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The importance of gut health in antibiotic-free pork production

6 critical factors in successful gilt management

Phytogenics and profitability

Keeping you naturally informed | Issue 52 | Swine

Feed your competitive edge


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Feed your Competitive Edge

Pig producers must manage a whole host of factors in order to stay naturally ahead; it is no longer enough to be good at handling pigs. You also need to know about a range of factors including the health of your animals, genetics, optimal housing conditions and nutritional requirements. But above all, you must be able to understand and react to the market forces affecting local and global pork consumption.

Sometimes problems arise in the herd that give obvious symptoms. In a previous job, I saw first-hand the problems caused by a faulty feed mixer. The consequent overdosing of soybean meal in the lactating feed mix meant that the piglets got a bad case of diarrhea. It was obvious that there was a problem, but identifying the problem took a long time and a lot of effort by everyone in the mill. Weight sensors were checked and numerous feed samples were collected and analyzed. Finally, the faulty dosing of soybean was linked back to the transport system and corrective action was taken.

Unfortunately, not all problems are so easy to identify. A slight downward shift in performance might be overlooked as a temporary anomaly, leaving the underlying cause untreated and able to reduce productivity further.

In this issue of Science & Solutions, we highlight the importance of managing all aspects of your pig herd, not just those where the problems are obvious.

One consumer-driven trend currently affecting all livestock production is the reduction or elimination of antibiotics. Without antibiotics, animals experience an additional microbial challenge but producers cannot afford any consequent reduction in performance. Santa-Maria Mendoza takes a closer look at the importance of gut health and how to bridge the performance gap with feed supplements. Phytogenic feed additives can also be used to increase profitability, as Thomas Weiland explains. And Konstantinos Sarantis reminds us that pig production would not be possible were it not for gilts, a group of animals that should be given dedicated attention to ensure production success.

Enjoy reading this issue of Science & Solutions, keeping you naturally informed.

Simon Jensen
Technical Sales Manager - Swine

SCIENCE & SOLUTIONS

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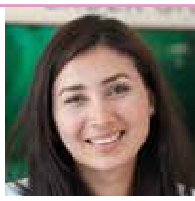
The Importance of Gut Health in Antibiotic-Free Pork Production



Santa Maria Mendoza PhD
Swine Technical Manager

Rising demand for antibiotic-free pork means that producers need to find alternatives for disease management. Understanding how to achieve optimal gut health without antibiotics will not only maintain, but also improve performance.

In the past decade, medium-sized producers in the United States accounted for most of the domestic antibiotic-free (ABF) pork production. Today, larger producers in the US and elsewhere are making the switch to ABF production due to growing consumer demand and the appeal of premium prices. Yet, several challenges can easily compromise profitability, such as higher mortality (especially in the post-weaning phase), variability of market weight, increased days to market, and higher costs of treatment when intervention is required.

In many markets, there are no official guidelines for the rearing of ABF pigs. Each producer has to develop their own program to achieve ABF production, from birth to harvest or during the period of growth being referred to in the claim. Therefore, producers can make their own decisions on adopting and discarding practices and tools to achieve profitability.

The main challenge of ABF pork production is to prevent respiratory and gastrointestinal diseases. In this article, we will discuss strategies to prevent gastrointestinal problems by going through an overview of each component of gut health.

What is gut health?

The gut is commonly understood as the gastrointestinal tract (GIT), the place where digestion and absorption of nutrients occurs. A healthy gut maximizes the extraction and utilization of nutrients for animal growth. The definition of gut health is not well established due to the complexity and overlapping functionality. However, most researchers talk about four main areas: microbiota, intestinal integrity, mucosal immune system, and intestinal morphology (*Figure 1*).

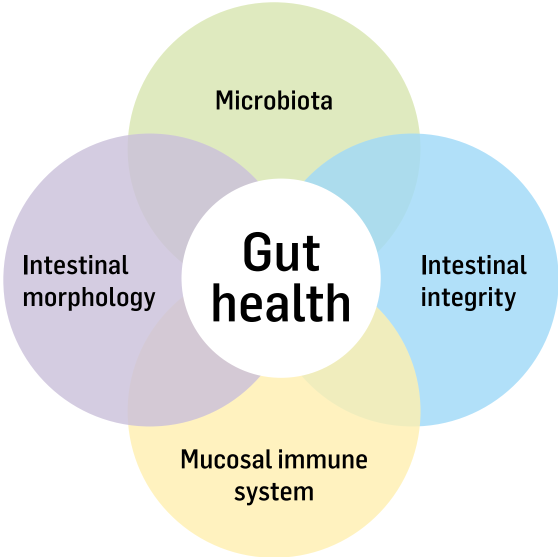
Early establishment of microbiota

The microbiota consists of commensal and pathogenic microorganisms that reside in the lumen of the GIT (*Figure 2*). The diversity and abundance of the microbiota has a direct effect on the health and well-being of the animals. The establishment of microbiota starts immediately after birth. A newborn piglet is naturally inoculated with microbiota from its environment. The microbiota of the sow and the sanitation of the crate play a crucial role in the establishment of microbiota in the piglet. Sanitation and biosecurity play a pivotal role in preventing disease outbreaks.

IN BRIEF

- Producing ABF pork can only be achieved through an understanding of gut health
- The four components of gut health are microbiota, intestinal integrity, the mucosal immune system and intestinal morphology
- Supplements added to the diet from birth can help promote gut health, improving nutrient absorption and growth rates

Figure 1.
The four overlapping components of gut health



Source: BIOMIN

Incorporating probiotics and prebiotics into the diet of lactating sows can facilitate the early colonization of the piglet's GIT with beneficial bacteria. In addition, to sustain this balance between commensal and pathogenic bacteria, supplementation of probiotics, prebiotics, organic acids, and phytogenics is also beneficial. An excess of indigestible protein can negatively affect the microbiota because, when it reaches the hindgut, it alters the pH and creates an environment more suitable for the growth of pathogenic bacteria. Hence, it is recommended to use a highly digestible protein source, reduce the level of crude protein in the diet, or incorporate feed additives that can enhance protein digestibility such as phytogenics or proteolytic enzymes (*Table 1*). The most common enteric problems caused by pathogenic organisms in swine are shown in *Table 2*.

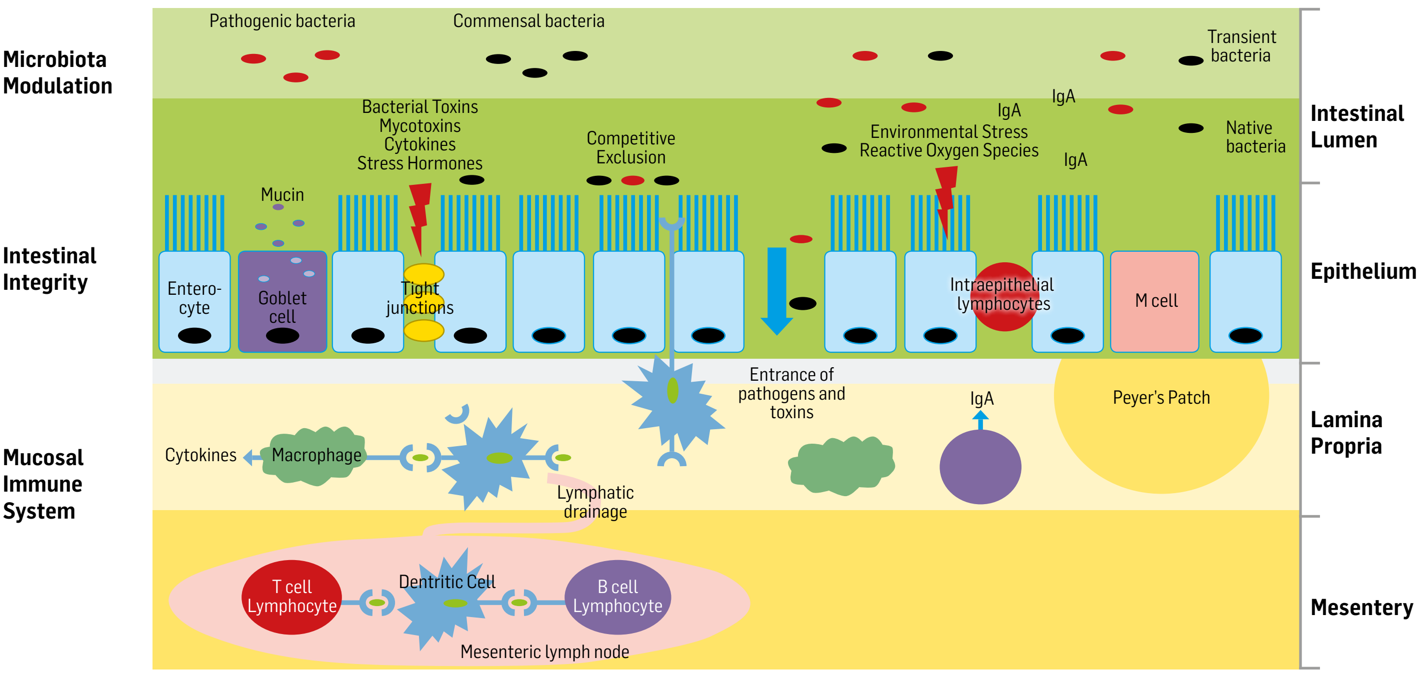
Competitive exclusion

E. coli is one of the most common causes of neonatal and post-weaning diarrhea. It binds to the enterocytes through fimbrial adhesions (such as F18, K88 and K99) and later the *E. coli* proliferates and produces enterotoxins (such as STa, STb and LT). The enterotoxins cause excessive secretion of fluids into the lumen, resulting in diarrhea. Some of the probiotic bacterial strains can attach to the intestinal wall, impeding the adherence of pathogenic bacteria to the wall, preventing them from colonizing the gut. This mechanism is referred to as competitive exclusion.

Preserving intestinal integrity

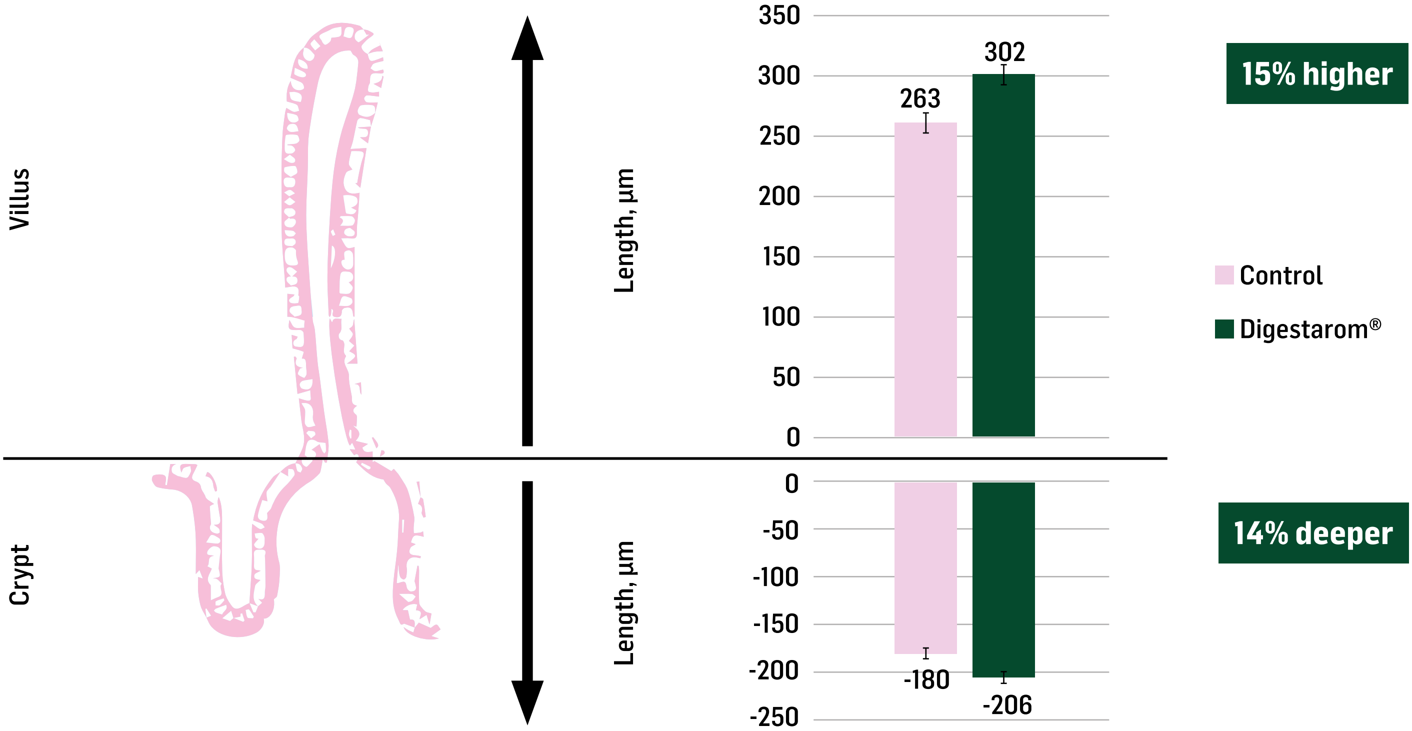
Intestinal integrity is the capability of the epithelial layer to serve as a physical barrier, preventing the translocation of toxins and pathogens while allowing the passage of nutrients (*Figure 2*). The epithelial layer consists of enterocytes joined together by a complex network of proteins known as tight junctions. The enterocytes have the

Figure 2.
Brief description of the components of the intestinal epithelium layer and its surroundings



Source: BIOMIN

Figure 3.
Effect of dietary supplementation of Digestarom® DC Xcel to nursery pigs on gut morphology. Digestarom® DC Xcel increased villi height and crypt depth (*P* < 0.001)



Source: BIOMIN

capability to transport molecules (e.g. ions, amino acids, sugars, and water) in a selective manner.

However, the enterocytes can be physically damaged during starvation, water deprivation, heat stress, or by consuming toxins and rancid fats. Damage to the enterocytes impairs the efficient transport of nutrients. In addition, the tight junctions can also be damaged by mycotoxins, bacterial toxins, cytokines, and stress hormones (*Figure 2*).

Disruption of the tight junctions allows many pathogens and toxins to pass through the epithelial layer, possibly causing a systemic inflammatory response. Preventing any sources of environmental stress, reducing the risk of mycotoxins and bacterial infection, and avoiding the inclusion of rancid fats in the diet can help to preserve intestinal integrity (*Table 1*).

Encouraging cell repair is also beneficial. This can be achieved by providing sufficient antioxidants (vitamins E, C, D and A) in the diet and supporting the activity of the antioxidant systems (glutathione peroxidase, thioredoxin reductase, superoxide dismutase, and catalase). The antioxidant systems are mineral-dependent, thus it is recommended to provide sufficient amounts of the minerals involved in these enzymatic reactions (Se, Zn, Cu, Mn and Fe) to ensure their proper functioning.

A common problem in swine production is the contamination of the diets with deoxynivalenol (vomitoxin). Deoxynivalenol is the most harmful mycotoxin known for swine as it damages the enterocyte and allows the invasion of pathogenic bacteria.

For instance, *Salmonella* invasion increased ten times when diets were contaminated with 750 ppb of deoxynivalenol (Vandenbroucke *et al.*, 2011). Therefore, having a mycotoxin risk management program in place is essential to support intestinal integrity.

Properly developed mucosal immune system

The mucosal immune system is composed of the immune cells (e.g. lymphocytes, macrophages, dendritic cells) that surround the intestinal epithelium, and the sites for recruitment of those immune cells (e.g. Peyer's patch, mesenteric lymph node; *Figure 2*). In mammals, the mucosal immune system is well-organized and sophisticated, working in two ways. The first is a quick but non-specific response (innate) and the second is a long-term, more specific response (adaptive).

Increasing the weaning age allows the mucosal immune system to develop properly. The immune system should be sufficiently able to fight a pathogen without over-stimulation, which causes unnecessary inflammation and is energetically costly. Therefore, adding phytogenic compounds with anti-inflammatory properties, and using omega-3 fats in the diets is recommended to reduce inflammation.

Table 1.
Strategies to improve gut health in an ABF pork production system

Gut health component	Strategy
Microbiota	Add probiotics and prebiotics to the diets of lactating sows to promote the early colonization of the GIT of piglets with beneficial bacteria.
	Add probiotics and prebiotics to the diets of pigs to sustain the population of beneficial bacteria.
	Add Biotronic® Top3 to the diets of nursery pigs to prevent overgrowth of *E. coli* and *Salmonella* in the GIT.
	Add Digestarom® to all dietary phases to improve digestibility of crude protein.
	Add proteolytic enzymes to improve digestibility of crude protein.
	Avoid the use of protein from animal sources.
	Reduce the level of crude protein in the diet (US diets are typically higher in crude protein compared to other regions).
Intestinal integrity	Reduce any source of environmental stress.
	Add Mycofix® to the diet to prevent mycotoxins damaging the epithelium.
	Avoid the use of rancid fats.
	Add sufficient antioxidants to the diet to prevent fatty acids from peroxidizing.
	Add sufficient antioxidants like vitamin E to prevent cell damage.
Mucosal immune system	Increase weaning age (no less than 23 days).
	Vaccinate against pathogens that are a risk on the farm.
	Add Mycofix® to the diet to prevent immune suppression.
	Evaluate the use of IgY antibodies against *E. coli*, *Salmonella* and Rotavirus.
	Add Digestarom® to the diets to reduce inflammation.
	Maintain a higher omega-3: omega-6 ratio in the diet to drive the anti-inflammatory effect of omega-3.

Source: BIOMIN

Table 2.
Most common gastrointestinal pathogens observed in swine

Pathogen	Period of Risk
E.coli	1 to 4 days old
Rotavirus	1 day to 7 weeks
Clostridium perfringens type C	1 to 14 days (rarely older)
Clostridium perfringens type A	2 to 10 days (rarely older)
Clostridium difficile	1 to 5 days (rarely older)
E. coli (ETEC, EPEC)	2 to 3 weeks after weaning
Coronaviruses (TGEV and PEDV)	All ages
Porcine Circovirus Type 2	6 to 16 weeks, occasionally older
Lawsonia intracellularis	From approximately 5 weeks old to young adults
Salmonella spp.	All ages after weaning (rarely pre-weaning)

Adapted from Zimmerman *et al.*, 2010

The use of vaccines helps the immune system to respond faster and more specifically to a pathogen. The vaccines induce the immune system to produce B and T lymphocytes (white blood cells) that are specific for a pathogen.
B lymphocytes produce antibodies that can be released into the surroundings, whereas T lymphocytes possess receptors that identify the pathogen and once activated, they proliferate very quickly to attack the pathogen (*Figure 2*).

Today, there are vaccines for most of the common gastrointestinal pathogens found in swine (*Table 2*). The vaccines for pathogens that are a risk for the nursing pig (*E. coli* and *C. perfringens*) are given to the sow during gestation. In the post-weaning period, common vaccines applied to the pigs are Porcine circovirus 2, *E. coli* (K88, K99, 987P, F41), and Ileitis. It is important to consider that the efficacy of vaccines can decrease due to immune suppression caused

Figure 4.
Body weight of pigs at day 35 post-weaning

Source: BIOMIN

by stressors. Mycotoxins decrease the activity of B and T lymphocytes. For instance, fumonisin has been found to reduce antibody production of *Mycoplasma agalactiae* (Taranu *et al*., 2005). Therefore, a vaccine program must be supported by a mycotoxin risk management program.

Healthy gut, more nutrient absorption

An intuitive way to determine gut health is by looking at the intestinal morphology, which is determined by the length of villi and the depth of crypt (*Figure 3*). In the absence of stressors, the cells lining the intestine can preserve their structure and functionality. The longer length of the villi is interpreted as a larger surface area for nutrient absorption. Intestinal morphology reveals that the first three components are in harmony and that the pig possesses a healthier gut for nutrient absorption and utilization.

Phytogenic compounds have numerous beneficial properties that support gut health, such as antimicrobial, anti-inflammatory and antioxidant effects. A deliberate combination of phytogenic compounds can provide a comprehensive approach to supporting gut health. The phytogenic blend offered by BIOMIN, Digestarom® DC Xcel has shown to increase villus height by 15% (*Figure 3*). The improvements in intestinal morphology had a direct effect on nitrogen retention (nitrogen intake – nitrogen excretions). These results validate that more nutrients were utilized for pig growth, as the pigs supplemented with Digestarom® DC Xcel weighed 1.18kg more in terms of body weight at d 35 post-weaning (*Figure 4*).

Summary

The profitability of ABF pork production can be easily affected during a health challenge. Implementation of a comprehensive gut health program is essential in ABF pork production to prevent enteric challenges. *Table 1* summarizes useful strategies that directly impact each of the components of gut health.

Producers must evaluate and determine suitability of the recommended strategies and their combination in their own production system. BIOMIN offers a combination of innovative products and on-site support to help customers reach their long-term goals.

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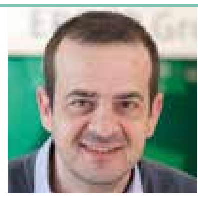
6 Critical Factors in Successful Gilt Management

Gilts are the vehicles for genetic progression in a pig unit, dictating the productivity performance of the entire unit. Particular care must be paid to six critical factors when managing this group of animals.



Konstantinos Sarantis MSc,
Technical Sales Manager Swine

Gilts play a paramount role in farm profitability. Together with primiparous sows, they represent the biggest group in an inventory. Gilt development is directly linked to productivity performance in later life; they are the vehicles for injecting genetic progression on a farm. Here are six critical factors for successful gilt production.

1. Provide a dedicated unit

Producing gilts is different to producing fatteners. This is especially true today, when fewer farms purchase gilts and more grow them on farm. Gilts have different requirements in their management, nutrition and housing; dedicated accommodation, management and labor is required. This can be complicated when the number of gilts does not justify a separate unit. Pen space per gilt, floor type, and humanization (accustoming animals to human presence) are parameters with different requirements compared with fatteners.

2. Planning

Every production system must have a constant and adequate gilt pool according to needs and targets. The size of the gilt pool should cover the target replacement rate. In order to achieve an annual replacement rate of up to 50%, grandparent sow numbers should account for 8% to 10% of the inventory. Farrowing of the multiplication herd should be spread throughout the year so that eligible gilts are available for mating every week.

3. Selection

The first inspection of piglets should be carried out in the first days of life, during tagging. Piglets with abnormalities can be excluded at this point. The final selection should take place at around 100kg of weight. Selection should be carried out where there is enough light and sufficient space for the gilts to move freely. Attention should be paid to the number of functioning teats, growth, conformation and leg structure scores. One person should score every animal and all measurements must be recorded. Consider pool quality and requirements for the size of the next pool. Decide the selection density based on gilt batch quality, size of next pool and future insemination targets.

4. Puberty stimulation

Environmental factors such as mixing, boar exposure and other stressors trigger the onset of puberty by acting on the last part of puberty attainment. In order to have a more synchronized estrus in a pool of gilts, boar exposure should not start earlier than 140 to 150 days.

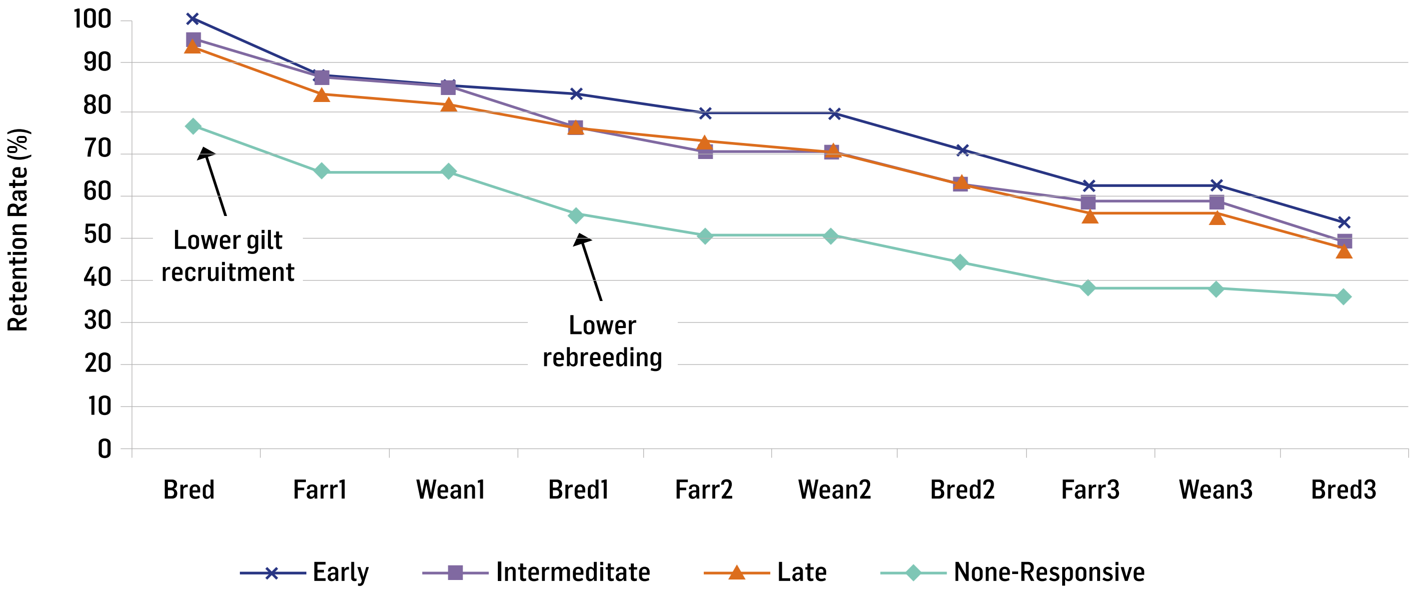
The response of gilts to boar exposure could be an

IN BRIEF

- Gilt development determines the future productivity of the unit.
- Where possible, raise gilts in a dedicated unit, ensure an adequate and consistent gilt pool, and set strict selection criteria for new gilts.
- Use puberty stimulation and insemination targets to synchronize breeding.
- An accurate record should be kept for each animal.

Figure 1.

Retention rate for early, intermediate, late and non-responsive gilts following boar exposure over 12 non-negotiable aspects of gilt development



Source: Beltranena *et al.*, 2004

indication of fertility. If boar exposure is not enough to trigger the onset of heat in gilts, artificial techniques may be used, but these gilts are expected to be less productive, having a lower retention rate and a smaller first litter (*Figure 1*). One quarter of the gilt pool can be expected not to respond to boar stimulation, but part of this sub group should be retained as reserve gilts.

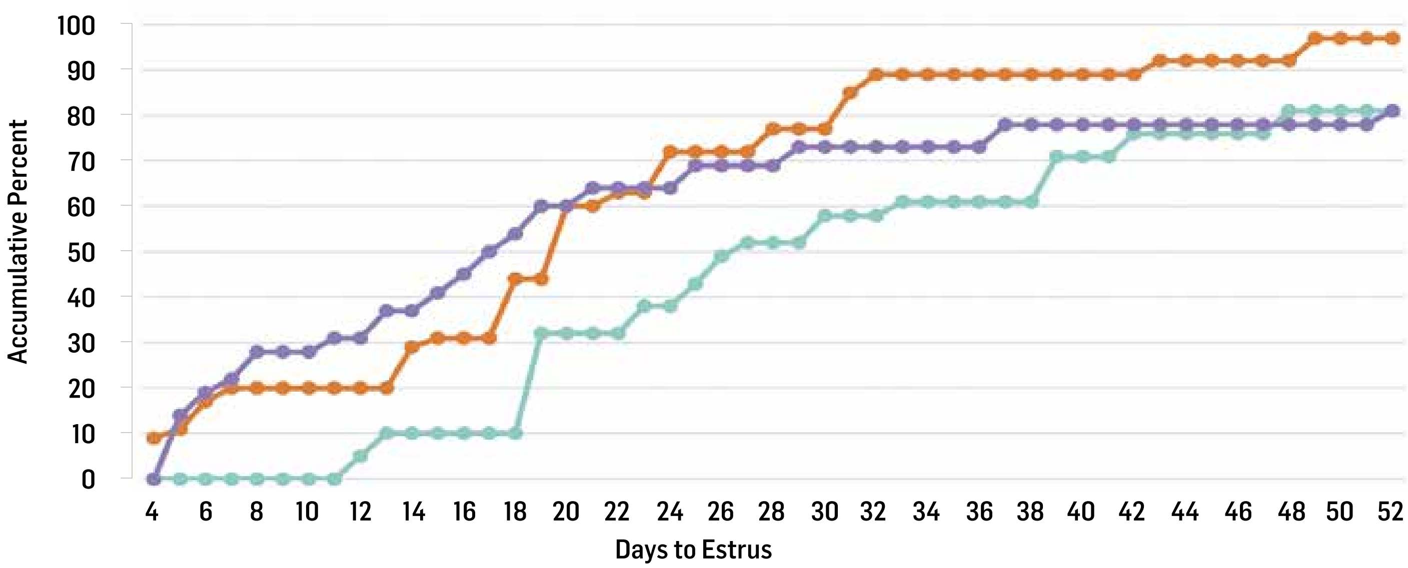
Direct boar contact is more effective than contact through a fence; fewer days are needed for the onset of estrus and estrus occurs in a better distribution (*Figure 2*). Light also plays an important role (*Table 1*).

5. Synchronized breeding and record keeping

Keeping records is the most important tool in gilt management. Once gilts are selected and boar exposure starts, the heat for individual gilts should be recorded. From these records, the next expected heat can be estimated. If the

Figure 2.

Cumulative percentage of gilts attaining a puberty response to direct contact with vasectomized boar in either a purpose built boar stimulation area (orange), in gilt home pens (purple) or fence line contact (green)



Source: Patterson *et al.*, 2002.

Table 1.
Effect of light on puberty onset age

Hours of light per day	0	9 to 10.8	18
	Ntunde *et al.*, 1979		
Number of gilts	12	12	12
Age at puberty, days	193.4[a]	175.6[b]	177.1[b]
Number of corpora lutea	12.3	12.4	13.3
	Hacker *et al.*, 1979		
Number of gilts	6	6	6
Age at puberty, days	200.5[a]	164.8[b]	175.3[b]
Number of corpora lutea	11.3[a]	13.5[b]	12.6[a,b]

[a,b] Means in the same row with different superscripts differ ($P<0.05$)

Adapted from Levis, 2000.

next heat is not regular, the gilt can be withdrawn from the pool as a gilt with an irregular cycle would result in a lower reproductive performance. For the regular cycling gilts, estimating the next heat 21 days in advance allows time for planning. Knowing which gilts are expected in heat facilitates decision making for insemination and grouping for flushing. In addition, synchronization costs may be avoided.

6. Insemination targets

By optimizing insemination targets, reproductive performance, sow longevity and overall profitability are optimized. However, the simultaneous achievement of optimal growth rate, optimal age and optimal gilt back fat depth at insemination is unlikely as these parameters are all interlinked.

Gilts with low growth rates need more days in feed to reach their target insemination weight, resulting in more non-productive days. Conversely, if the growth rate is too high, it could have a negative impact on longevity by causing future locomotive problems, and a negative impact on productivity through excessive body weight loss in the first lactation, resulting in a delayed return to estrus.

Reviewing insemination targets and research work carried out by various genetic companies indicates that insemination weight, with an optimum at 140 ± 5 kg, seems to be the first priority. Serving a second or third cycle would maximize ovary number and litter size at first farrowing. Following target recommendations based on herd genetics is the best strategy. Each genetic company shares mean parameters that optimize profitability according to their genetic line.

These above points do not cover all the parameters that should be considered in a gilt development plan. Issues such as acclimatization for incoming gilts, nutrition, nutrient requirements, feed quality and vaccination program (immunological preparation) are also important aspects. A sound gilt development plan can positively affect subsequent productivity and longevity of the sow, supporting farm profitability.

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What Dozens of Swine Trials Tell Us about Phytogenics and Profitability

Performance and meat quality improvements stemming from phytogenic feed additive application are key to achieving better economic results.

Thomas Weiland Dr.ag.Ing,
Product Manager Phytogenics

Our scientific understanding of the application of phytogenic feeds additives (PFAs) has progressed considerably and continues to do so. At the same time, our practical experience continues to grow. BIOMIN has partnered with many feed and livestock producers to achieve better outcomes through PFA application.

The 2017 BIOMIN Phytogenics Feed Additives Survey identified the top reasons why swine professionals use phytogenic feed additives. BIOMIN has conducted more than 60 commercial swine trials with PFAs in operations across the globe. This article highlights some of the most important commercial trials and their results for sows, weaners and finishing pigs.

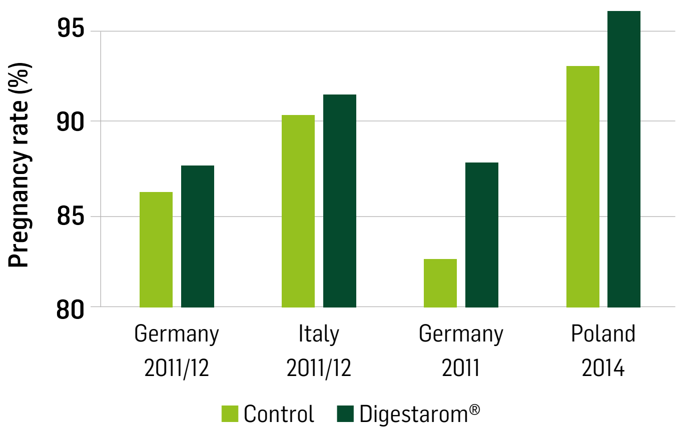
Sow fertility improvement, reduced culling

While obtaining a complete data set that covers the full productive lifespan of sows is difficult to achieve in practice, commercial results reveal multiple benefits derived from PFA supplementation of sow diets.

In trials where Digestarom® was used from day 80-85 of gestation until weaning, or only in the lactation feed, higher sow feed intakes, higher piglet weaning weights (0.25 – 0.7 kg), lower sow body weight losses and shorter wean-to-estrus intervals were reported. In trials where Digestarom® was applied for one or more complete reproductive cycles in gestation and lactation feed, a similar improvement was observed.

The most salient result of these long-term trials was the positive influence of Digestarom® on fertility, as shown in *Figure 1*.

Figure 1.
Digestarom® improves sow fertility in four long-term commercial trials

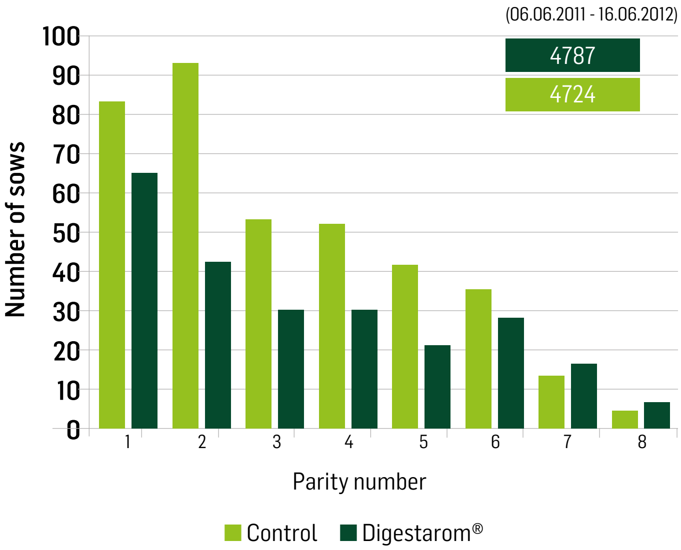


Source: BIOMIN

IN BRIEF

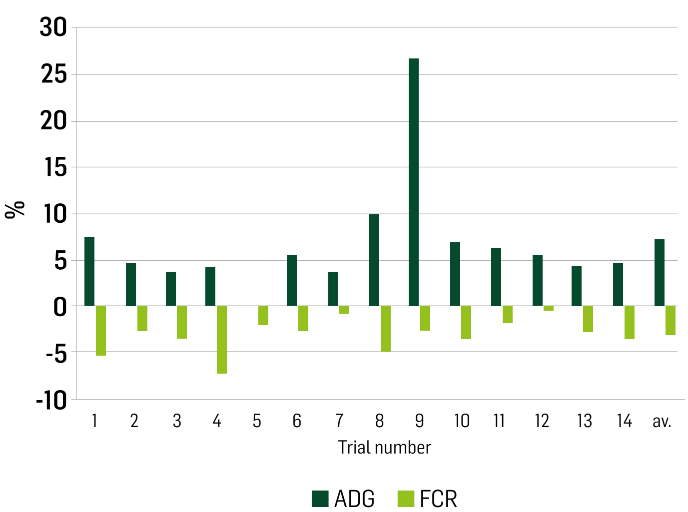
- PFAs can improve sow feed intake, improve piglet weaning weights, lower sow body weight losses and shorten the wean-to-estrus interval.
- Trials with Digestarom® show improvements in fertility, improvements in weight gain and feed conversion in piglets, and improvements in finisher performance.

Figure 2.
Digestarom® reduces culling through better fertility



Source: BIOMIN

Figure 3.
Average Daily Gain (ADG) and Feed Conversion Ratio (FCR) improvement with Digestarom®



Source: BIOMIN

Table 1.
Adjusted weaning weight for 23 days in nursery

Farm	Control		Treatment		Change (kg)	Change (%)
	# of piglets	Average weight (kg)	# of piglets	Average weight (kg)		
1	739	5.83	501	6.88	1.05	15.3
2	1092	6.30	1389	6.74	0.44	6.5
3	156	6.05	198	6.54	0.49	7.5
4*	11397	5.62	828	5.98	0.36	6.1

*Only first parity litters

Source: BIOMIN

Table 2.
Impact on mortality and weaning weight of first parity litters

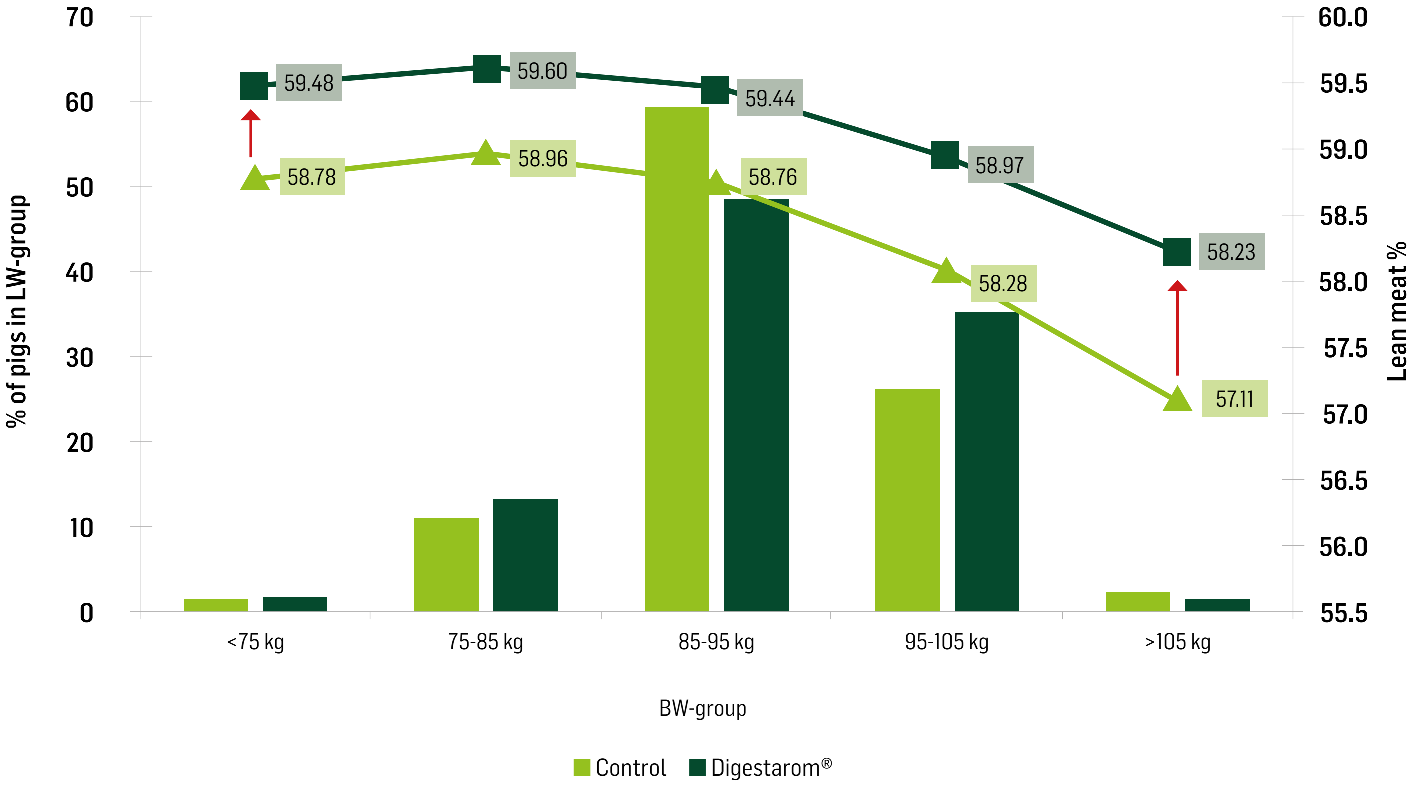
Parameters	Control	Treatment
Number of litters	1098	76
Live born/litter (#)	11.24	11.41
Mortality (%)	7.7	4.5
Weaned/litter (#)	10.38	10.90
Weaning weight (kg)	5.62	5.98

Source: BIOMIN

The enhancement in fertility combined with an equal or slightly higher number of piglets born results in one to two more piglets weaned per sow per year. *Figure 2* highlights results of a trial in a 10,000 head sow unit (two herds with approx. 5,000 sows each) where the fertility enhancement meant less culling for reproductive failures in the Digestarom® herd.

The consequent economic benefits of PFA application in sows stems from numerous sources, including enhanced fertility, more piglets weaned per sow per year, enhanced performance persistence and reduced replacement rates. (Read “Maximizing Sow Productivity using Phytogenics - A Nutritional Approach”).

Figure 4.
Increase in lean meat with Digestarom®



Source: BIOMIN

Growth promotion in piglets

Looking across 14 commercial trials conducted in China, USA, Mexico, Russia, Poland, France, Germany, and the Netherlands, reveals that using Digestarom® in weaner/grower feed results in a seven percent improvement in weight gain and more than a three percent improvement in feed conversion, on average (*Figure 3*).

These data have been obtained partly from trials where in-feed antibiotics were compared against phytogenics. (For further discussion of head-to-head comparison of growth promotion of sub-therapeutic antibiotic application vs. PFAs in pig diets, see "Proven Tools to Replace AGPs").

The ability of Digestarom® to support growth promotion stems from its multi-component mode of action. Scientific trials have shown that Digestarom® enhances the digestibility of feed ingredients, especially of crude protein, by almost 10% (Maenner *et al.*, 2011). The same publication reported a modulating effect on the gut microbiota. Other scientific studies have shown that Digestarom® is capable of reducing inflammatory processes in the gut tissue while also stimulating one of the mayor cell defense mechanisms, the Nrf2 pathway (Gessner *et al.*, 2013).

Combatting scour in piglets

Unspecific diarrhea poses health and performance problems in piglets. Digestarom® P.E.P. liquid is a phytogenic product specifically developed for treating diarrhea in piglets.

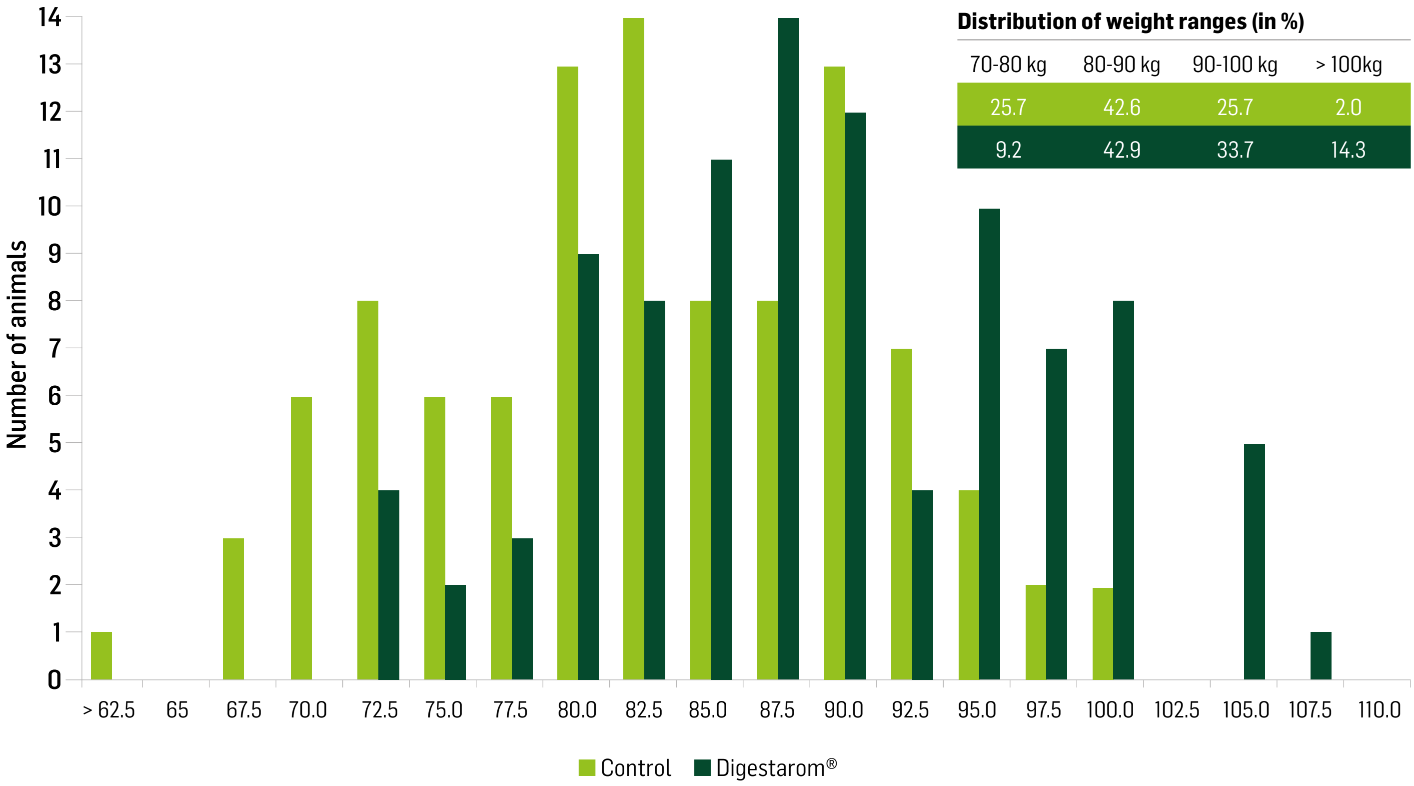
Trials in South America, Europe and Asia indicate that this phytogenic liquid product used as a preventive application in newborn piglets has the potential to increase weaning weights and to lower pre-weaning mortality as well as the incidence of unspecific diarrhea in piglets, as shown in *Tables 1* and *2*.

Performance improvements in finishers

BIOMIN has conducted more than 20 commercial trials of Digestarom® in finisher diets in Asia, Europe and the US, comparing outcomes against (1) diets with no other additives, (2) diets containing antibiotic growth promoters (AGPs) and (3) more recently with diets containing Ractopamine. (The latter, while banned for pigs in the EU and parts of Asia, is still permitted in certain areas).

Zootechnical performance parameters like weight gain or feed efficiency were the most commonly observed and recorded parameters. Due to different trial set ups, very different feed ingredients, and great variability in the

Figure 5.
Digestarom® improves distribution of weight categories



Distribution of weight ranges (in %)

70-80 kg	80-90 kg	90-100 kg	> 100kg
25.7	42.6	25.7	2.0
9.2	42.9	33.7	14.3

Source: BIOMIN

starting weights, a direct comparison of the trials results is not feasible. Nevertheless, ADG improvements of 3.5% to 9%, and reductions in FCRs of 2% to 6% are comparable with those observed in piglets. In addition to zootechnical parameters, lean meat percentage, carcass characteristics, meat quality and stock uniformity have a major impact on the profitability of pig finishing.

Even with a wide variety of feed ingredients, in different climatic conditions and production technologies, the use of Digestarom® in finishers has demonstrated its economic advantages for the producer, accomplishing an average return on investment of 3 – 7:1.

More lean meat in finishers

Figure 4 shows a commercial trial that included ten Austrian farms in which Digestarom® improved average lean meat percentages by 0.81 points.

Uniformity improvements in finishers

Unfortunately, herd uniformity was not recorded in the majority of the commercial finisher trials. To highlight one particular example where it was observed, *Figure 5* shows the results of a commercial trial in Germany where more than 90% of the Digestarom® group were in the highest three weight categories compared to less than 75% in the control group.

Conclusion

Although not all standards of scientific trials are met in commercial trials, the importance of the latter in demonstrating the value of PFAs under different production conditions, at different production levels and under different climate conditions should not be underestimated.

Commercial trials in pigs at various production stages indicate the value of Digestarom® to swine producers in geographies throughout the world.

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