Issue 40 • Swine
A magazine of Biomin®

Science & Solutions

Photo: M2K7

Feed Efficiency and Growth Performance

Photo: Onnes

3 Sow Milk Contaminants

Photo: fotostorm

What's Wrong With My Pigs?

Part 7: Conjunctivitis

Editorial

Success in a New Era

In December 2013, the US Food and Drug Administration (FDA) announced long-awaited changes on the use of antibiotics deemed medically important to humans in food-animal production. The 3-year transition period has come to an end. US pork producers should now be ready to cease sub-therapeutic usage of antibiotics and adopt a more sustainable way to improve animal health. Numerous countries around the globe have made or are in the process of making a similar shift, and BIOMIN has been there each step of the way for more than 3 decades.

At BIOMIN, we are devoted to providing natural solutions that support animal health and enhance growth. In this issue of **Science & Solutions**, we show the potential of phytogenic products at the most vulnerable phase of pork production: the post-weaning period. We focus on how to improve feed conversion and share the latest trial results demonstrating feed efficiency gains using Digestarom®. Reducing feed conversion ratio helps to extract the most nutrients from your feed and drives profitability.

Optimizing piglet performance and health is an essential step to ensure future profits. That is why you may want to consider three frequently overlooked threats found in sow milk today —somatic cell count, endotoxins, and mycotoxins— and evaluate preventive measures.

Finally, we detail the potential causes of conjunctivitis, a common eye problem that may indicate more serious underlying health issues that can reduce performance, and the actions producers can take to address this problem.

New regulations and health challenges will keep coming. The science driving innovation and discovery today will give us the tools to adapt and succeed in the future.

Sincerely,

Santa Maria Mendoza

S. Maria MENDOZA
Technical Manager Swine

Contents

Science & Solutions is a monthly publication of BIOMIN Holding GmbH, distributed free-of-charge to our customers and partners. Each issue of **Science & Solutions** presents topics on the most current scientific insights in animal nutrition and health with a focus on one species (aquaculture, poultry, swine or ruminant) per issue.
ISSN: 2309-5954

For a digital copy and details, visit: http://magazine.biomin.net
For article reprints or to subscribe to **Science & Solutions**, please contact us: magazine@biomin.net

Editor: Ryan Hines
Contributors: Vladimir Borges, István Csutorás, S. Maria Mendoza, Thomas Weiland
Marketing: Herbert Kneissl, Cristian Ilea
Graphics: Reinhold Gallbrunner, Michaela Hössinger
Research: Franz Waxenecker, Ursula Hofstetter
Publisher: BIOMIN Holding GmbH
Erber Campus, 3131 Getzersdorf, Austria
Tel: +43 2782 8030
www.biomin.net

Photo: Igor Stramyk

Improving Weaning Piglets' and Growth Performance

By **István Csutorás**, Product Manager Phytogenics

The push for antibiotic reduction has heightened the need for better gut performance. Phytogenic feed additives offer a way to achieve better feed conversion in weaning piglets.

Feed Efficiency

"Good gut health is the best growth

Antibiotic growth promoters (AGPs) have been widely used since the mid twentieth century. Though considered cheap and easy to use, AGPs have attracted greater scrutiny from producers, regulators and consumers in recent years. Today's search for sustainable alternatives to improve animal performance and support animal health while maintaining profitability and minimizing environmental pressure put further stress on the swine industry.

AGPs lose favor

This trend started in 2006 with the European Union's AGP ban. Real efforts to reduce antibiotics in livestock have sprung up across the globe. Indonesia banned several AGPs in 2015. The US has implemented its veterinary feed directive (VFD), and Canada has banned AGPs from 2017.

Fortunately, innovative tools to cope with these challenges are already available.

Better gut performance

"Good gut health is the best growth promoter," according to Franz Waxenecker, Development Director at BIOMIN. Maintenance of a stable and strong intestinal environment is a must for efficient animal performance. Phytogenic feed additives (PFAs, or botanicals) have gained significant interest due to their ability to improve pig performance by supporting the maintenance of a healthy gut.

Plant power

Phytogenic feed additive products consist mainly of herbs, spices, volatile and non-volatile plant extracts and their active compounds. Some of the well-known bioactive molecules of PFA are anethol, carvacrol, cinnamaldehyde, eugenol, thymol etc., most of them having phenolic properties.

Improving feed conversion

Thanks to the increased palatability, higher saliva amounts and higher digestive enzymes secretion, the main mode of action of PFAs is enhancing nutrient digestibility, ultimately delivering better feed conversion and supporting overall profitability. PFAs are capable of supporting pathogen control and able to beneficially modulate the intestinal microbiota in direct and indirect ways.

Gut modulation

PFAs indirectly modulate intestinal microbiota by enhancing digestibility and leaving less nutrients available in the gastrointestinal tract for pathogens. Low digestibility results in a large amount of undigested feed in the gastrointestinal tract, which can let undesired microbes to grow and ferment those nutrients.

These metabolites, such as biogenic amines and ammonia are not only result of the unwanted way of degradation of nutrients but also can be toxic for the animals. This process can result an imbalance in the gastrointestinal tract, leading to inflammation, finally resulting in suboptimal performance and diarrhea. The efficacy on nutrient utilization by enhanced production of digestive secretions and enzymatic activity can be completed with positive effects on the morphology of small intestinal tissues (increased villus height, increased goblet cell counts, etc.).

These effects on gastrointestinal morphology can further help to increase the nutrient digestibility, thus the economic results. PFAs directly modulate intestinal microbiota by exerting direct antimicrobial activity on potential pathogens.

Piglet trials

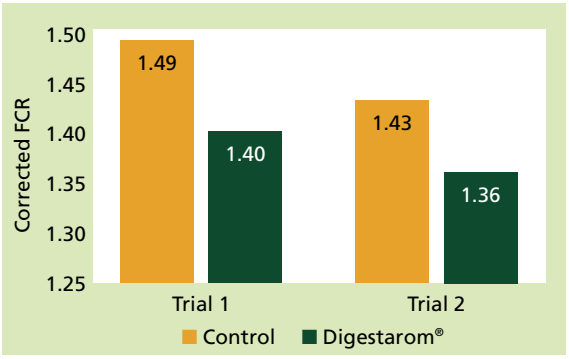
Two consecutive studies were conducted to evaluate the effect of a phytogenic feed additive (Digestarom® Grow) on the performance of weaning piglets under commercial conditions. The negative control groups received a standard diet, which contained no antibiotic

István Csutorás
Product Manager Phytogenics

promoter".

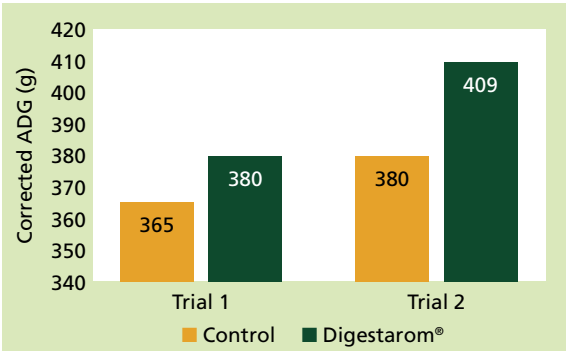
Photo: hocus-focus

Figure 1. Digestarom® improves feed conversion ratio.



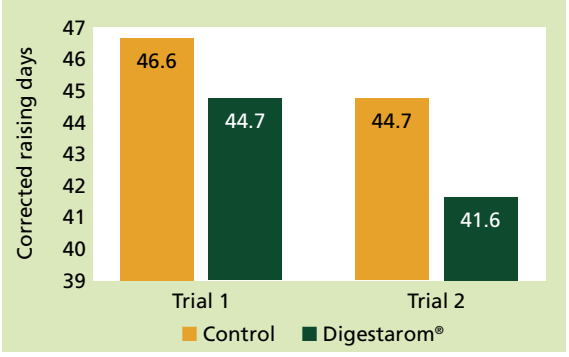
Source: BIOMIN Trials

Figure 2. Digestarom® improves corrected average daily gain.



Source: BIOMIN Trials

Figure 3. Digestarom® improves corrected raising periods.



Source: BIOMIN Trials

or natural growth promoter. The diet of the trial groups were supplemented with Digestarom® (300 g/t). The trial period was 46 days in both trials. Production data were recorded in all groups, such as live weight, feed intake, daily weight gain, feed conversion ratio and mortality.

The main mode of action of PFAs is enhancing nutrient digestibility, ultimately delivering better feed conversion and supporting overall profitability.

Results

The results of the studies showed that supplementation of the diet with Digestarom® enhanced the daily weight gain and improved the feed conversion of the piglets. To make the data more easily comparable, we corrected the performance of all groups to 23 kilograms of end live weight.

The animals fed Digestarom® achieved 1.40 kg/kg corrected FCR in the first and 1.36 kg/kg corrected FCR in the second trial, while the control groups had 1.49 kg/kg and 1.43 kg/kg corrected FCR respectively (*Figure 1*). The corrected daily weight gain of the Digestarom groups were 380 and 409 gram, while in the control groups these gains were 365 and 380 grams per day, respectively (*Figure 2*).

Conclusion

Good nutrient digestion and absorption are a key to better feed efficiency. The two trials demonstrated the efficacy of Digestarom® and confirmed the importance of considering the inclusion of a PFA in piglets' diets, especially to improve the performance in gain and efficiency in converting feed into animal protein products.

In summary, PFAs can be considered as real alternatives of traditional antibiotics. Additionally they can be used sustainable nutritional tools to maintain the gut integrity thus improve the animals' performance in critical situations.

Photo: zhuzhu

3 Contaminants to Watch for in Sow Milk

By **Thomas Weiland**, Product Manager Phytogenics

Somatic cell count, endotoxins and mycotoxins are seemingly forgotten threats in sow colostrum and milk that may negatively affect piglets.

Generally considered the ideal feed for neonatal mammals, mother´s milk is the exclusive nutrient source during the first days of a piglet´s life and the main nutrient source during the suckling period. The benefits of milk and colostrum cannot be overstated. It is rich in energy (lipids, lactose), highly digestible protein, provides maternal immunity and affords systemic and mucosal protection.

Despite the benefits, sow's milk may conceal one or several threats to piglets. The emergence of neonatal porcine diarrhea syndrome (NNPDS) in many countries suggests that these threats might deserve closer attention. Comparisons with the dairy cow industry can be illustrative.

1. Somatic cell count

Somatic cell count (SCC) is a key quality parameter of cow's milk. It has an effect on the market price of milk. The somatic cell count fluctuates in line with the presence of inflammatory processes. In both pigs and cows, the somatic cell count can indicate the general health status, intestinal and udder health and the milk formation process.

Unfortunately the number of investigations related to SCC in sow's milk is limited and the reported levels differ greatly. Levels of 2 to $3x10^6$ cells/ml in colostrum and $5x10^5$ cells/ml in mature milk or higher seem to be quite normal. In the first week after farrowing the SCC typically falls by 10% and remains stable. Recently it has been investigated the influence of SCC on piglet body weight (*Table 1*). In light of these significant correlations, the SCC should be monitored more closely for its negative effects in neonatal piglets.

Table 1. Sow's milk SCC is correlated to lower piglet body weight (BW).

Specification	BW day 1 (kg)	BW day 7 (kg)	BW day 14 (kg)
SCC 24 h p.p.	-0.12	-0.12	-0.19*
SCC day 7	-0.28**	-0.21**	-0.16
SCC day 14	-0.23**	-0.23**	-0.22**
SCC day 21	-0.30**	-0.24**	-0.26**

*Significance level $P \leq 0.05$, **significance level $P \leq 0.01$

Source: Skrzypczak et al. *(2012)*

2. Endotoxins

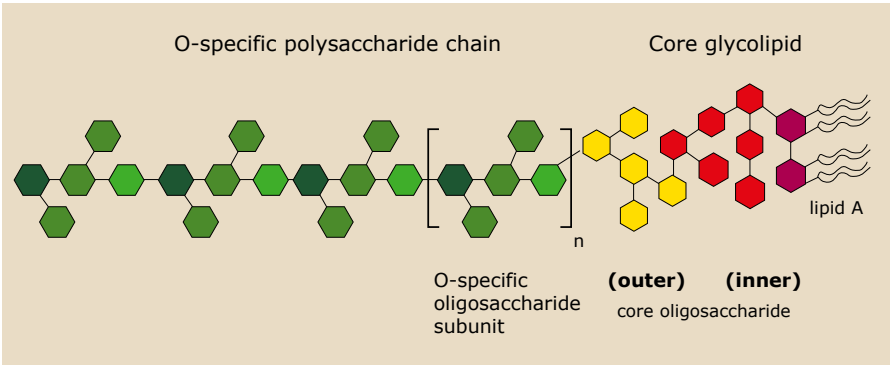
Endotoxins are thermostable lipopolysaccharides (LPS) found mainly in the cell walls of Gram-negative bacteria i.e. *E.coli*, *Salmonella*, etc. and are released when the bacterium dies in the host's body. Pigs are continuously exposed to endotoxins present in the ground, air, water and the gastrointestinal tract. Once LPS enter the bloodstream, they can cause fever, chills, shock, leukopenia and a variety of other symptoms, depending on the condition of the infected organism. Endotoxins can be involved in the occurrence of mastitis, metritis and agalactia (MMA) and acute respiratory distress (PPD) syndromes. Lipopolysaccharides can also

Endotoxins can be involved in the occurrence of mastitis, metritis and agalactia (MMA) and acute respiratory distress (PPD) syndromes.

This article originally appeared in Pig International

Figure 1. Aflatoxins are naturally-occurring mycotoxins produced by the fungi species *Aspergillus flavus* (pictured) and *Aspergillus parasiticus*, which are a major concern to the dairy and pig industries.

Figure 2. Gram-negative bacterial endotoxin (lipopolysaccharide) structure.



increase a pig's sensitivity to deoxynivalenol (DON), a major mycotoxin that can cause vomiting, diarrhea, and weakened immune function.

LPS content has been used as a quality parameter in heat treated milk for human consumption, set at a maximum 400 EU/ml. To date, there is little research on endotoxin presence in colostrum and mature sow milk as well as on effects of endotoxin challenged colostrum or milk on piglet growth.

In this context the findings of Shreeve *at al.* (1970) that piglets from sows immunized with E. coli extract, developed hypersensitivity against different endotoxin challenges, are interesting as well.

3. Aflatoxins

Aflatoxins are naturally occurring mycotoxins, produced by the fungi species *Aspergillus flavus* and *Aspergillus parasiticus*, of major concern to the dairy industry. Aflatoxin B1 is the most carcinogenic natural compound known to date. Aflatoxin M1, the natural metabolite of Aflatoxin B1, has a carry-over rate of 1% to 6% in milk. Concentrations of Aflatoxin M1 above 0.05 µg/kg in the EU or 0.5 µg/kg in the US are considered undesirable and must be discarded—representing lost revenue and extra disposal costs for dairy producers.

It is young pigs and pregnant sows that are often more affected than other stages. Aflatoxin effects can include general symptoms of slow growth, reduced feed intake and immune suppression. Liver toxicity and kidney inflammation and systemic hemorrhages are also characteristic of aflatoxin effects. The damage aflatoxins can cause in suckling piglets is still not investigated.

Addressing threats

Given the complex nature of the harm to piglets that includes some well-documented risks and other, less well researched potential threats, caution is advised. It may be helpful to take a cue from the dairy cow industry in identifying appropriate preventive measures.

There are some steps that swine producers can take to mitigate the SCC-endotoxin-mycotoxin triple threat. Biosecurity and robust mycotoxin risk management, including strategies to control endotoxins are important.

Modern mycotoxin binding and deactivating agents can help to control the endotoxin risk as well.

Our own trials have shown that using certain complex phytogenic feed additives in all sow feed can improve zootechnical performance parameters of sows, as well as quantity and quality of sow milk produced, reducing SCC particularly in the birth close period.

Hopefully, with these measures in place and further research on these topics, the swine industry will see sows producing more and better milk and piglets develop into more healthy and profitable animals.

Cut & Keep Checklist

What's Wrong With My Pigs?

Part 7: Conjunctivitis

Conjunctivitis can be caused by a variety of reasons. Here we describe some of the risk factors related to it and some useful tips for the differential diagnosis of this pathology. Conjunctivitis is the inflammation of conjunctiva, a thin and delicate membrane that covers the eyeball and lines the eyelid.
Conjunctivitis is an extremely common eye problem because the conjunctiva is continually exposed to micro-organisms. Also, environmental agents can cause infections or allergic reactions.
The clinical signs can be seen in one or both eyes and, if caused by infection, can be very easily transmitted to other animals due to close physical contact. Outbreaks may be associated with conjunctivitis infection Chlamydiae but there may be other manifestations of diseases such as influenza, Aujeszky's disease and Porcine Reproductive and Respiratory Syndrome (PRRS), among others. However, clinical and laboratory results are necessary to obtain the correct diagnosis.
Disinfection with most common detergents and disinfectants will inactivate Chlamydiaceae. Current infections are being treated with antibiotics. Generally, tetracyclines are the first antibiotics of choice to control it. In case Chlamydia suis is resistant to those, quinolones (enrofloxacin) or macrolides (erythromycin) could be the second choice.
Facilities with poor ventilation and poor environmental hygiene can also cause conjunctivitis. Improvement in environmental conditions is the key to solve the problem. The presence of some mycotoxins, especially trichothecenes, are sometimes related to this problem.
From this group, the most frequently observed are deoxynivalenol (DON) and T-2. In addition to the signs of conjunctivitis, intoxicated animals with trichothecenes will show other symptoms like vomiting, decrease in feed intake, reduced weight gain, weight uniformity in lots and high incidence of diarrhoea. The use of strategies for inactivation of mycotoxins, especially from the trichothecenes group, is important to control the situation.

Checklist	Corrective action
Potential cause: MYCOTOXINS (Trichothecenes)	
• Chronic poisoning • Positive raw materials ELISA, feed HPLC	• Check raw materials and feed • Use Mycofix at suitable inclusion rate
Potential cause: ENVIRONMENT	
• Smell and lacrimation • Presence of high concentrations of toxic gases (NH3 and H2S) • Excess of powder and dust	• Adjust the conditions of hygiene, ventilation and relative humidity
Potential cause: CHLAMYDIA SUIS	
• Enteritis, pneumonia, pleuritis, pericarditis, arthritis, lameness, orchitis, uterine, infection, late abortion, stillbirths, mummification • Carrier pigs, flies, dust, bird droppings	• Biosecurity • Hygiene • Disinfection • Antibiotics
Potential cause: PRRS	
• Periorbital oedema • RT-PCR, ELISA, Indirect Fluorescent Antibody Test (IFAT)	• Biosecurity • Vaccination
Potential cause: AFRICAN SWINE FEVER (ASF) AND CLASSICAL SWINE FEVER (CSF)	
• Vomiting • Epidemiology and clinical signs	• Biosecurity • Stamping out
Potential cause: INFLUENZA	
• Fever, lethargy, coughing, dyspnoea, infertility, decreased litter size, abortion, stillbirths • Epidemiology, clinical signs • RT-PCR and/or ELISA	• Vaccination • Anti-inflammatory drugs
Potential cause: AUJESZKY'S DISEASE	
• Keratoconjunctivitis, retinitis, optic neuritis, rhinitis, laryngitis, tracheitis, necrotising tonsilitis • Epidemiology, clinical signs, dog or cat dead bodies • PCR, ELISA	• Biosecurity • Vaccination
Potential cause: MYCOPLASMA HYORHINIS	
• Reddening of conjunctiva, crusting of eye lid margin by exudation, tearing, polyserositis, rough hair, slight fever, depression, reduced FI, respiratory distress, abdominal cramp, lameness and swollen joints • PCR	• Antibiotics

References are available on request

For more information, visit **www.mycotoxins.info**

Mycofix®

Absolute Protection

With 3 combined strategies

- ADSORPTION
- BIOTRANSFORMATION
- BIOPROTECTION

*Authorized by EU Regulations No 1115/2014, 1060/2013 and 1016/2013 for the reduction of contamination with fumonisins, aflatoxins and trichothecenes.

mycofix.biomin.net

Naturally ahead

Biomin®