PorkFACTS™

AN UPDATE OF RECENT SWINE RESEARCH

Comparative Effects of Alphamune® and Bio-Mos® on Performance, Health, and Vaccination Responses of Nursery Pigs

Summary

A study compared the performance, health, and vaccination responses of nursery pigs fed Alphamune® or Bio-Mos.® Equal numbers of weaned gilts and barrows were assigned to 4 treatment groups (control, 0.5 or 1 lb/ton of Alphamune, or 4 lb/ton of Bio-Mos), vaccinated for *Mycoplasma hyopneumoniae* (2 doses), and observed during a 4-phase, 41-day nursery period. Performance between treatment groups was similar, likely due to high dietary levels of Zn and Cu that moderated additional growth responses. However, pigs fed Alphamune generated significantly ($P < 0.05$) greater *M. hyopneumoniae* antibody titers at day 38, 16 days after booster vaccination. The most favorable performance and immunological responses were observed with the lower feeding level of Alphamune (0.5 lb/ton).

Nursery pigs fed Alphamune generated greater immune responses to Mycoplasma vaccination than pigs fed Bio-Mos.

Rationale

- Alphamune® is a blend of non-antibiotic (1,3)/(1,6) β-glucans and mannan-oligosaccharide (MOS, or mannans) feed ingredients derived from cell walls of brewer's dried yeast (*Saccharomyces cerevisiae*). Classified as 'prebiotics', these nondigestible feed ingredients beneficially improve animal health by selectively stimulating the growth and/or activity of healthful bacteria resident in the digestive tract, and by stimulating the immune system.[1]

- MOS are thought to improve growth performance of swine through two modes of action:
  - binding to cell walls of bacterial pathogens in the gut, thus preventing their attachment to the intestinal epithelium (competitive exclusion);
  - enhancing the immune system by evoking a direct antibody response.[2]

- The β-glucans components stimulate immunity by binding to specific white blood cells (most notably macrophages) via their CR3 receptor sites, which triggers a cascade of cellular events that culminates in enhanced phagocytosis and increased antibody production.

Alphamune Granular offers superior handling and feed distribution characteristics.

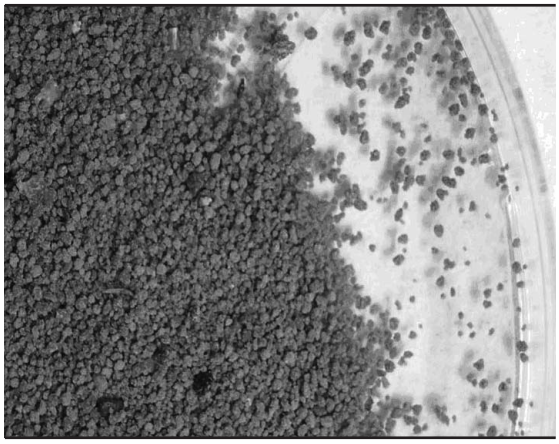

FIGURE 1: *Granular Alphamune formulation that contributes to superior handling and feed distribution characteristics.*

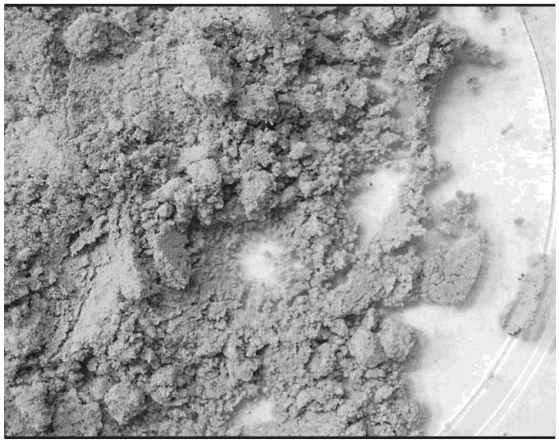

FIGURE 2: *Non-granular meal formulation of Bio-Mos.*

- Because of its granular formulation, Alphamune offers superior handling and distribution characteristics compared to Bio-Mos,® a competitive yeast-extract product (Figures 1 and 2).
- Alphamune is formulated with a consistent level (≥ 24%) of high-quality β-glucans.
- A research study was recently conducted to evaluate the performance, health, and vaccination responses of nursery pigs fed Alphamune or Bio-Mos.[3]

EXPERIMENT DESIGN

- The nursery study involved 880 weanling (10.3 lb) PIC barrows and gilts sourced from a herd asymptomatic for PRRSV and *Mycoplasma hyopneumoniae*.
- Pigs were initially penned by gender and visually sorted into 4 weight groups per gender. Five to six pigs of each weight group were then placed in each of 40 pens (22 pigs/pen), providing 20 complete replicates of both barrows and gilts. Blocked by location within the barn, 10 pens (5 barrows, 5 gilts) were assigned to each of 4 treatment groups:
  - Negative control (non-supplemented);
  - Alphamune, 0.5 lb/ton;
  - Alphamune, 1.0 lb/ton;
  - Bio-Mos, 4.0 lb/ton.

The extensive study involved 220 pigs per treatment group, with equal numbers of gilts and barrows.

- During the 41-day nursery period, pigs were fed a 4-phase pelleted nursery diet (5, 9, 9, and 18 days in length for phases 1, 2, 3, and 4, respectively) containing high zinc (3030, 1950, 1515, and 150 ppm Zn from zinc oxide) and copper levels (240 ppm Cu from copper sulfate) and no antibiotics.
- Pen weights, feed consumption, and feed:gain ratio were calculated at the end of each dietary phase. Mortality and pig removal rates were calculated for the entire study.
- Pigs received an initial 1 mL intramuscular dose of *M. hyopneumoniae* bacterin on day 6 post-weaning and a booster injection on day 22. Blood samples were collected on days 6, 22, and 38 post-weaning from 4 randomly selected pigs per pen and analyzed for *M. hyopneumoniae* titer.

Performance Results

Performance was similar between treatment groups, likely due to high dietary levels of Zn and Cu.

- Performance results for the entire 41-day nursery trial are summarized in Table 1. No significant differences ($P > 0.1$) were detected between Alphamune and Bio-Mos treatment groups for initial or final weight, average daily gain, feed efficiency, or mortality and removals.
- Feed intake tended to be higher ($P < 0.1$) for pigs fed Bio-Mos compared to animals that received Alphamune.

TABLE 1. Performance and health results for the 41-day nursery study.

Variable	Controls	Alphamune 0.5 lb/t	Alphamune 1 lb/t	Bio-Mos 4 lb/t
Initial weight (lb)	10.47	10.49	10.49	10.40
Final weight (lb)	50.29	50.56	49.70	51.14
Total gain (lb)	39.82	39.97	39.21	40.74
Avg. daily gain (lb)	0.971	0.977	0.956	0.994
Avg. daily feed intake (lb)	1.311	1.307	1.286	1.335[a]
Feed/gain	1.350	1.338	1.346	1.344
Cost/lb gain (¢)*	21.5	21.3	21.5	21.6
Mortality and removals (%)	1.4	2.3	2.7	2.3

[a] = $P < 0.1$ vs Alphamune; *includes current feed cost and Midwest US retail pricing of $1.91/lb for Alphamune Granular and $1.40/lb for Bio-Mos

- Pigs supplemented with Alphamune had a lower cost per lb gain compared to pigs fed Bio-Mos ($P > 0.1$). Increasing levels of Alphamune had no significant effect on performance parameters.
- Significant additive performance-enhancing effects of MOS inclusion in diets high in zinc and copper were not observed in this study, although numerical additive effects did occur.
- The presence of high levels of zinc and copper in the diet may have confounded performance results because pharmacological levels of zinc and copper have been shown to exert growth promoting properties, especially in nursery pigs.[4-6]

Immunological Results

Pigs fed Alphamune demonstrated a greater anamnestic response to booster M. hyo vaccination.

- Day 6 (baseline) and day 22 *M. hyopneumoniae* antibody titers did not differ between treatments (Table 2).
- On day 38, however, pigs fed Alphamune demonstrated a greater anamnestic response to the booster vaccination administered 16 days earlier, generating significantly higher ($P < 0.05$) *M. hyopneumoniae* titers compared to pigs fed Bio-Mos (Table 2, Figure 3).

TABLE 2. Vaccination titer results for the 41-day nursery study.

Variable	Controls	Alphamune 0.5 lb/t	Alphamune 1 lb/t	Bio-Mos 4 lb/t
M. hyo titers, day 6	0.034	0.047	0.041	0.035
M. hyo titers, day 22	0.067	0.060	0.062	0.064
M. hyo titers, day 38*	0.573	0.638	0.585	0.529

*Alphamune (avg.) vs Bio-Mos significantly different ($P < 0.05$); Linear analysis not significant ($P > 0.05$); Alphamune 0.5 lb vs 1.0 lb quadratic analysis significant ($P < 0.1$)

Immunological Results (cont.)

- Day 38 *M. hyopneumoniae* titer levels of pigs fed Alphamune at 0.5 lb/ton were higher ($P < 0.1$, quadratic effect) than those for pigs fed 1.0 lb/ton, again indicating that 0.5 lb/ton was the most favorable Alphamune inclusion rate.

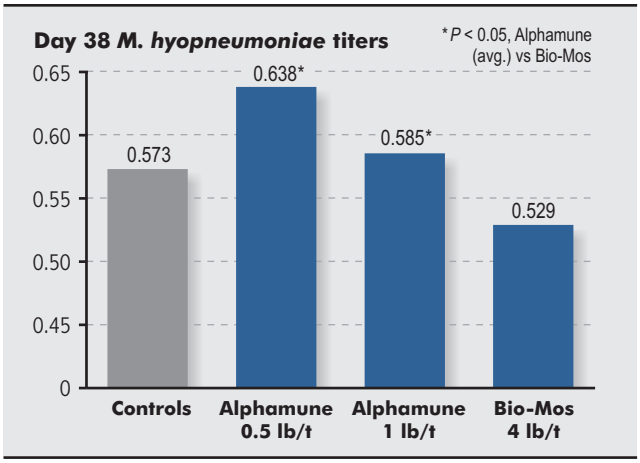

FIGURE 3: Mycoplasma hyopneumoniae antibody titers at day 38, 16 days after booster vaccination.

Alphamune is a viable option for producers seeking alternatives to antibiotics.

Cost Comparison

- While performance results were similar in this study for pigs supplemented with Alphamune or Bio-Mos, substantial cost differences exist between the two prebiotic products.

- As shown in Figure 4, the $5.60 expense for supplementing 1 ton of feed with Bio-Mos is nearly ***6-times*** the $0.96 required for Alphamune (0.5 lb/ton inclusion rate), even though Alphamune is a superior granular premix formulation.

- Alphamune offers better value than Bio-Mos.

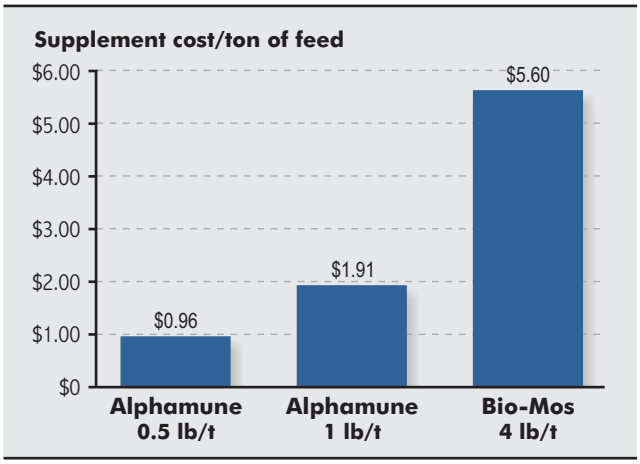

FIGURE 4: Comparison of costs required to supplement 1 ton of feed with Alphamune or Bio-Mos (retail pricing of $1.91/lb for Alphamune Granular and $1.40/lb for Bio-Mos).

Conclusions

Alphamune-supplemented animals generated a significantly greater antibody titer response to *M. hyopneumoniae* vaccination than pigs fed Bio-Mos. Furthermore, pigs fed 0.5 lb/ton Alphamune tended to produce higher titer levels than pigs fed Alphamune at 1.0 lb/ton. While pigs fed Alphamune or Bio-Mos demonstrated similar growth performance, cost/lb of gain was numerically improved for Alphamune treatment groups compared to Bio-Mos, and animals fed 0.5 lb/ton Alphamune performed numerically better than pigs fed 1.0 lb/ton Alphamune for most parameters measured.

Compared to Bio-Mos, Alphamune Granular offers better immune-stimulating effects, more desirable handling and distribution characteristics, consistently high quality (β-glucan level guaranteed to be ≥ 24%), and lower dosage levels, factors that support the conclusion that Alphamune is a viable option for swine producers and feed manufacturers seeking alternatives to antibiotics.

References

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