SN Titer Response Comparisons Among Fourteen Diagnostic Laboratories for Antibodies Protecting Against IBR, BVD and BRSV Virus Following the Administration of Modified Live Vaccine to Weaning Aged Calves

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Summary

Eleven yearling calves were vaccinated with BRSV Vac® 4[1]. Serum samples collected 35 days after vaccination were sent to 14 different diagnostic laboratories around the United States for assay of IBR, BVD and BRSV antibodies. A great deal of lab to lab variation was encountered. This variation was due in part to the virus strain used, lab technique and cell culture line utilized.

Introduction

There is considerable discussion and confusion among veterinarians as to the significance of titer values. The primary purpose for conducting this research was to demonstrate possible differences among laboratories illustrating to veterinarians that results are relative and will vary.

SN titers are commonly reported as a measure of response to vaccine or field virus. SN titers are reported as the highest dilution of serum to provide protection. Serum samples are diluted in the lab and mixed with a known amount of virus. This mixture is incubated for a certain length of time at 37 degrees centigrade and then mixed with a cell line and incubated for several days. Serum with high antibody levels will bind to the virus and prevent the virus from creating pathology on the cell line. The greatest dilution of serum that provides protection to the cell line is the figure reported. The higher the dilution that provides protection, the greater the response the test animal developed.

Materials and Methods

Animals

Eleven calves, weighing 227-272 kgs., were vaccinated with BRSV Vac® 4 on January 19, 1995 with serial #1340 and boostered on April 25, 1995 with serial #1342.

Sampling

Calves were sampled May 30, 1995. These samples were sent to 14 different labs for comparison.

A questionnaire was submitted with the samples asking for information on: virus used, cell line, TCID 50, incubation time before adding cells, and reading time. The answers to these questions can be found in Tables 1-3.

Statistics

A coefficient of variation (C.V.) was calculated for each of the animals across labs. The coefficient of variation describes the amount of variation in a population. It is a dimension less figure and is calculated by dividing the standard deviation by the mean.[2]

Results

The enclosed tables outline the results obtained. Table 1 contains the BVD results, Table 2 contains the IBR results, and Table 3 contains the BRSV results.

[1]Bayer Corporation, Shawnee Mission, KS 66201
[2]Snedecor and Cochran, Statistical Methods, Iowa State University Press, Ames, IA, Eighth Edition, p. 36.

Table 1. SN Titer Response for BVD
Diagnostic Laboratory Comparison Fieldtrial Bayer Corporation

1st dose of vaccine: 1/19/95
2nd dose of vaccine: 4/25/95
Sampled: 5/30/95

	LABORATORY																	
An ID	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	Range of Titers	GMT Across Labs
840	1821	512	64	512	32	256	128	384	512	128	1024	32	512	256	192	96	32-1821	231
842	2462	384	16	256	128	128	128	384	256	64	512	128	512	256	128	64	16-2462	193
845	2638	512	8	1024	512	512	128	512	1024	128	512	256	1024	512	192	96	8-2638	340
846	3642	768	16	256	512	64	128	768	512	128	512	64	1024	128	192	96	16-3642	247
847	1446	384	8	128	64	256	128	512	512	128	512	128	1024	256	96	48	8-1446	191
848	2638	768	64	512	256	128	64	512	512	256	512	128	1024	512	192	192	64-2638	320
849	1319	256	8	512	32	256	32	512	512	64	512	64	512	256	192	32	8-1319	159
850	910	768	64	512	128	128	64	256	512	128	512		512	512	128	96	64-910	244
851	2893	512	8	1024	32	256	128	1024	512	256	512	128	512	512	192	128	8-2893	268
852	2298	512	16	1024	128	512	128	512	256	128	512	128	512	512	96	128	16-2298	264
856	1821	512	16	128	256	256	128	384	512	128	512	128	512	512	192	96	16-1821	241
Lab GMT	**2028**	**510**	**18**	**424**	**120**	**212**	**99**	**491**	**481**	**128**	**545**	**104**	**659**	**351**	**157**	**88**		
Virus Strain	Oregon C24V	Singer	Singer	Singer	Singer	Oregon C24V	NADL	Singer	Singer	NADL	Singer	Singer	Singer	Singer	Singer	NADL		
Cell Line	BK	LPBTP4-5	MDBK	BT	MDBK	EBK	MDBK	MDBK	BT	BFT	BT	BT	BT	BT	BT	BT		
TCID 50	178	100	933	316	237	500	100	178	100	203	100	100	316	175	100	300		
Incubation Time*	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour		
Reading Time	5 days	4 days	2 days	5 days	3 days	3 days	3 days	3 days	3 days	4 days	4-5 days	End Point on Controls	4 days	6 days	4 days	4 days		

*Before Adding Cells
Cell Line Key

BK: Bovine Kidney
LPBTP: Low Passage Bovine Testicle
MDBK: Mardin Darby Bovine Kidney
BT: Bovine Turbinates
EBK: Primary Embryonic Bovine Kidney
EBL: Embryonic Bovine Lung
BFT: Bovine Fetal Testicle
BFL: Bovine Fetal Lung

Table 2. SN Titer Response for IBR
Diagnostic Laboratory Comparison Fieldtrial Bayer Corporation

1st dose of vaccine: 1/19/95
2nd dose of vaccine: 4/25/95
Sampled: 5/30/95

	LABORATORY															
An ID	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	Range of Titers	GMT Across Labs
840	156	192	16	64	128	64	64	96	512	128	64	128	64	64	16-512	93
842	165	96	8	16	64	64	64	96	1024	64	64	64	64	128	8-1024	73
845	287	192	16	64	128	128	64	192	4096	128	256	128	128	64	16-4096	144
846	45	32	8	4	32	8	8	12	256	32	128	16	16	64	4-256	24
847	57	64	8	16	32	32	8	32	256	64	128	32	32	16	8-256	35
848	198	128	8	16	64	32	32	48	2048	32	64	64	64	64	8-2048	62
849	128	128	8	16	32	64	32	48	1024	32	128	64	32	64	8-1024	57
850	362	256	8	32	256	128	32	48	4096	128	256	64	128	64	8-4096	116
851	165	192	8	16	64	32	64	48	1024	64	128	64	32	64	8-1024	66
852	165	192	16	16	16	64	16	64	2048	128	128	64	128	64	16-2048	74
856	181	96	16	16	64	64	32	32	2048	64	128		64	128	16-2048	75
Lab GMT	**150**	**124**	**10**	**19**	**60**	**50**	**30**	**52**	**1162**	**68**	**120**	**60**	**56**	**64**		
Virus Strain	Baker	NVSL	NVSL	Cooper	Colorado	Cooper	NADL	Colorado	Colorado	Cooper	Colorado	NVSL	?	Colorado		
Cell Line	BK	RK13	MDBK	MDBK	MDBK	MDBK	MDBK	MDBK	BT	MDBK	BT	BT	BT	BT		
TCID 50	235	100	933	422	500	100	100	178	100	318	100	100	316	100		
Incubation Time*	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	1 hour	24 hours	1 hour	1 hour	1 hour	1 hour	1 hour		
Reading Time	5 days	3 days	1 day	3 days	3 days	2 days	3 days	3 days	3 days	3 days	2 days	End Point on Controls	3 days	6 days		

*Before Adding Cells
Cell Line Key

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Discussion

When comparing the log base 2 coefficients of variation, the BRSV titers had the highest and BVD had the lowest.

Lab to lab variation does occur and can be accounted for by viral strain used in the analysis, cell culture line, and technique. Information on variation should not be used to pick a "better" lab but rather be used to understand and explain why variations do occur. **SN**

Table 3. SN Titer Response for BRSV
Diagnostic Laboratory Comparison Fieldtrial Bayer Corporation

1st dose of vaccine: 1/19/95
2nd dose of vaccine: 4/25/95
Sampled: 5/30/95

	Laboratory															
An ID	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	Range of Titers	GMT Across Labs
840	57	64	NA	128	NA	64	32	32	16	40	128	32	8	32	8-128	41
842	51	96	NA	64	NA	64	16	48	4	20	128	16	8	32	4-128	31
845	287	48	NA	32	NA	64	16	48	8	40	128	8	8	16	8-287	31
846	18	128	NA	64	NA	64	32	32	8	160	256	32	8	16	8-256	39
847	32	48	NA	32	NA	64	16	24	4	20	128	8	4	16	4-128	21
848	38	64	NA	64	NA	64	8	64	16	40	128	32	16	32	8-128	37
849	14	16	NA	32	NA	16	8	8	2	80	64	16	2	16	2-80	14
850	7	16	NA	4	NA	8	16	6	4	40	32	8	2	8	2-40	8
851	20	32	NA	8	NA	32	32	32	4	40	64	8	8	16	4-64	19
852	54	24	NA	32	NA	8	16	8	8	40	64	8	2	8	2-64	14
856	25	64	NA	32	NA	128	64	24		20	256	16	8	16	8-256	31
Lab GMT	33	**45**		**32**		**39**	**19**	**23**	**6**	**40**	**106**	**14**	**5**	**17**		
Virus Strain	Lehmkuhl	NVSL	NA	Lehmkuhl	NA	NADC	Rosenquist	NVSL	NVSL	NVSL	NVSL	NVSL	#375	NVSL		
Cell Line	EBL	LPBT P4-5	NA	BT	NA	EBK	MDBK	MDBK	BT	BFL	BT	BT	BT	BT		
TCID 50	263	100	NA	237	NA	100	100	37	100	25% CPE IFA	100	100	316	150		
Incubation Time*	1 hour	1 hour	NA	1 hour	NA	1 hour	1 hour	1 hour	1 hour	30 min	1 hour	1 hour	1 hour	1 hour		
Reading Time	10 days	7 days	NA	7 days	NA	4 days	4 days	4 days	6 days	NA	5 days	End Point on Controls	4 days	7-10 days		

*Before Adding Cells
Cell Line Key
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Table 4. Coefficents of Variation by ANID across Labs
Diagnositc Laboratory Comparison Field Trial Bayer Corporation

	BVD		IBR		BRSV	
ANID	Titer	Log2	Titer	Log2	Titer	Log2
840	1.14	0.21	0.97	0.17	0.74	0.21
842	1.6	0.21	1.82	0.25	0.83	0.3
845	1.06	0.23	2.53	0.24	1.36	0.33
846	1.6	0.24	1.45	0.37	1.12	0.31
847	1.11	0.25	1.18	0.27	1.1	0.35
848	1.21	0.17	2.61	0.31	0.69	0.21
849	1.1	0.28	2.03	0.29	1.1	0.44
850	0.79	0.17	2.47	0.32	0.99	0.39
851	1.3	0.25	1.85	0.28	0.71	0.29
852	1.2	0.21	2.38	0.31	0.93	0.41
856	1.11	0.19	2.48	0.28	1.31	0.31
Average C.V.	**1.2**	**0.22**	**1.98**	**0.28**	**0.99**	**0.32**

result differences among laboratories are relative, and interpretation of those results need to be discussed with the individual lab conducting the test in order to gain a clear understanding of the meaning of those titers.