

Bovine Biologicals Technical Bulletin



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PYRAMID® BVDV Type 1 & 2 Fetal Protection Challenge Trials¹

Bovine viral diarrhea virus (BVDV) vaccines are commonly used prior to breeding to prevent fetal infections and reduce losses associated with BVD. BVDV infections can result in infertility, abortions, stillbirths and congenital defects.² Between 58 and 120 days of gestation and prior to the development of a specific immune response, fetal infection with a non-cytopathic strain of BVDV leads to “immune

tolerance” to the infecting strain of BVDV and persistent infection.³⁻⁵

To determine if PYRAMID® vaccines adjuvanted with MetaStim® (an organic emulsified oil adjuvant) could prevent fetal infection from a BVDV Type 1 & Type 2 challenge, a trial was conducted at the University of Wyoming.

Type 1 Trial

Materials and Methods

Animals- 49 beef cows from a single ranch in south central Wyoming. **Thirty-five (35) cows were vaccinated subcutaneously once with Pyramid.** Fourteen cows served as non-vaccinated controls; they were injected subcutaneously with Saline. Cows used in this trial were seronegative to Type 1 BVDV prior to vaccination, and no BVDV vaccines had been used on the ranch.

Procedure- Starting 30 days after vaccination, the breeding of the animals by artificial insemination began. They were examined for pregnancy and 25 pregnant animals from the Pyramid vaccinated group and 8 pregnant, non-vaccinated animals were challenged **with a non-cytopathic Type 1B BVDV.** The animals ranged between 75 to 96 days of gestation and 114 to 150 days post vaccination on the day of challenge. Animals were monitored for post-challenge responses and the fetuses were evaluated for presence of BVD virus.

Testing- Fetuses were collected by Caesarean section between 151 to 174 days of gestation. Two non-vaccinated control animals and one vaccinated animal were no longer pregnant when they were scheduled for C-section. Twenty-four fetuses from vaccinated cows and six fetuses from non-vaccinated controls were available for examination. Fetuses were evaluated for BVDV infection by virus isolation (VI) of pooled fetal tissues, immunohistochemical staining (IHC) for BVDV antigens on multiple fetal tissues, and BVDV-capture ELISA on tissue samples. Twenty-three fetuses from the Pyramid vaccinated animals were negative for BVDV by VI, IHC, and BVDV-capture ELISA. One fetus from a Pyramid vaccinated cow was positive for BVDV by VI and IHC at Colorado State University –Veterinary Diagnostic Laboratory. BVDV was detected in the fetal tissues from the six fetuses removed from the

non-vaccinated control animals by VI, IHC and ELISA. The genotype of the non-cytopathic BVDV isolated from the six control fetuses was confirmed as genotype 1 using RT-PCR.

Results- A case definition for persistent infection was used to analyze the study outcome, including fetal virus isolation, IHC and skin ELISA as indicators of persistent infection. It was concluded that six of six control fetuses were persistently infected with BVDV, while only one of the 24 fetuses from the vaccinated cows was judged persistently infected based on CSU testing. **This study demonstrated significant prevention of persistently infected calves in cows vaccinated with Pyramid compared to controls.** The preventable fraction was 96 percent.

Type 2 Trial

Materials and Methods

Animals- Fifty cows and heifers were randomly divided into Pyramid vaccinates and controls. **Thirty-five (35) breeding-age females were vaccinated subcutaneously once with Pyramid.** The females used in this trial were seronegative to Type 1 and Type 2 BVDV prior to vaccination. Fifteen females served as non-vaccinated controls; they were injected subcutaneously with Saline.

Procedure- Starting 30 days after vaccination, the breeding of the animals by artificial insemination began. They were examined for pregnancy and 25 pregnant animals from the Pyramid vaccinated group and 10 pregnant, non-vaccinated animals were randomly chosen for challenge

with a **non-cytopathic Type 2 BVDV.** The animals were between 75 to 83 days of gestation and 110 to 128 days post vaccination on the day of challenge. Animals were monitored for post-challenge responses and the fetuses were evaluated for presence of BVD virus.

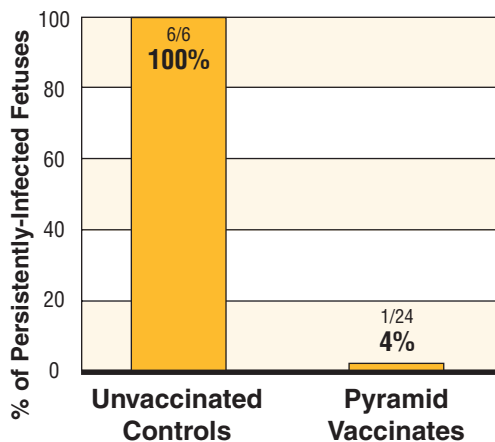
Testing- Fetuses were collected by Caesarean section at 148 to 160 days of gestation. Fetuses were evaluated for BVDV infection by virus isolation (VI) of pooled fetal tissues, immunohistochemical staining (IHC) for BVDV antigens on multiple fetal tissues, and BVDV-capture ELISA on skin samples. The fetuses from the 25 Pyramid 9 vaccinated animals were negative for BVDV by VI, IHC and

BVDV-capture ELISA; whereas BVDV was detected in the fetal tissues from the 10 non-vaccinated control animals by all methods. The genotype of the BVDV from positive fetuses was confirmed as genotype 2 by RT-PCR.

Results- A case definition for persistent infection was used to analyze the study outcome, including fetal virus isolation, IHC and skin ELISA as indicators of persistent infection. It was concluded that 10 of 10 control fetuses were persistently infected while **none of the 26 fetuses from the 25 cows vaccinated with Pyramid were persistently infected.** The preventable fraction was 100 percent.

Positive Fetuses Following Challenge with Type 1 BVDV

Type 1b BVDV challenge



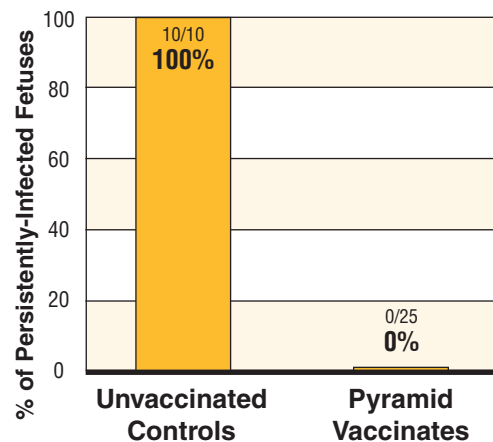
Type 1 Challenge Cows

Geometric Mean Type 1 BVD SN titers as determined by Colorado State University Veterinary Diagnostic Laboratory

	0 DPV	28 DPV	0 DPC	21 DPC	35 DPC	~74 DPC
Controls	<2	<2	<2	2	9	38
Range:	<2	<2	<2	<2-4	<2-64	8-128
Vaccinates	<2	≥230	≥867	≥881	≥1085	471
Range:	<2	<2-≥4096	256-≥4096	256-≥4096	256-≥4096	256-2048

Positive Fetuses Following Challenge with Type 2 BVDV

Type 2 BVDV challenge



Type 2 Challenge Cows

Geometric Mean Type 2 BVD SN titers as determined by Colorado State University Veterinary Diagnostic Laboratory

	0 DPV	28 DPV	0 DPC	21 DPC	35 DPC	70-72 DPC
Controls	<2	<2	<2	104	≥588	≥2048
Range:	<2	<2	<2	64-256	256-≥4096	1024-≥2048
Vaccinates	<2	<9	36	≥367	≥286	≥388
Range:	<2	<2-64	8-128	32-≥4096	8-≥4096	16-≥4096

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