C
84	W21	M	S	1983	Wisconsin	C
85	192	F	l	1983	Minnesota	C
86	NR	M	NR	1983	Minnesota	C
87	G84	F	m	1983	Minnesota	C

*BPDME = bovine progressive degenerative myeloencephalopathy
*NR = not recorded

Figure 1. The occurrence of bovine progressive degenerative myeloencephalopathy in Brown Swiss cattle in the United States.

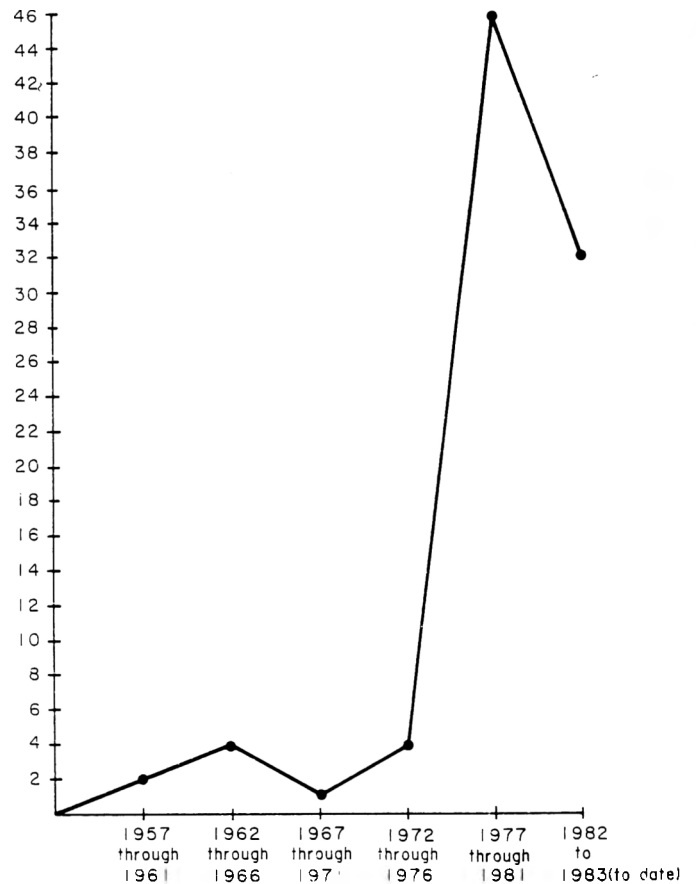


TABLE 2
Origin of Cases Studied

State	No. of Cases	% Total
Wisconsin	28	32.2
North Dakota	13	14.9
Iowa	11	12.7
Minnesota	9	10.3
Illinois	6	6.9
South Dakota	4	4.6
Oregon	3	3.5
Washington		
Indiana	2 each	4.6
All others (9)	1 each	10.3
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18 states	87	100.0 Totals

TABLE 3
Sire Frequency in BPDME*

Sire(s)	Number of cases	Cumulative Numbers
I	30	30
H	7	7
Y	4	4
R,S	3	6
C,G,J,T	2	8
All others (30)	1	30
Unknown	2	2
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39 (known)		87 Totals

this study indicates the frequency of occurrence of BPDME in breeding males may be more significant than in females. No explanation for this is proposed.

Breeding records from cattle affected with BPDME indicate the condition is familial and may be hereditary in

TABLE 4
Registered Brown Swiss Cattle in US (1962-1982)

Year	Male	Female	Total	
1962	2066	16327	18393	
1967	2161	16953	19114	
1972	2359	12494	14853	
1977	1477	10545	12022	
1982	1048	11722	12770	
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	9111	68041	77152	Grand Totals
	1822.2	13608.2	15430.4	\bar{x}
	11.81	88.19	100.0	%Total
	1.0	7.467		Ratio

TABLE 5
Incidence of BPDME* in Brown Swiss Cattle in US (1957-1983)

Population	Male	Frequency		Ratio Male:Female
		Female	Total	
Registered Base Popn.	20	67	87	1:3.35
Per 100,000	129.61	434.21	563.82	1:3.35
Adjusted Per 100,000	967.80	434.21	1402.01	1:0.4486

*BPDME = bovine progressive degenerative myeloencephalopathy

the Brown Swiss breed. Data from over half of the recorded cases indicated a familial pattern involving 5 common sires, 2 of which were highly involved. If the disease is hereditary, breeding records indicate it would most likely be a simple recessive trait.

Population studies indicate a relatively high frequency rate for BPDME in the Brown Swiss breed. Compared to figures reported for neurodegenerative diseases of man (1), including the spinocerebellar degenerations, the observed rate in BPDME is much higher than for comparable disease in man. It is unlikely that diagnostic techniques or reporting methods could account for any such difference. The high frequency of usage of a limited number of sires and the widespread use of artificial insemination in the dairy industry might be interpreted to account for this finding.

Summary

Epidemiological studies failed to indicate any specific geographical or environmental factors common to the occurrence of BPDME in purebred Brown Swiss cattle. There was no sex predilection, though possibly a slightly higher incidence may be observed in males kept for production purposes. The incidence of recorded cases of BPDME has increased greatly during the past 6-7 years. Breeding records indicated there was a familial pattern to the occurrence of BPDME, and this disease may be inherited. Population studies demonstrated a relatively high frequency

of occurrence of BPDME in the Brown Swiss breed, compared to similar human diseases.

References

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