

Phytogenics – a possible and natural alternative for growth-enhancing drugs?

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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. After the ban of antimicrobial growth promoters (AGPs) in the EU and other countries, the search was on for alternatives and many studies were conducted to look into replacements.

In 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 the last few years.

Besides positive influences on the gastrointestinal tract, selected plant-derived additives are known to improve growth performance and influence carcass composition.

Background of β -agonists

Beta adrenergic agonists (β -agonists) act as repartitioning agents, promoting lean tissue deposition in pigs. In 1999, a specific β -agonist was approved in the U.S. and was subsequently introduced in other countries.

Currently there is only one β -agonist approved by the US Food and Drug Administration for use in swine diets.

Benefits in finishing pigs

In finishing-pigs, 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. It also increased carcass weight and dressing percentage.

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 to maximise the response.

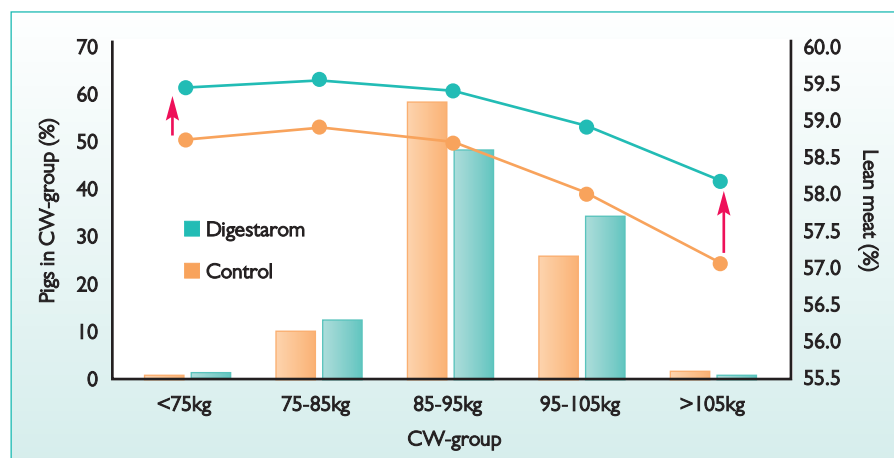


Fig. 1. The effect of a PFA on lean meat yield compared to a control period.

The minimum requirement for the protein content in the diet for this particular β -agonist is stated as 16% crude protein (CP).

Further the protein composition of the diet has to be adjusted. Particularly the first-limiting amino acid lysine has to be available for 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 the discussion?

In recent years, the import of meat with certain β -agonists' residues has been banned in China and Russia, as it was deemed unfit for human consumption.

In 2013, Russia restricted meat imports to those which are certified free of a particular β -agonist. Interestingly, the People's Republic of 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.

The discussion about the use of β -agonists in pig production and its residues in meat is arousing greater attention due to public concerns as well as reported animal health issues arising from the use of the drug in the feed.

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 byproducts derived from animals that have consumed β -agonists with 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 consumption of products containing β -agonists is not advisable for people with cardiovascular diseases.

The β -agonist used in swine diets is metabolised quickly and over 84% of it is excreted in the first day after withdrawal. Due to the lack of a withdrawal period however, it is fed right until slaughter. Hence residues are still in the body when pigs are slaughtered.

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

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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 behaviour, 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 greatest percentage of attacks ($p < 0.05$).

This change in behaviour may cause major problems under farm conditions because it can lead to associated injuries, social stress and animal losses.

Positive use of phytogenics

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

Research has shown that phytogenics 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 phytogenics. 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 utilisation 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 broilers as well as in pigs. This has to be taken into consideration when talking about phytogenics as a natural solution to replace β -agonists in livestock.

Use of natural product instead

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 was 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 Fig. 1.

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

Lean meat yield increased by 0.68 percentage points in the CW-group of 85-95kg. At over 105kg, lean meat percentage was improved by 1.12 points compared to the control. This once more indicates better nutrient utilisation.

Conclusion

Overall, the side effects of β -agonists on finishing pigs, as well as concerns regarding the residues of those drugs are important issues that are becoming 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, is promising. The results have shown that PFAs, depending on the balancing of the mixture of natural ingredients, can have a positive impact on the FCR as well beneficial effects like a higher carcass yield and quality (lean meat percentage) in finishing pig production. ■

*References are available
from the author on request*