Phytogenics

Enhancing growth, naturally

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Phytogenics are materials of plant origin such as herbs, spices, essential oils or other plant extracts. They have been used for thousands of years for everyday purposes as well as for their specific properties as natural remedies.

Phytogenics express a wide range of biological activities including antimicrobial, anti-inflammatory and antifungal. With the ban on antimicrobial growth promoters (AGPs) in the EU and other countries, the search is on for alternatives. Many studies have been conducted to look into replacements for AGPs.

In the case of phytogenics, the anti-inflammatory and gut microbiota modulating effects in particular were researched and the use of these additives as a replacement for AGPs has increased significantly in recent years.

Benefits of β-agonists in finishing pigs

In finishing-pigs, the dietary use of a certain β-agonist improved growth performance at different feeding durations from six days, whereas carcass composition was...
improved at longer feeding durations. Carcass weight and dressing percentage also increased as a result.

What one has to bear in mind is that in order to have a considerable effect, the nutrient concentrations in the diet must be increased. Further, the protein composition of the diet has to be adjusted. In particular, the first-limiting amino acid, lysine, has to be available to the animal in sufficient amounts for the β-agonist to have an effect on growth performance and leanness. These adjustments ultimately make the feed more expensive.

Why β-agonists?

In recent years, China and Russia have banned the import of meat containing residues of certain β-agonists, as it was deemed unfit for human consumption. In 2013, Russia restricted meat imports to those certified free from a particular β-agonist.

Interestingly, China has also banned the use of specific β-agonists, the production of β-agonists and the import of meat containing β-agonists. The reason for the ban in China might be that traditional Chinese dishes commonly use offal in which residues might be higher.

Discussions on the use of β-agonists in pig production and their residues in meat have aroused greater attention due to public concerns as well as reported animal health issues arising from the use of the drug in the feed.

Reason for public concern

The metabolic fate of β-agonists is similar in the target species (pigs and cattle), laboratory animals and humans. Besides the pharmacological effect, β-agonists may cause intoxication. Therefore, any consumption of meat or by-products derived from animals that have consumed β-agonists in feed for growth stimulation may result in clinical effects such as tachycardia, heart rate increase, tremor, headache, muscle spasm and high arterial blood pressure.

The effect of β-agonists on humans is not completely known, but people with cardiovascular diseases are advised not to consume products containing β-agonists.

Beta-agonists used in swine diets metabolize quickly. Although only 84% of the β-agonist is excreted on the first day, no withdrawal period is given. Due to this lack of a withdrawal period, the β-agonist is fed right until slaughter. Hence, residues are still in the body of slaughtered pigs.

Potential side-effects

Independent studies have revealed some negative effects of β-agonists on animals.

After six weeks of feeding a certain β-agonist, pigs spent more time lying and less time walking. Pigs fed β-agonists were more difficult to handle. These differences became apparent very quickly after feeding of the β-agonist had started and continued over an entire four week-period.

The effects of a β-agonist on finishing pigs affected behavior, elevated heart rates and potentially made pigs more susceptible to stress from handling and transport. In a resident-intruder test, a test used to measure aggressiveness, β-agonist-fed gilts performed more attacks in the first 30 seconds. By the end of the test (300 seconds) the dominant control gilts and barrows and dominant but also subordinate β-agonist-fed gilts performed the most attacks (p<0.05). This change in behavior may cause major problems under farm conditions because it can lead to associated injuries, social stress and animal losses.

Phytophyscics increase digestibility

Several studies have shown that phytophyscics have a positive effect on nutrient digestibility, for example on ileal amino-acid digestibility.

Research has shown that phytophyscics are able to stimulate digestive secretions, like saliva or bile acids and the activity of digestive enzymes. These effects are proposed to be the core nutritional mode of action of phytophyscics. Subsequently, the above-mentioned stimulating effects on secretions and enzyme activity influence the digestibility of nutrients. Accordingly, several studies conducted in different animal species have confirmed higher ileal
digestibility of amino acids and better nutrient utilization as a result.

Enhanced digestibility entails a general improvement in feed conversion ratio (FCR). The higher protein digestion results in better muscle accretion as shown in pigs as well as in broilers. This has to be taken into consideration when discussing the potential of phytogenics as a natural solution to replace β-agonists in livestock.

Wouldn’t a natural product be better than β-agonists?

Phytogenics have been shown to improve feed intake, FCR, growth rate and carcass composition. In the following field study, the effect of a phytogenic feed additive (PFA, Digestarom® Finish, Biomin Phytogenics GmbH, Germany) on performance parameters as well as on carcass characteristics of growing-finishing pigs were investigated.

The trial included 5,732 finishing pigs on a total of 10 commercial farms in Austria. The data of lean meat percentage in the different carcass weight (CW) groups is shown in Figure 1.

This study compares the effect of a Digestarom® application period to a control period. The average lean meat percentage was higher in all CW-groups of finishing pigs in the Digestarom® group. The heavier the CW, the higher the lean meat percentage through Digestarom® application.

Lean meat yield was 0.68 percentage points higher in the CW-group of 85-95 kg. For pigs over 105 kg, lean meat percentage was 1.12 points higher. This once more indicates better nutrient utilization.

Conclusion

Overall, the side effects of β-agonists on finishing pigs, as well as concerns over residues are important issues that have become a focus of attention. Already banned in many countries, the use of β-agonists in animal production is disputable.

The use of natural substances like PFAs and their beneficial effects on digestibility, especially of feed protein, are promising. The results have shown that PFAs, depending on the balance of natural ingredients in the mixture, can have a positive impact on FCR as well beneficial effects such as higher carcass yield and quality (lean meat percentage) in finishing pig production.

References are available on request.

Figure 1. The effect of a PFA on lean meat yield compared to a control period.