A Comparison of Vaccination of Cattle using Agro-Jet and Traditional Methods of Delivery in Cattle

OBJECTIVE:

To compare a needless to traditional needle and syringe method of vaccination by measuring serum viral neutralizing antibody titers prior to and following vaccination by both methods.

STUDY DESIGN

This study was performed in a commercial feedyard in the Texas panhandle in the spring of the year (March and April). A total of 279, Beef type cattle in a weight range of 600 – 800 pounds were used in the study. The animals were individually identified with an ear tag and randomly allocated to each of 2 experimental groups as described below. Personnel responsible for identification of sick animals and those performing laboratory tests (serology) were blinded to the experimental group assignment.

Treatment Groups:

Treatment Group	Vaccine on Study Day 0			Route	Injection Location
	Identification	Applicator	Dose (mL)		
1	Jencine® 4	Jet injector (Agro-Jet)	2 ml	SQ	Neck
2	Jencine® 4	Manual	2 ml	SQ	Neck

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EXPERIMENTAL PROCEDURES

Vaccination:

Vaccine Administration: Jencine® 4 was reconstituted with sterile water as per label and two (2) mL will be administered subcutaneously to all of the cattle. The jet injector **(Agro-Jet, Needle-less Jet Injector, Medical International Technologies, 2281 Guenette St-Laurent, Montreal, Qc H4R 2E9)** was used to administer vaccine to one group (*INJECTOR*) and traditional needle and syringe will be used for the other group (*SYRINGE*).

Procedures:

Serology: Blood was collected from 25% of the cattle in each treatment group via the jugular vein on days 0 (initiation of the study) and day 28 post vaccination. Blood was collected from the same animals on Day 0 and Day 28 of the study. Sera was harvested, held frozen at -20º C or colder until antibody analysis of 15% of the cattle in each group for the presence of neutralizing antibodies to BVD, IBR at a veterinary diagnostic laboratory. The day 0 and day 28 serum samples for each animal were analyzed at the same time to reduce variability.

Vaccine Viral Titers: A sample of the vaccine from the both methods (INJECTOR and SYRINGE) was collected in plastic conical tubes and flash frozen. The samples were collected at the mid-point of bottle of vaccine (e.g. after 20 doses of a 50 dose vial). These flash-frozen vaccine samples were then analyzed for viability using vaccine viral titers. This method of analysis can determine if any detrimental effects occurred to the vaccine with either administration method.

DATA ANALYSIS

Statistical Analysis: The serum antibody titers were compared between treatment groups for bith IBR and BVD. The SN titers were evaluated as continuous variables after log transformation of the raw titers. Differences between treatments are evaluated using the student's *t*-test. Additionally, the percentage of animals from each treatment group that showed a 4-fold rise in titers (from Day 0 to Day 28) were calculated. This data was evaluated by Chi Square analysis and differences determined using a Fisher's Exact Test.

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RESULTS

Following logarithmic transformation of the SN titers for IBR the GMT were 8 and 11.1 for the INJECTOR and SYRINGE groups respectively on Day 0 (pre-vaccination) while the GMT were 52.5 and 85.7 for the INJECTOR and SYRINGE groups, respectively on Day 28 post-vaccination. The SN data indicate a statistically significant increase in antibodies following vaccination by either method (Tables 1 & 2). A comparison of the Day 28 SN titers against IBR with the INJECTOR and SYRINGE did not statistically differ (Table 3).

Table 1. Analysis of log transformed IBR SN titers for Agro-Jet Injector

IBR Serology	Injector Day 0	Injector Day 28	P value
Mean	0.90	1.72	0.0001
SD	0.45	0.47	

Table 2. Analysis of log transformed IBR SN titers for traditional syringe

IBR Serology	Syringe Day 0	Syringe Day 28	P value
Mean	1.04	1.93	0.0001
SD	0.39	0.37	

Table 3. Comparison of log transformed IBR SN titers for Agro-Jet Injector and syringe

IBR Serology	Syringe Day 28	Injector Day 28	P value
Mean	1.93	1.72	0.12
SD	0.37	0.47	

Following logarithmic transformation of the SN titers for BVD the GMT were 64 and 229.5 for the INJECTOR and SYRINGE groups respectively on Day 0 (pre-vaccination) while the GMT were 247.7 and 493.7 for the INJECTOR and SYRINGE groups, respectively on Day 28 post-vaccination. The SN data indicate a statistically significant increase in antibodies following vaccination by either method (Tables 4 & 5).). A comparison of the Day 28 SN titers against BVD with the INJECTOR and SYRINGE did not statistically differ (Table 6).

Table 4. Analysis of log transformed BVD SN titers for Agro-Jet Injector

BVD Serology	Injector Day 0	Injector Day 28	P value
Mean	1.81	2.39	0.0415
SD	0.88	0.92	

Table 5. Analysis of log transformed BVD SN titers for traditional syringe

BVD Serology	Syringe Day 0	Syringe Day 28	P value
Mean	2.36	2.69	0.0176
SD	0.27	0.52	

Table 6. Comparison of log transformed BVD SN titers for Agro-Jet Injector and syringe

BVD Serology	Syringe Day 28	Injector Day 28	P value
Mean	2.69	2.39	0.22
SD	0.52	0.92	

These data (BVD and IBR SN titers) indicate that there is not a liability while using the INJECTOR as compare to the SYRINGE method of vaccine administration.

Evaluation of the proportion of animals in each experimental group that showed a 4-fold increase in titers to BVD and IBR are presented in Table 7. These data indicate that there is no impact on the antibody production relative to the method of administration.

Table 7. Percentage of Cattle with 4 Fold Rise in Titers from Day 0 to Day 28

	Injector	Syringe	p value
BVD	48	32	0.54
IBR	80	89	0.66

The results for the viral vaccine titer are presented in Table 8. The INJECTOR and SYRINGE had equivalent viral vaccine titers with both in the same concentration (10^6) of viral particles. This method measures all viable virus present (not just BVD and IBR). These data suggest that there is no impact on the viability of the modified-live vaccine when it is administered through the INJECTOR as compared to the SYRINGE.

Table 8. Viral Vaccine Titer of a Modified Live Vaccine

	Injector	Syringe
Titer	1.3 x 10^6 / ml TCID	4.0 x 10^6 / ml TCID

RAW DATA (Serology)

BVD					IBR			
Day 0	Day 28	Day 0	Day 28		Day 0	Day 28	Day 0	Day 28
INJ	INJ	SYR	SYR		INJ	INJ	SYR	SYR
BVD-A	BVD-C	BVD-A	BVD-C		IBR-A	IBR-C	IBR-A	IBR-C
512	128	256	512		8	32	32	128
128	256	512	256		4	64	64	128
2	16	256	256		2	16	32	128
8	2048	128	128		4	64	4	64
128	128	128	2048		8	128	4	32
128	16384	128	1024		32	128	16	64
64	512	256	128		8	128	4	64
256	128	1024	512		16	128	16	128
2	32	256	512		2	8	8	64
512	256	256	256		8	64	8	128
1024	8192	256	512		16	128	32	256
16	8192	512	512		4	256	4	64
256	1024	256	4096		16	32	4	8
256	256	128	2048		64	128	8	128
2	8	256	128		2	4	8	32
128	128	256	256		2	64	32	256
128	256	64	1024		16	64	16	128
2	16	256	64		2	8	16	256
512	1024	128	4096		32	64	4	64
128	64				16	64		
64	32				16	64		