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PYRAMID® + PRESPONSE® SQ

PYRAMID® 5 + PRESPONSE® SQ VACCINE SUPERIOR TO INFORCE 3® + ONE SHOT® BVD IN DUAL CHALLENGE STUDY[1]:

PROVEN BY THE NUMBERS

Researchers set out to determine whether PYRAMID® 5 + PRESPONSE® SQ, with its unique MetaStim® adjuvant, could overcome maternal antibodies when calves were vaccinated at about 30 days of age, and challenged about five months later with BVDV 1b and *Mannheimia haemolytica.*

This study evaluated three protocol options and their abilities to overcome maternal antibodies and protect against disease. Sixty calves were vaccinated at 30 days of age with:

- PYRAMID 5 + PRESPONSE SQ [injectable, (P5P)]
- Inforce 3® + One Shot® BVD [intranasal + injectable, (IOS)]
- Saline (control)

The calves were challenged five months later with bovine viral diarrhea virus (BVDV) Type 1b and *M. haemolytica.* All calves received colostrum with a known amount of BVDV antibodies prior to vaccination.

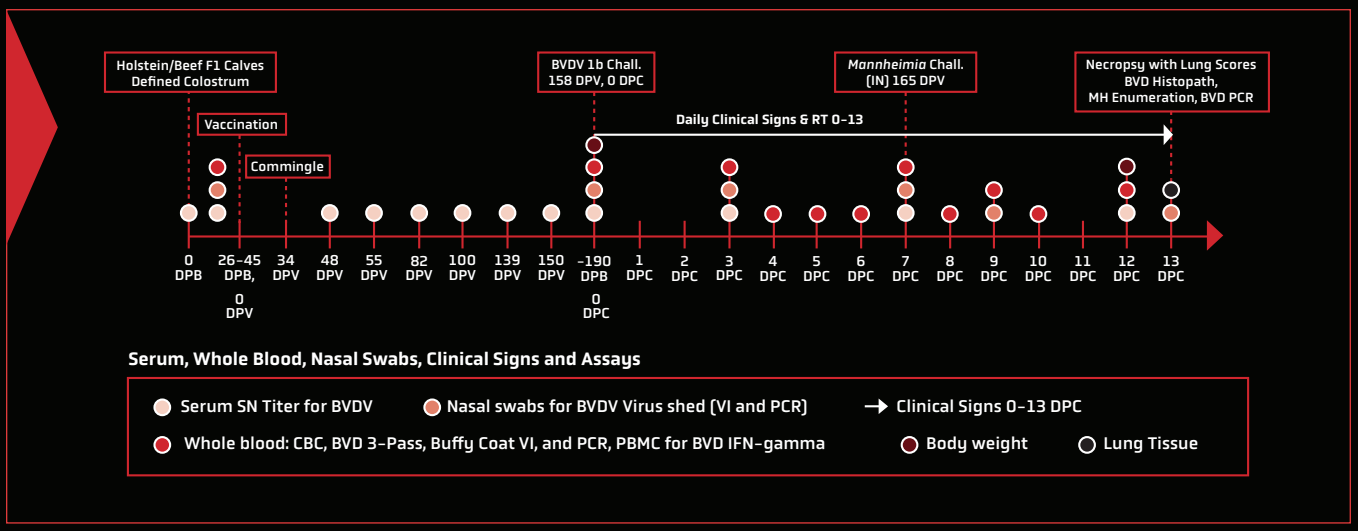

Figure 1: Dual-challenge study timeline including vaccination, challenges and data collection.

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HIGHER LEVEL OF PROTECTION

1,000%

INCREASE IN ANTIBODY RESPONSE FOR BOTH TYPES 1 AND 2 BVDV

PYRAMID® 5 + PRESPONSE® SQ (P5P) calves demonstrated **a strong Type 1 humoral memory response following BVDV 1b challenge,** with antibody titer increasing more than 10-fold from DPC 7 to DPC 12 (6.8 $\log^2$ to 10.5 $\log^2$: 1:111 to 1:1448) ($P < 0.01$).

The P5P group demonstrated **a strong Type 2 humoral memory response following the BVDV 1b challenge** with antibody titer increasing more than 10-fold from DPC 3 to DPC 12 (3.8 $\log^2$ to 7.5 $\log^2$: 1:14 to 1:181) ($P < 0.01$).

The P5P calves maintained and sustained a higher BVDV antibody response, with higher titers than both other groups postvaccination and throughout the challenge.

LESS IMMUNOSUPPRESSION

The P5P group only had a 2% decrease in white blood cells, beginning on DPC 3 through DPC 6 after BVDV challenge compared to the control and IOS groups, which had a 33% significant decrease ($P < 0.01$).

There was significantly less leukopenia following BVDV 1b infection than in either the IOS group or control group. The less leukopenia would reduce the amount of immunosuppression with the primary viral infection, and help maintain a higher innate immune response to a secondary bacterial infection.

250%

INCREASE IN INTERFERON-GAMMA (IFN-Y) PRODUCTION

At DPC 7, the IFN-γ levels increased significantly ($P < 0.05$), by almost 2.5-fold (127.9 to 309.1 pg/mL) in the P5P group compared to a decrease in IFN-γ levels in the IOS and control groups ($P < 0.05$).

The BVDV-specific IFN-γ response at DPC 7 indicated that even with maternal antibodies present, the P5P calves were able to generate a strong memory response following vaccination, in contrast to the IOS and control groups, which failed to generate a BVDV-specific memory response.

Data Shows that P5P Demonstrates Superior Protection and Immune Response[1]

REDUCED DISEASE SEVERITY

89.8%
LESS VIREMIC
THAN CONTROL GROUP VIA PCR

69.8%
LESS VIREMIC
THAN INTRANASAL VACCINE VIA PCR

Detection of BVDV from buffy coats via PCR revealed higher sensitivity and a longer viremia in the control group, and both vaccine groups had lower and shorter viremia. **Over the entire experiment for BVDV PCR from buffy coats, the number of positive animals was 1 (5.2%) for P5P, 15 (75%) for IOS and 19 (95%) for control calves ($P < 0.01$).**

0%
BVDV VIREMIC
DETERMINED BY VIRUS ISOLATION

BVD virus isolation (VI) was performed on buffy coat cells. Over the entire experiment for BVDV VI from buffy coats, **the number of positive animals was 0% (0 animals) for P5P, 20% (4 animals) for IOS, and 45% (9 animals) for control calves ($P < 0.05$).**

LESS SHEDDING

95% **DID NOT SHED VIA NASAL SWABS**

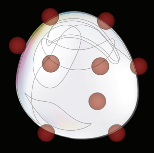
The P5P group had only one animal shed virus on one day post BVDV challenge, thus reducing spread to healthy herd mates. Over the entire experiment for BVDV PCR from nasal swabs, the number of positive animals was 1 (5%) for the P5P group, 3 (15%) for the IOS group, and 6 (30%) for control calves ($P < 0.01$).

The numbers prove P5P provided a higher level of protection, with higher antibody response and less immunosuppression in the face of maternal antibodies, reduced disease severity with less viremia and lower rectal temperatures, and less shedding.

HOW DOES PYRAMID® WORK IN THE FACE OF MATERNAL ANTIBODIES?

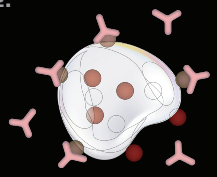
MetaStim® adjuvant helps PYRAMID® vaccines stimulate immunity in the face of maternal antibodies to boost immune system response.

1.



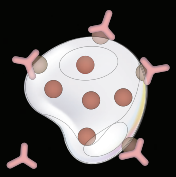
Vaccine antigens on adjuvant lipid droplets stimulate the immune system.

2.



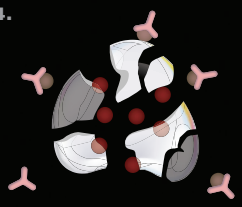
Maternal antibodies can neutralize exposed antigens.

3.



Some antigens are "hidden" inside lipid droplets to escape maternal antibodies.

4.



Immune cells metabolize lipid droplets, releasing "hidden" antigens to stimulate an immune response.

Previous studies found that the PYRAMID 5 vaccine provides protection against diseases like BVDV Type 2 and BRSV, even in the face of maternal antibodies.[2,3,4] This dual-challenge study presents even more evidence that the PYRAMID vaccines with the METASTIM adjuvant can stimulate robust immunity — even when maternal antibodies are present.

SCAN THE QR CODE TO LEARN MORE ABOUT THE PYRAMID FAMILY OF VACCINES.

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References:

[1] Perkins-Oines S, Dias N, Krafsur G, et al. The effect of neonatal vaccination for bovine respiratory disease in the face of a dual challenge with bovine viral diarrhea virus and Mannheimia haemolytica. *Vaccine* 2023;41(19):3080–3091.

[2] Zimmerman AD, Boots RE, Valli JL, Chase CCL. Evaluation of protection against virulent bovine viral diarrhea virus Type 2 in calves that had maternal antibodies and were vaccinated with a modified-live vaccine. *JAVMA* 2006;228(11):1757–1761.

[3] Zimmerman AD, Buterbaugh RE, Schnackel JA, Chase CCL. Efficacy of a modified-live virus vaccine administered to calves with maternal antibodies and challenged seven months later with a virulent bovine viral diarrhea Type 2 virus. *Bov Pract* 2009;43(1):35–43.

[4] Kolb EA, Buterbaugh RE, Rinehart CL, et al. Protection against bovine respiratory syncytial virus in calves vaccinated with adjuvanted modified-live virus vaccine administered in the face of maternal antibody. *Vaccine* 2020;38(2):298–308.