



PorkFACTS™

AN UPDATE OF RECENT SWINE RESEARCH

Effect of BMD® in Sow Gestation/Lactation Diets on Clostridial Infection, Piglet Pre-Weaning Performance, and Sow Body Condition

► SUMMARY

A study examined the effectiveness of supplementing sow diets with BMD® for controlling clostridial infection and enhancing piglet performance and sow body condition.¹ Sows at a well-managed sow farm received rations supplemented with 250 g/ton of BMD for 2 weeks before farrowing through 3 weeks of lactation. Though no clinical clostridial enteritis was observed, BMD-supplemented sows demonstrated significantly ($P < 0.05$) less clostridial shedding compared to non-medicated sows. Furthermore, piglets nursing BMD-supplemented sows grew faster ($P < 0.05$) as evidenced by fewer days to weaning and increased adjusted 21-day weaning weights. These effects were amplified in low-birth-weight piglets. Medicated sows also lost less ($P < 0.05$) body tissue during lactation. Based on study data, the BMD program produced a return on investment of 9:1.

**Piglets nursing
BMD-medicated
sows grow faster,
with benefits
amplified in piglets
with low birth
weights.**

► RATIONALE

- Sow farm managers often must resort to partial or early weaning to meet unrelenting demands for high-quality weaned pigs from nursery growers. Consequently, production practices that improve pre-weaning growth can be major determinants of facility productivity and profitability.
- Supplementation of sow diets with appropriate antimicrobial agents has been shown to improve neonatal piglet performance. BMD® (bacitracin methylene disalicylate), when fed to sows at a level of 250 g/ton of feed from 14 days before through 21 days after farrowing, is the only feed medication approved for the control of clostridial enteritis caused by *Clostridium perfringens* in neonatal piglets.
- Most past studies evaluating sow gestation/lactation programs used a fixed age at weaning (i.e., around 21 days) and reported the growth of the entire litter, not individual pigs.
- An extensive study was recently conducted to examine the effectiveness of supplementing sow diets with BMD in a production system where partial and early weaning was common.¹ Furthermore, because individual piglet weights were recorded, researchers could also determine if the relative size of a piglet at birth influenced its response to BMD in sow lactation diets.

▶ EXPERIMENT DESIGN

The study was conducted in a well-managed sow herd with a consistent history of high productivity.

- The study involved 258 crossbred sows maintained at a well-managed, 2400-head commercial sow farm in northeastern North Carolina (averaged 24 pigs/sow/year for previous 3 years). Sows were housed during gestation in pens of 8 to 10 animals according to parity and size.
- Each pen of sows was randomly assigned to receive either BMD-medicated feed (250 g/ton) from day 100 of gestation through weaning (n=129 sows), or non-medicated feed (controls; n=129 sows).
- Sows were moved into individual farrowing crates between days 110 and 112 of gestation (166 farrowing crates in 7 rooms).
- Piglets (n=2767) received individual ear tags and were weighed within 2 days of birth and again at weaning. Litter size was adjusted (via crossfostering) within treatment groups only during the first 48 hours after birth.
- Weaning occurred twice per week (Mondays and Thursdays), with weaning decisions based primarily upon: 1) demands from nursery operations for weaned pigs; 2) the number of farrowing crates required for pregnant sows. Minimum weaning age was 14 days. If piglets scheduled to be weaned were judged by farm or nursery personnel to be too small, they were fostered back onto a sow with a younger litter until the next weaning date. Personnel making weaning decisions were blinded to treatment group identities.
- Fecal samples were collected from 30 sows in each treatment group within 2 days post-farrowing and 1 day prior to weaning. Samples were cultured to estimate the level of *Clostridium* infection in sows, using a visual scoring system (0-4, 0=no growth; 4= heavy growth).
- Sow condition was assessed within 2 days post-farrowing and 1 day before weaning to allow estimation of sow tissue losses during lactation. Two methods were used: 1) measurement of body girth (thoracic circumference near the heart); 2) measurement of backfat depth at the last rib.
- Reproductive performance data (number born alive, stillbirths, mummies, pre-weaning mortality, number of pigs weaned, piglet weights, weaning age, average daily gain) were analyzed using each litter as an experimental unit.
- Subsequent analyses examined the effect of BMD on piglets with low birth weights. Two low-birth-weight categories were analyzed using each individual piglet as the experimental unit: 37 piglets weighing less than 2 lb at birth; and 332 piglets weighing between 2 and 3 lb at birth.

▶ CLOSTRIDIAL SHEDDING

- No clinical signs of clostridial enteritis were observed in the herd at any time during the study.
- Fecal sample analyses from a subset of sows in each treatment indicated that BMD reduced ($P < 0.05$) the exposure of the treated sows/litters to *Clostridium* spp (control score = 2.2; BMD score = 1.0).

Sows fed BMD shed fewer clostridia into the nursing environment.

- Only 17% of the fecal samples from BMD-treated sows were considered positive for clostridia (score >1), compared with 74% of the samples from the non-medicated control group (Figure 1).
- Even though clostridial infections were sub-clinical, use of BMD further limited infection loads and clostridial shedding of treated sows.

▶ PIGLET PERFORMANCE

- Piglets nursing BMD-supplemented sows achieved weaning weight **2.5 days sooner** ($P < 0.05$) than controls (17.25 vs 19.70 days, respectively) (Figure 2).
- The rapid growth demonstrated by piglets nursing BMD-medicated sows was reflected in corresponding improvement in average daily gain (14%; $P < 0.05$) and significantly heavier adjusted 21-day weaning weights (1.67 lb, 13%; $P < 0.05$) compared to controls. (Figure 3).
- Other piglet reproductive parameters were similar ($P > 0.15$) between control sows and BMD-medicated sows (number of pigs born alive, stillborn/mummified piglets, piglets weaned, piglet birth and unadjusted weaning weights, all computed on a per-litter basis) (Table 1).

Piglets nursing BMD sows achieved weaning weight 2.5 days sooner.

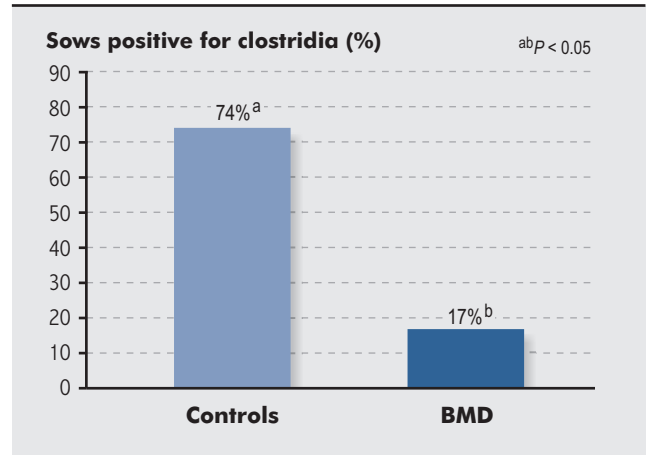


FIGURE 1: Sows considered positive for clostridial infection (culture score >1).

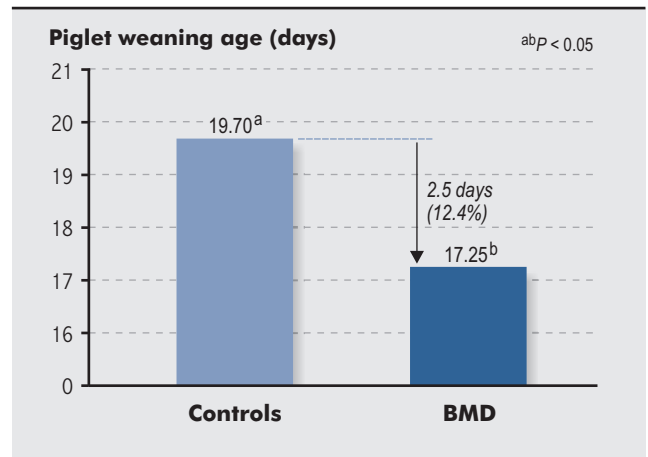


FIGURE 2: Age of piglets at weaning.

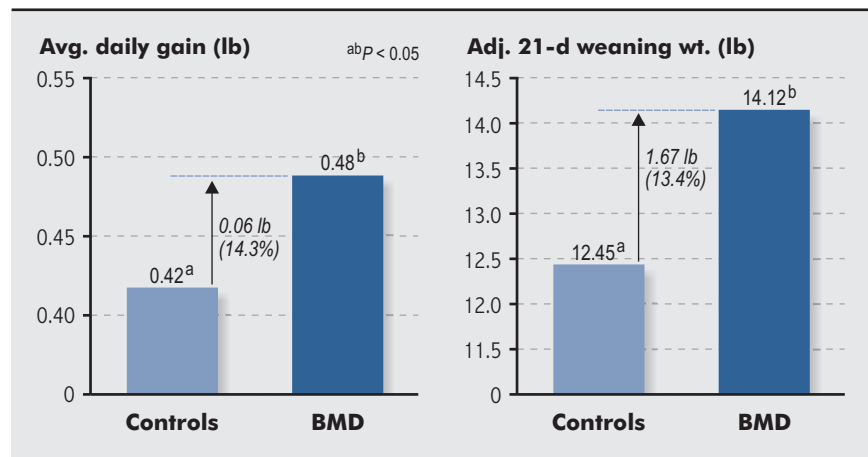


FIGURE 3: Average daily gain and adjusted 21-day weaning weights of piglets.

- Pre-weaning mortality was 10.2% for the BMD group, substantially lower than the 12.3% rate observed in the control group.

▶ PIGLETS WITH LOW BIRTH WEIGHTS

- Even greater trends in piglet growth rates were detected in analyses that examined individual weaning weights of piglets with low birth weights.
- Piglets weighing under 2 lb at birth achieved weaning age 6.3 days sooner (25% improvement; $P < 0.05$) when reared by sows supplemented with BMD (Figure 4).
- Furthermore, these animals produced adjusted 21-day weaning weights 3 lb heavier (55% improvement; $P < 0.05$) than piglets in the control group (Figure 4).
- Similar results were observed for piglets with birth weights of 2 to 3 lb. Piglets in the BMD group achieved weaning weight 2.7 days sooner (14% improvement; $P < 0.05$) and generated adjusted 21-day weaning weights 1.3 lb heavier (13% improvement; $P < 0.05$) than controls (Figure 5).
- Though the industry trend for larger litters often results in smaller piglets, these results suggest that BMD supplementation of sow diets helps smaller pigs achieve marketable size (8-lb target) within a 21-day window.
- Data for both subsets of low-weight pigs are summarized in Tables 2 and 3.

Low birth weight piglets from BMD-treated sows had adjusted 21-d weaning wts. up to 55% heavier than controls.

BMD in the sow diet helped piglets under 2 lb at birth achieve marketable size within a 21-day window.

TABLE 1. Mean reproductive performance of control and BMD sows, and growth of piglets.

Variable	Controls	BMD
Number of sows	129	129
Parity	2.5	2.7
Number born alive/litter	11.0	10.8
Stillbirths/litter	0.6	0.7
Mummies/litter	0.1	0.2
Number of piglets born	1243	1231
Weight at day 1 or 2 (lb)	3.89	3.92
Pre-weaning mortality (%)	12.3	10.2
Number of pigs weaned/litter	9.7	9.8
Age at weaning (days)	19.70	17.25*
Weaning weight (lb)	11.86	12.17
Adjusted 21-day weaning wt. (lb)	12.45	14.12*
Avg. daily gain during lactation (lb)	0.42	0.48*

*Significantly different from controls ($P < 0.05$)

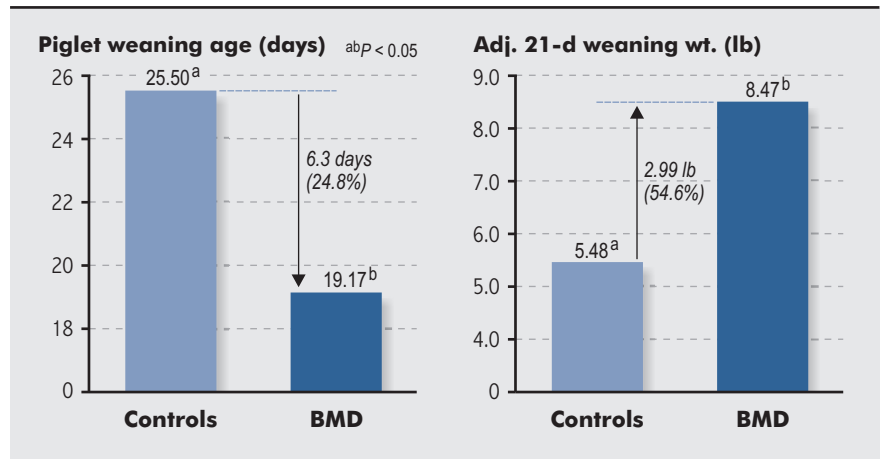


FIGURE 4: Weaning age, adjusted 21-day weaning weights for piglets < 2 lb at birth.

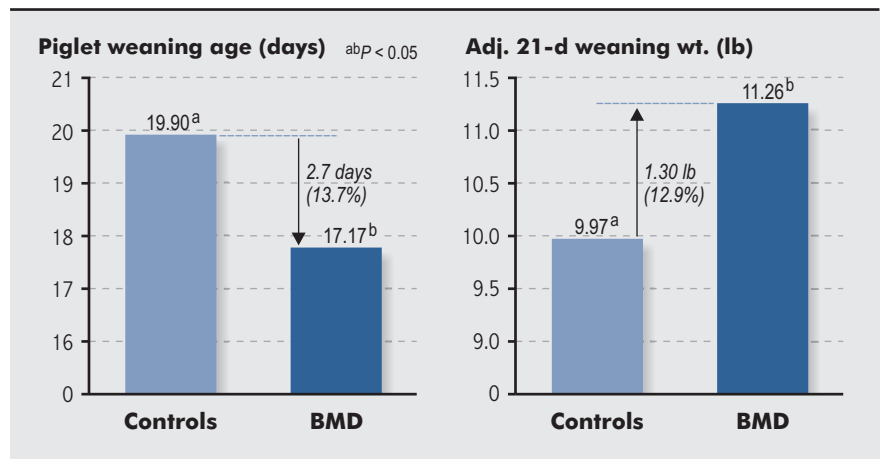


FIGURE 5: Weaning age, adjusted 21-day weaning weights for piglets 2-3 lb at birth.

TABLE 2. Mean growth of piglets with birth weights less than 2 lb.

Variable	Controls	BMD
Weight at day 1 or 2 (lb)	1.80	1.80
Age at weaning (days)	25.50	19.17*
Weaning weight (lb)	6.40	7.90
Adjusted 21-day weaning wt. (lb)	5.48	8.47*

*Significantly different from controls ($P < 0.05$)

TABLE 3. Mean growth of piglets with birth weights between 2 and 3 lb.

Variable	Controls	BMD
Weight at day 1 or 2 (lb)	2.66	2.68
Age at weaning (days)	19.90	17.17*
Weaning weight (lb)	9.57	9.68
Adjusted 21-day weaning wt. (lb)	9.97	11.26*

*Significantly different from controls ($P < 0.05$)

► SOW BODY CONDITION

- Sows receiving feed supplemented with BMD maintained better body condition through lactation, demonstrating greater ($P < 0.05$) body girth dimensions and back fat than control sows at weaning (Table 4).
- Previous studies indicate that each 1-cm change in body girth circumference equates to about 2.9 lb of body weight.² Based on these data, BMD-supplemented sows retained 10.6 lb more body tissue mass (29.2% less tissue loss; $P < 0.05$) during lactation than control sows (Figure 6).
- Because BMD-treated sows maintained better body condition and lost less weight during lactation, they subsequently returned to estrus 1 day sooner than control animals.

BMD sows lost less body mass and weight during lactation, and returned to estrus sooner.

► RETURN ON INVESTMENT

- A financial analysis computed the monetary value of the BMD sow program, based on the results of this study and conservative economic assumptions. The analysis quantified the value of additional piglet weight at weaning, the value of marketing additional low-weight pigs (< 2 lb birth weight), and improved piglet survival to weaning.
- Results suggest that an additional \$36/sow/year can be realized by implementing the BMD gestation/lactation program (a conservative estimate). Assuming a BMD program cost of about \$4.37/sow, return on investment (ROI) was calculated at 9:1.

The BMD sow program produced a 9:1 return on investment.

TABLE 4. Mean estimates of tissue loss during lactation for control and BMD-treated sows.

Variable	Controls	BMD
Body girth post-farrowing (cm)	152.9	153.2
Body girth at weaning (cm)	140.2	144.2
Change in body girth (cm)	-12.7	-9.0*
Backfat depth post-farrowing (mm)	25.9	26.3
Backfat depth at weaning (mm)	16.7	19.5*
Change in backfat depth (mm)	-9.2	-6.8*

*Significantly different from controls ($P < 0.05$)

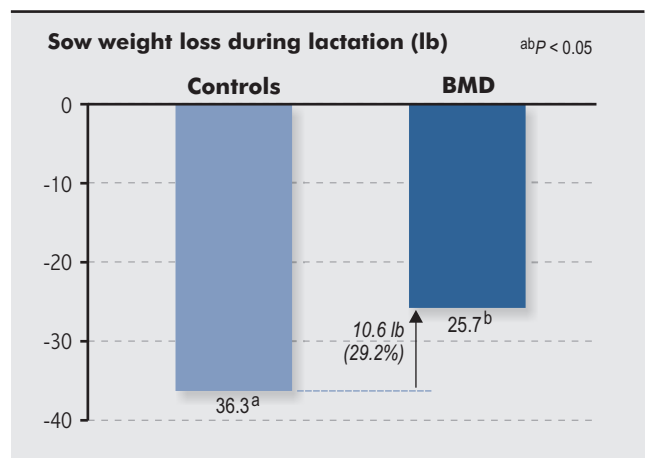


FIGURE 6: Weight loss of sows during lactation, computed from body girth measurements (2.9 lb of body weight loss per cm of girth loss²).

- A summary of the various parameters significantly ($P < 0.05$) improved in this study by the BMD sow program appears in Table 5.

▶ CONCLUSIONS

A sow gestation/lactation program utilizing 250 g BMD in the feed starting 2 weeks before farrowing and continuing through lactation reduced clostridial shedding by sows, improved piglet growth performance (especially in low-weight piglets), elevated piglet survivability, and moderated sow weight/condition loss during lactation. The program was highly cost-effective, producing a ROI of 9:1.

TABLE 5. Improvements ($P < 0.05$) observed in BMD-supplemented sows and their nursing piglets.

Variable	BMD improvement
Age at weaning (all pigs)	12.4%
Piglets 2-3 lb at birth	13.7%
Piglets < 2 lb at birth	24.8%
Adjusted 21-day weaning weight (all pigs)	13.4%
Piglets 2-3 lb at birth	12.9%
Piglets < 2 lb at birth	54.6%
Sow body girth change at weaning	29.1%
Sow backfat change at weaning	26.1%

REFERENCES

1. Flowers WL, Schultz RA, Pratte B. Effect of BMD in sow diets on clostridial numbers, sow weight loss, and neonatal piglet performance. *Am Assoc Swine Vet* 2007; 163-165.
2. Flowers WL. Management of Reproduction. In: *Progress in Pig Science*. Chadwick J, Varley M, Wisemann J (eds). 1999. University of Nottingham Press, Nottingham, UK, pp. 383-405.