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- **Stress in pigs may interfere with gut integrity and compromise herd health and performance.**
- **BMD[®] (bacitracin methylene disalicylate), indicated for increased rate of weight gain and feed efficiency in grower-finishers, was administered to pigs subjected to common production stressors.**
- **Stressed grower pigs that received BMD had better average daily gain and final weight.**

Pigs fed BMD[®] gain more weight faster despite stress in controlled studies

Grower pigs fed BMD[®] (bacitracin methylene disalicylate) gained weight faster and had better feed efficiency compared to controls despite exposure to commonly encountered production stressors, studies show.

“We’ve long known stress can adversely affect performance,” says Daniel A. Nelson, PhD, senior swine nutritionist, Zoetis. “Because some natural stressors — weaning, commingling, transportation, disease — are inevitable in live production, we wanted to find out if feeding an antibiotic to stressed pigs would help improve growth rate and feed conversion in these situations.”

Toward this end, Zoetis enlisted the help of Adam Moeser, DVM, PhD, a veterinarian who specializes in stress-induced gastrointestinal disorders, and colleagues at North Carolina State University to determine whether feeding BMD to stressed grower pigs would still result in improved growth rate and feed conversion. (Moeser is now at Michigan State University.)

In the first study with 16 pigs, the animals were acclimated to their respective treatment diets and rooms at 72° F (22° C) for 5 days. Then one-half of the pigs were kept for 10 days in temperatures of 96.8° F (36° C) for 12 hours and for the other 12 hours at 84.2° F (29° C) — the same heat stress pigs might encounter during hot summer months. The other half of the pigs were housed in a thermoneutral environment, meaning that ambient temperatures were maintained to prevent changes in metabolic heat production or evaporative heat loss.

In each environmental group, half of the pigs were fed BMD at the rate of 30 grams per ton, while the other half was unmedicated. In both environments, pigs fed BMD had better average daily gain (ADG) and lower feed-to-gain (F/G) ratios compared to controls, Nelson reports (Table 1).¹

continued



“We still have a lot to learn, but research indicates stress can impair performance by adversely affecting gut integrity.”

DANIEL A. NELSON, PHD

Table 1. Growth rate and feed-to-gain ratio in heat-stressed pigs receiving bacitracin compared to unmedicated controls

	Thermoneutral environment		Heat-stress environment	
	Control		Control	BMD
ADG, lbs	0.98 ± 0.07		0.90 ± 0.11	1.27 ± 0.13*
F/G	2.55 ± 0.16		3.08 ± 0.46	2.04 ± 0.18*

Data represents means ± SE

* $p < 0.05$ compared with controls within temperature treatment

In a second study, the researchers acclimated pigs to diets and rooms for 7 days, then for an additional 7 days they mixed unfamiliar pigs and caused crowding by reducing pen size.² There were 24 pigs in each group.

Pigs fed BMD at 30 grams per ton once again had a better ADG compared to unmedicated, stressed pigs, Nelson says.

Stress linked to gut impairment

“We still have a lot to learn, but research indicates stress can impair performance by adversely affecting gut integrity,” the nutritionist says.

“The gut not only absorbs nutrients; it’s also an important part of the immune system. The gut barrier protects the host from toxins and microorganisms. However, if damaged, especially early in life, pigs can have compromised growth and disease susceptibility throughout the production period,”³ he says.

It’s believed that more extensive damage to the intestine occurs if pigs are stressed at the same time they are developing their gastrointestinal system. Stress, which includes weaning as well as excessive heat or mixing and crowding, activates corticotropin-releasing factor, a stress hormone, which in turn causes excessive activation of mast cells — a type of immune cell.⁴

“This cascade of events leads to gut-barrier permeability. In other words, the gut barrier does a poorer job of protecting the host,” Nelson explains.

Evidence of damage

Evidence of gut-barrier damage was documented in both Zoetis-sponsored stress studies, based on testing of intestinal samples. One of the tests used was transepithelial electrical resistance (TER), a widely accepted method of evaluating gut permeability. Less electrical resistance reflects more permeability — more damage, he explains.

The second test used involves measuring the passage of dextran, a large carbohydrate, across the gut barrier. Dextran generally won't penetrate a healthy barrier to any appreciable amount. Higher amounts of dextran crossing the barrier indicate greater damage, Nelson continues.

“TER and dextran test results indicating better gut integrity were found in both studies among sampled pigs medicated with BMD compared to unmedicated, stressed pigs — and the results were significant ($p < 0.05$).”

The passage of endotoxin across the gut barrier also increases if gut tissue is damaged. In the heat-stress study, the researchers found that serum endotoxin levels were elevated significantly in unmedicated, heat-stressed pigs at 3 and 10 days after initiation of heat stress. However, in pigs fed BMD, those levels were significantly lower ($p < 0.05$) compared to the unmedicated pigs.

BMD, Nelson notes, is not considered by FDA to be medically important in human medicine and therefore does not require a veterinary feed directive. It's one of the few in-feed antimicrobials that can still be used in swine for performance purposes.

For more information, contact Dr. Nelson (daniel.nelson@zoetis.com) or your Zoetis representative.

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¹ Moeser AJ, et al. The effects of bacitracin on gut health and performance in heat-stressed pigs. Proceedings of the Am Assoc Swine Veterinarians Annual Meeting. 2012 March;189-191.

² Moeser AJ, et al. Dietary bacitracin (Albac and BMD) improves ADG and FE in pigs in routine production environments (subjected to mixing and crowding stress). J Anim Sci. 2014;92(2). Midwestern Section Meetings.

³ Moeser AJ, et al. Weaning stress and gastrointestinal barrier development: Implications for lifelong gut health in pigs. Anim Nutri. 2017 Dec.;3(4):313-321.

⁴ Ibid.



notes



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