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NUPLURA® PH™

Research Brief 4

BRD Prevention: A Comparison of Three Vaccination Programs in High-Risk Feedlot Heifers[1]

KEY FINDINGS

- **Vaccination programs implementing Titanium® 5 and NUPLURA® PH had similar effects on BRD-related health outcomes, growth performance, and carcass characteristics in feedlot heifers as an arrival vaccination program that utilized Pyramid® 5 + Presponse® SQ**
- **Delaying Titanium 5 until 28 days on feed did not affect the health or growth-performance outcomes measured in this study**
- **There were fewer mortalities attributable to acute interstitial pneumonia in the heifers that received Titanium 5 and NUPLURA PH at arrival compared to the heifers that received Pyramid 5 + Presponse SQ at arrival (0 vs. 9 for Titanium 5 + NUPLURA PH vs. Pyramid 5 + Presponse SQ, respectively)**
- **The recombinant technology and purification processes used to manufacture NUPLURA PH result in significantly lower endotoxin concentrations compared to Presponse SQ, whose toxoid component is a supernatant derived from whole-cell *Mannheimia haemolytica* culture**

STUDY OVERVIEW

A study was conducted in a commercial feedlot to compare the relative efficacy of three vaccination programs designed to protect against *Mannheimia haemolytica* and respiratory viruses in 2,575 high-risk heifers sourced from auction markets. The study followed the heifers through harvest and evaluated the effects of the vaccine programs on health, growth performance, and carcass characteristics.

TRIAL DESIGN

- **Heifers were assigned to one of three vaccination programs that differed by either vaccine products or timing of administration of the pentavalent viral vaccine:**
  - Titanium 5 and NUPLURA PH administered concurrently during arrival processing
  - NUPLURA PH during arrival processing with Titanium 5 delayed until 28 days on feed
  - Pyramid 5 + Presponse SQ vaccine during arrival processing

MATERIALS AND METHODS

Study population — 2,575 high-risk heifers (568 +/- 28.1 lbs) placed in May and June of 2017 that received metaphylactic treatment during arrival processing

- **The three pens within a block were located adjacently, so that health observations were performed by the same pen rider within a day**
- **Necropsies were performed by a veterinarian or trained feedlot personnel who determined the probable cause of death**

TABLE 1. **HEALTH OUTCOMES BY VACCINE PROGRAM**					
Variable	**Pyramid® 5 + Presponse® SQ**	**Titanium® 5 + NUPLURA® PH**	**NUPLURA PH on Arrival Titanium 5 Delayed**	**SEM***	***P*-Value**
BRD 1ST TREATMENT, %	14.27	13.24	15.77	2.11	0.31
BRD 2ND TREATMENT, %	6.64	6.24	7.53	1.26	0.54
BRD 3RD TREATMENT, %	2.87	3.10	3.62	0.80	0.64
BRD CASE FATALITY RISK, %	18.67	21.91	13.61	4.62	0.18
OVERALL MORTALITIES, %	4.00	3.82	3.06	0.94	0.50
OVERALL REMOVALS, %	0.20	0.31	0.20	0.22	0.86

* Largest SEM in the analysis.

Vaccinations programs with NUPLURA PH and Titanium 5 saw a lower overall mortality rate.

TABLE 2. **DISEASE RISK AND PROBABILITY OF MORTALITY OUTCOMES OF FEEDLOT HEIFERS AT CLOSEOUT BY VACCINE PROGRAM**									
Etiology	**Pyramid 5 + Presponse SQ (PRE)**		**Titanium 5 + NUPLURA PH (TNA)**		**NUPLURA PH on Arrival Titanium 5 Delayed (TND)**		**Probabilty of Difference***		
	Mean	**95% PI**	**Mean**	**95% PI**	**Mean**	**95% PI**	**PRE vs TNA**	**PRE vs TND**	**TNA vs TND**
BRD**	2.60	(1.37; 4.94)	3.30	(1.75; 6.11)	2.23	(1.16; 4.24)	0.30	0.19	0.48
DIGESTIVE	0.11	(0.03; 0.57)	0.15	(0.03; 0.58)	0.28	(0.06; 0.69)	0.67	0.60	0.66
AIP**	1.01	(0.37; 1.81)	0.00	(0.00; 0.01)	0.05	(0.01; 0.44)	1.00	0.79	0.99
OTHER	0.05	(0.00; 0.33)	0.34	(0.08; 1.12)	0.07	(0.00; 0.60)	0.70	0.23	0.55

* Probability of difference between vaccine programs based upon Bayesian posterior distributions.
** BRD = Bovine respiratory disease; AIP = Acute interstitial pneumonia.

TABLE 3. **GROWTH PERFORMANCE AND ECONOMIC OUTCOMES BY VACCINE PROGRAM**					
Variable	**Pyramid 5 + Presponse SQ**	**Titanium 5 + NUPLURA PH**	**NUPLURA PH on Arrival Titanium 5 Delayed**	**SEM***	***P*-Value**
FINAL BODY WEIGHT,** LBS	1,248.7	1,248.8	1,248.3	8.75	0.99
ADG, LB†	2.87	2.86	2.91	0.08	0.73
F:G†	6.41	6.36	6.24	0.11	0.34
DRY MATTER INTAKE, LBS	18.31	18.17	18.14	0.28	0.65
COST OF GAIN,† $/100 LB	80.39	79.78	78.64	1.38	0.46
PROFIT,† $/HEIFER SOLD	79.30	87.51	99.60	13.69	0.35

* Largest SEM in the analysis.
** Adjusted for 4% shrink.
† Dead animals included in analysis.

Vaccinations programs with NUPLURA PH and Titanium 5 saw a lower cost of gain per hundredweight and a higher profit per heifer sold.

TABLE 4. **CARCASS CHARACTERISTICS BY VACCINE PROGRAM**					
Variable	**Pyramid® 5 + Presponse® SQ**	**Titanium® 5 + NUPLURA® PH**	**NUPLURA PH on Arrival Titanium 5 Delayed**	**SEM***	***P*-Value**
HOT CARCASS WEIGHT, LBS	796.3	793.9	795.7	4.29	0.81
DRESSING PERCENT, %	63.44	63.46	63.49	0.34	0.98
CARCASS ADJUSTED ADG,** LB	3.14	3.11	3.12	0.04	0.60
PRIME, %	2.03	1.40	1.63	0.58	0.61
CHOICE, %	66.93	70.16	65.45	2.97	0.15
SELECT, %	29.65	27.23	30.89	3.30	0.30
STANDARD/NO ROLL, %	0.74	0.73	1.34	0.47	0.35
YIELD GRADE 1, %	6.67	6.22	6.80	1.45	0.88
YIELD GRADE 2, %	37.96	37.06	34.46	3.66	0.36
YIELD GRADE 3, %	46.15	44.87	44.26	3.76	0.76
YIELD GRADE 4, %	6.71A	9.09[a,b]	10.68[b]	1.79	0.02
YIELD GRADE 5, %	0.38	0.64	1.27	0.46	0.14

* Largest SEM in analysis.
** ADG estimates based upon common dressing percentage of 63.46% in the 9 blocks in which carcass outcomes were captured.
[ab] Means without common superscripts differ ($P < 0.05$).

TABLE 5. **ENDOTOXIN CONCENTRATIONS IN THE *MANNHEIMIA HAEMOLYTICA* VACCINES**				
Variable	**Endotoxin Concentration (EU/ML)**	**95% Confidence Interval**	**Standard Deviation**	***P*-Value**
NUPLURA PH	1,587.6	(679; 3,710)	1,069.9	< 0.01
PRESPONSE SQ	56,120.3	(24,012; 131,160)	11,951.2	

NUPLURA PH has a 35x lower endotoxin concentration.

To learn more about NUPLURA PH, contact your herd health veterinarian, Elanco sales representative, technical consultant or visit NUPLURA.COM

Elanco NUPLURA® PH™ Elanco Titanium®™

The label contains complete use information, including cautions and warnings. Always read, understand and follow the label and use directions.

[1] Hagenmaier JA, Terhaar BL, Blue K, et al. *A comparison of three vaccine programs on the health, growth performance, and carcass characteristics of highrisk feedlot heifers procured from auction-markets.* Bovine Practitioner 2018;120-130.

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