

# **BVD Type 1 and 2 SN Titer Response in Weaning Age Beef Calves Following the Administration, in Various Combinations, of Two MLV Vaccines Containing Different BVD Type 1 and 2 Strains**

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## **Objective**

Evaluate SN titer response to BVDV Type 1 and 2 and weight gain in weaning age calves following various vaccine combinations to determine if boosting with a different strain of BVD than was given at the initial vaccination will result in a stronger titer response and improved performance (weight gain).

## **Key Points**

- Using the Singer strain of BVD Type 1 (Express® 5) at the initial and booster dose, or using Singer (Express 5) at the initial dose and NADL strain (Bovi-Shield® Gold 5) at the booster dose resulted in the highest BVD Type 1 titers.
- Vaccination protocols utilizing different strains of BVD Type 2 at the initial and booster dose did not result in higher BVD-2 titers versus protocols using the same strain.
- Additional trials with a larger number of animals should be completed to determine if the differences with the BVD Type 1 titers will result in significant differences in morbidity, mortality, and other performance parameters.

## **Study Design**

- 50 bulls and 50 heifers were randomly assigned to one of four treatment groups.
- Calves were ~5 months old at the start of the study, varied in age by 30 days, and were BVD-PI negative.
- Bulls and heifers were distributed as evenly as possible between groups.
- Bulls were castrated on the last day of the study.

## Treatment Groups and Vaccine Administered

	3-4 Weeks Prior to Weaning	At Weaning	N =
Group 1	Bovi-Shield® Gold 5 (B5)	Bovi-Shield Gold 5	24*
Group 2	Bovi-Shield Gold 5	Express 5	24*
Group 3	Express® 5 (E5)	Bovi-Shield Gold 5	25
Group 4	Express 5	Express 5	25

\* Prior to booster vaccination one calf died. Death was unrelated to vaccine.

	Type 1 BVD	Type 2 BVD
Express 5	Singer	Bolin 296
Bovi-Shield 5	NADL	53637 (Guelph)

### Samples Collected

- Blood was collected for SN assays at the following times:
  - Day 0: At time of first vaccination
  - Day 25: At time of second vaccination
  - Day 56: At conclusion of the trial
  - At each sampling time the serum was separated, poured off, and frozen. All serum samples were sent to the lab at the same time.
- Individual calf weights were recorded at the time of the first and last blood collection.

### Serology – Serum Neutralization (SN) Assay

- Benchmark Bio Labs (Lincoln, NE)
  - Blinded to treatment groups
- Since Express contains the Singer strain (Type 1) and Bovi-Shield Gold contains the NADL strain (Type 1), SN assays for BVD Type 1 were performed twice using different challenge viruses.
  - One assay used Singer as the challenge virus.
  - One assay used NADL as the challenge virus.
- The BVD Type 2 assay utilized 125C as the challenge virus.

### Statistical Analysis

- The natural log of the SN titer and average daily gain were analyzed to evaluate the differences between the treatment groups.
- The natural log titer at the time of first vaccination was analyzed using ANOVA.
- The natural log titer at second vaccination, and four weeks after the second vaccination, were analyzed using analysis of covariance, where Day 0 natural log titer was tested as a covariate.
- ADG was analyzed with analysis of covariance using Day 0 weight as a covariate.
- For all analyses, if the F-test for sex by group interaction was significant, two-sided pair-wise comparisons between groups for each sex were performed.
- If the F-test for the sex by group interaction was not significant, but the F-test for differences among group means was significant, two-sided pair-wise comparisons between groups were performed. T-tests were used for all pair-wise comparisons.

### BVD Type 1 Titers\*

Singer BVD-1 used as challenge virus in SN assay			
Group	Day 0 (1st Vac.)	Day 25 (2nd Vac.)	Day 56
1 (B5-B5)	69.8	67.6	63.6
2 (B5-E5)	75.6	45.4	1585.8
3 (E5-B5)	83.2	2266.4	4107.2
4 (E5-E5)	71.9	1757.4	3266.0

\*Geometric mean titer

Day 0: No significant differences ( $p \geq 0.8796$ )

Day 25: Differences between groups 1 – 3, 1 – 4, 2 – 3, and 2 – 4 ( $p < 0.0001$ ).

Day 56: Group 1 differed from groups 2, 3 and 4 ( $p < 0.0001$ ).

Group 2 differed from group 3 and 4 ( $p \leq 0.0230$ ).

### BVD Type 1 Titers\*

NADL BVD-1 used as challenge virus in SN assay			
Group	Day 0 (1st Vac.)	Day 25 (2nd Vac.)	Day 56
1 (B5-B5)	49.3	24.9	40.9
2 (B5-E5)	36.3	16.5	377.8
3 (E5-B5)	31.0	270.6	725.4
4 (E5-E5)	39.8	259.9	669.1

\*Geometric mean titer

Day 0: No significant differences ( $p \geq 0.1309$ ).

Day 25: Differences between groups 1 – 3, 1 – 4, 2 – 3, and 2 – 4 ( $p < 0.0001$ ).

Day 56: Group 1 differed from groups 2, 3, and 4 ( $p < 0.0001$ ).

Group 2 differed from groups 3 and 4 ( $p \leq 0.0126$ ).

### Summary – BVD Type 1 (Day 56)

- The highest titers were observed when Express 5 was used as one of the vaccines in the vaccination protocol.
- Two doses of Express 5 or an initial dose of Express 5 boosted with Bovi-Shield Gold 5 resulted in a significantly higher ( $p \leq 0.0230$ ) titer versus two doses of Bovi-Shield Gold 5 or an initial dose of Bovi-Shield Gold 5 boosted with Express 5.
- There was no significant difference ( $p \geq 0.2641$ ) between two doses of Express 5 versus an initial dose of Express 5 boosted with Bovi-Shield Gold 5.

## BVD Type 2 Titers\*

Group	Day 0	Day 25			Day 56		
	All	All	Bulls	Heifers	All	Bulls	Heifers
1 (B5-B5)	23.3	21.4	30.4	15.0	125.7	120.2	131.5
2 (B5-E5)	29.8	12.7	11.4	14.0	170.0	229.9	125.7
3 (E5-B5)	31.9	72.2	75.8	68.8	177.9	186.5	169.7
4 (E5-E5)	36.5	67.6	35.3	128.5	264.8	209.4	334.7

\*Geometric mean titer

### Day 0

No significant differences for group or sex, and no significant group by sex interaction ( $p \geq 0.2931$ ).

### Day 25

Significant sex by group interaction ( $p = 0.0326$ ).

Bulls – differences were detected between groups 1 – 2, 2 – 3, and 2 – 4 ( $p \leq 0.0487$ ).

Heifers – Group 1 differed from 3 and 4 ( $p \leq 0.0026$ ). Group 2 differed from 3 and 4 ( $p \leq 0.0013$ ).

### Day 56

No significant difference in titers among groups ( $p = 0.0987$ ) or group by sex interaction ( $p = 0.3323$ ).

## Summary – BVD Type 2 (Day 56)

- No significant differences in SN titer response ( $p = 0.0987$ ) were observed between any of the vaccine combinations for BVD Type 2.

## Weight Gain

Mean average daily gain did not differ significantly between groups ( $p = 0.6321$ ).

Group	ADG
1 (B5-B5)	1.58
2 (B5-E5)	1.54
3 (E5-B5)	1.39
4 (E5-E5)	1.56

## Bottom Line

Utilizing Express 5 as the initial vaccine followed by either Express 5 or Bovi-Shield Gold 5 resulted in the highest BVD-1 Titers.