Published Article

Weaning piglets without antibiotics

60-80% of antibiotics are used for digestive problems. The period after weaning is known for its regular antibiotic application and could be a perfect target for an important step in antibiotic reduction.

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Restrictive use of antibiotics is no longer an exception, but a global target. Besides the EU, also the US and Asia, started to implement changes. To restrict antibiotic usage (and ZnO in EU) without compromising animal health, welfare and economic viability, it is crucial to understand the complex mechanism that maintains intestinal health and to support and optimise this mechanism with non-antibiotic solutions. Because of the complexity of the intestinal system, scientists and veterinarians agree that one single non-antibiotic molecule has its limits in controlling the overall situation especially with weaning stress, which involves interactions between many factors.

Stable microbiome and pathogen bacteria

A stable intestinal microbiota has important protective and metabolic functions and a major role in the immune system and development of the epithelium and natural defence mechanisms against pathogens. This vast array of intestinal bacteria responds to stress but is also subject to antibiotic induced disturbances.

Various studies confirm a stimulating effect of butyric acid (BA) and medium chain fatty acids (MCFA) on beneficial microflora in pigs while decreasing the number of coliforms (*E. coli*). To guarantee the presence of BA in the intestine, recent attention goes to esterified forms of BA. Similar to triglycerides, they automatically bypass the stomach and the butyric acid molecules are enzymatically released (mainly from di- and tributyrins) by lipase into the small intestine. Polar mono-butyrins pass the hydrophilic membrane of pathogenic bacteria (*E. coli, Salmonella, Clostridium perfringens*), disturbing their metabolism and inactivating them. Mono-glycerides work immediately and are much more antibacterially active compared to the original acid (*Table 1*), which is important when the microbiome is stressed during the weaning process. The effect of MCFA and essential oils, both strong in selective antimicrobial activity, is well documented.

Barrier function and tight junctions

Beyond the compromised digestive and absorptive capacity, the intestinal barrier function and tight junctions' quality are also deteriorated at weaning. BA induces the production of host defence peptides and repair of the intestinal tract architecture through an increased cell proliferation, tight junction assembly and immune cell regulation. At weaning, the activation of the intestinal immune system and up-regulation of genes of pro-inflammatory cytokines lead to a significant inflammatory reaction, resulting in intestinal mucosal injury and dysfunction. The energy needs for an activated immune system increases (>20%). The anti-inflammatory properties of BA and alkaloid rich plant extracts can largely temper the inflammatory reaction, which contributes to an energy saving and growth promoting effect.

PHOTO: RONALD HENKE

Table 1 – MIC (in vitro): acid vs mono-esters

MIC	*S. Typhimurium*	*E. coli*
Butyric acid	1:400	1:400
Mono-esterified butyrins	1:1600	1:800

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Weaning stress is also related to increased reactive oxygen species (ROS). Glutathione, positively influenced by BA, plays a critical role in many biological processes as major redox-buffer in mammalian cells. An intensive renewal process of the intestinal cells (2-7 days) requires adequate energy supply. SCFA and MCFA stimulate mitosis, maturation and differentiation of intestinal mucosal cells and inhibit their apoptosis.

Results from the field

Three trials set out to illustrate the effectiveness of Lumance, a precise and synergistic combination of SCFA and MCFA, plant extracts and essential oils, in a real farm situation on clinical symptoms of post weaning diarrhoea (PWD) and performance of the pigs without antibiotics (for PWD) and in more difficult situations without both – antibiotics and ZnO.

Trial 1: Non-antibiotic for PWD

A group of 1600 piglets (400 piglets per group, 2 repetitions) was set up in a field trial at an integrator farm in Bulgaria. Piglets in the trial groups T1 and T2 were treated with the product in the feed from weaning (D30, 8 kg BW) for 20 days onwards (respectively 1.5 kg/T and 1 kg/T) and ZnO (respectively 3000 ppm and 2000 ppm). Control groups C1 and C2 received, in the feed from weaning, respectively, Colistin (2 kg/T) for 10 days & ZnO (3000 ppm) for 20 days. Clinical symptoms of PWD and average daily weight gain (ADWG) from D30 till D94 were monitored. No symptoms of PWD or increased mortality were observed in treatment or control groups. The results (*Figure 1*) show increased ADWG in T1 with 65 g and T2 with 89 g respectively.
Additionally, pigs of T1 and T2 achieved slaughter weight (107 kg) seven days earlier (at 150 days).

Trial 2: Non-antibiotic and ZnO-free feed for PWD

In a field trial (Spain) 40 piglets in the trial group received the product at 3 kg/T in the feed (D21- D62), starting from the day of weaning (21 days, 6 kg). The control group (40 piglets) was on a regular treatment with Neomycin 150 ppm (D21- D42) and ZnO (2500 ppm from D21-D42 and 1500 ppm from D42-D62). Live weight (*Figure 2*), FCR, mortality and PWD-symptoms were monitored from D21 till D62.
ADWG was similar for both treatments. FCR: Control = 1.45; Lumance =1.39. Mortality: Control = 2.5%; Lumance = 0%. PWD symptoms were observed in 1 box of the control group.

Trial 3: Non-antibiotic and ZnO-free feed for PWD vs with or reduced antibiotic and ZnO-feed – preliminary results

In a large field trial (Spain) 2423 piglets/four treatments/four repetitions per treatment: T1 (576 pigs) – only Lumance (3kg), T2 (608 pigs) – Lumance (3kg) + ZnO 1500 ppm, T3 (616 pigs) – Lumance (3kg) + Apramycin, C1 (623 pigs)- regular treatment with ZnO + Apramycin). All treatments started from day of weaning (21d, 5.8 kg). PWD and ADWG from D21 till D48 were monitored. No differences in ADWG or quality of the pigs were observed between groups at the end of the period. The difference in ADWG between the best performing group and the weakest group is only 14 g per piglet. (*Figure 3*). In terms of general results (based on the preliminary data) the results are comparable between the different scenarios.
The Lumance concept supports the mechanisms of intestinal health: strong tight junctions, long and healthy villi, balanced microflora, low levels of ROS and inflammatory cytokines. It prevents PWD similarly to standard antibiotics, but in addition it has the potential to improve animal performance and even effectively prevent PWD and keep performance in the most difficult scenarios without antibiotics and ZnO. ■

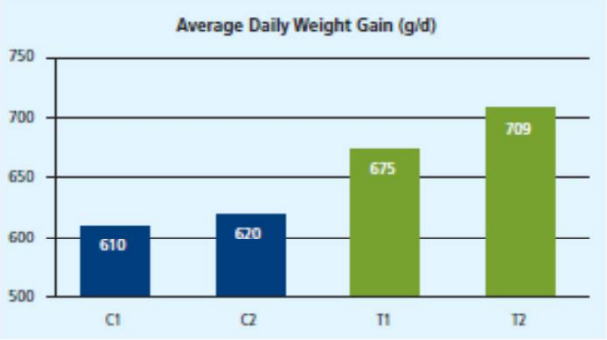

Figure 1 - Average daily weight gain (g/d) for the antibiotic control groups (C1 & C2) and the Lumance groups (T1 &T2).

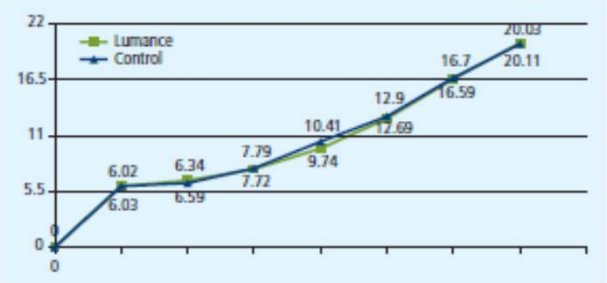

Figure 2 - Performance data (kg LW) of control versus Lumance.

References available on request

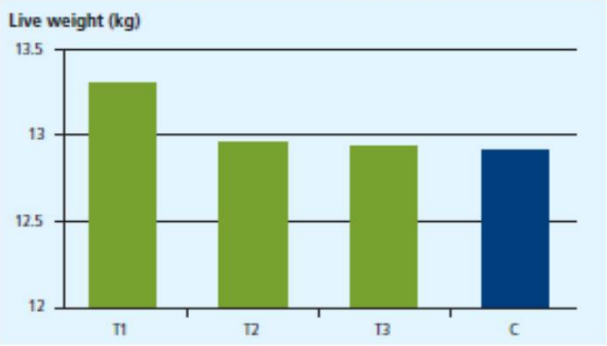

Figure 3 - Live weight (kg) of the piglets at the end of the trial (D48).