

Managing the Digestion Process in Slaughter Poultry



From the economic point of view, for livestock farms what matters is the end result, which is observed in animal weight or the amount of raw material produced. Numerous factors contribute to the final result, with the condition of the digestive system during breeding as one of the key factors. Quick and efficient digestion translates into the amount of nutrients effectively building up the organism. However, digestive processes are frequently disrupted by bacterial, viral, fungal, parasitic and protozoan infections, as well as by environmental stress and imbalanced diet. Ever since the withdrawal of antibiotic-based growth stimulants, more attention has been devoted to natural substances which have accompanied animals for thousands of years and supported the digestive system in various ways.

Herbs and Digestive Processes

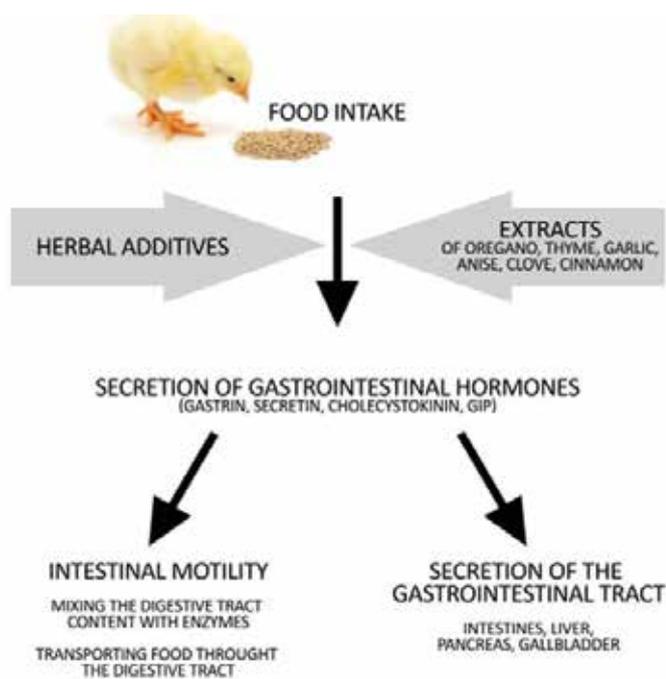
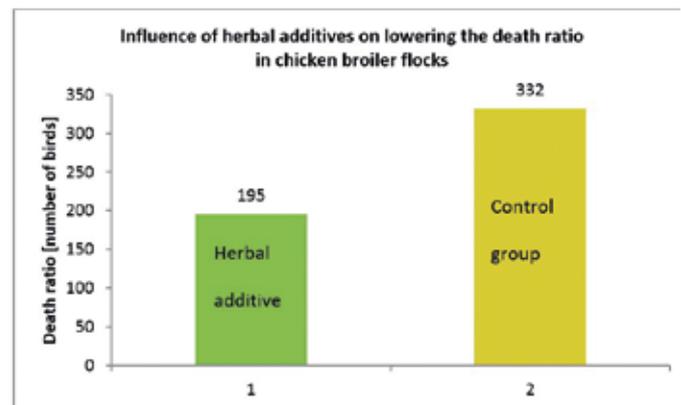


Fig. 1 Influence of natural active substances of plant origin on the digestive system functions.

The application of herbal additives in poultry nutrition triggers a more intense absorption of nutrients, so the birds weigh more at the end of the fattening period. Hence the possibility of using herbal extracts as an alternative for the withdrawn antibiotic-based growth stimulants. It results from the strong scent of herbs, which boosts the functions of the digestive system by stimulating taste and smelling as well as somatic sensations. The latter, connected with the trigeminal nerve in the nasal and oral cavity, is of extreme importance. The strong herbal aroma irritates the said nerve, which in turn

informs further digestive tract segments about a possible threat. The system prepares itself to receive the irritating element by increasing the secretion of epithelial mucus, enforced secretion of digestive enzymes, hormones and accelerating peristalsis (Fig. 1) (Tominaga & Julius, 2000; Djouhri & Lawson, 2004). As a consequence of the said phenomena, more intensive feed digestion and absorption of nutrients in the digestive tract take place. Numerous tests conducted on chicken and turkey broilers proved that herbal mixtures containing garlic, oregano, onion, mint and cinnamon administered during the fattening period increase the final weight of birds and reduce the death ratio in flocks (Cross *et al.*, 2002; Bampidis *et al.*, 2005, Cabuk *et al.*, 2006).



Graph 1. Influence of herbal additives containing BioPoint garlic and oregano extracts on lowering the death ratio in chicken broiler flocks. The research was conducted on a group of 29,000 broilers. The results reflect the overall number of deaths within the period of six weeks of breeding. The mixture was administered with drinking water, according to BioPoint's own research.

Herbs During Indigestion

The greatest threats for the assumed poultry breeding results are bacterial, fungal and parasitic infections of the digestive system. Diarrhoeas and indigestions resulting from such infections may be reduced by using natural substances, the so-called phytobiotics. Phytobiotics are natural substances hindering the development of unwanted microflora. The most frequently examined substances are those derived from oregano – thymol and carvacrol, garlic – allicin, and other herbs, such as cinnamon, curcuma and pepper. On the basis of thymol and its isomer – carvacrol – it was possible to determine that the most frequent mechanism of antimicrobiological function of phytobiotics is the destruction of external and internal layers of pathogens. The research using thymol as an antibacterial agent shows the impact of ions and intracellular substances originating in bacterial cells (Xu *et al.*, 2008). Most probably, thymol destroys

the cellular wall of a cell and creates pores in it, thereby disabling the bacterium to defend itself against the external environment – limiting the infection-spreading possibility by doing so. It is a *modus operandi* similar to that of some antibiotics (destroying the cellular wall and/or membrane as well as disrupting the functioning of external layers). Such antibiotics include cephalosporins, penicillins, polymyxins, colistins and vancomycins.



Fig. 2. Susceptibility of *E. coli* bacteria on active substances of plant origin. 1 – carvacrol, 2 – thymol, 3 – cinnamaldehyde, 4 – allicin. (BioPoint's own research)

Other interesting mechanisms of their functioning are presented below:

- Allicin in garlic can penetrate cellular walls and membranes of bacteria in an unconstrained manner, then join with key enzymes containing cysteine groups (e.g. alcohol dehydrogenase, hexokinase) so as to block their functions. It is one of the strongest natural antibacterial substances (Borlinghaus *et al.*, 2014).
- Tannin obtained from oak or chestnut bark has a very specific effect on intestinal epithelium – it creates a thin layer on the surface which prevents excessive water loss. By doing so, it limits the spreading of diarrhoeas.
- Carvacrol found in oregano blocks calcium receptors in *Eimeria* protozoa trigger poultry coccidiosis. By deactivating calcium receptors, carvacrol deprives the *Eimeria* protozoa of the ability to attack target intestinal cells (Schubert *et al.*, 2005).

Aid in (Stressed) Liver Functioning

Liver is a multifunctional organ highly important for the metabolic processes of the digestive tract. It is responsible for a number of metabolic processes of carbohydrates, amino acids and fats, being the main constituents of feed. The final production result largely depends on efficacy of absorption of these substances. In the liver, complex carbohydrates are transformed into easily absorbed glucose, which is the main source of energy of an organism. A well-functioning liver supplies energy for proper functioning of the cells of an organism. Also, it is in the liver where bacterial toxins and ammonia are neutralised, and the chemotherapeutics are being metabolised. It is worth mentioning that the liver also

provides storage for vitamins A, D, and K, as well as for iron. In short, the liver is responsible for four main functions: metabolic, detoxifying, storing and secretion (producing bile). Supporting the above-mentioned functions of the liver is increasingly popular in intensive poultry production. Examples of targeted herbal substances that aid the heavily-burdened livers of poultry are mentioned below:

- a. Globe artichoke extract containing cynarin regulates the level of LDL cholesterol, that can deteriorate the quality of meat and eggs
- b. Milk thistle extract containing silymarin protects the liver cells and helps the regeneration of damaged hepatocytes after illness
- c. Taraxinic hypericin acid, present in extracts of St. John's wort and dandelion, exhibits properties regulating the flow of bile, thus reducing the risk of stagnation and deposits that lead to inflammation of the gall bladder.

Stress and Herbs

A frequent cause of poultry indigestion is excessive and lasting environmental stress. As a result, an abundance of free radicals is accumulated in the intestines, which damages the epithelium and causes inflammations. It turns out that nature provides strong antioxidants neutralising the adverse functioning of reactive oxygen species. Cinnamaldehyde (a component of cinnamon extract) proves to have a comparable antioxidating effect to synthetic antioxidants, e.g. BHT (butylated hydroxytoluene) (Kamel, 1999). Protection against oxidation, when it comes to natural components, is based on various OH phenol groups in a particle (e.g. thymol), which act as hydrogen donors (Farag *et al.*, 1989). Hydrogen inhibits the creation of free radicals and lowers their number. Free radicals in small amounts are seen as signalling molecules without hazardous characteristics.

The Importance of Herbs in the Prevention of Metabolic Diseases

Intensive animal breeding which is focused on maximising the production result entails serious consequences which can appear in the form of metabolic diseases. Diseases included in this group are extremely varied and their aetiology and predisposing factors are still not fully understood, or are only identified to a small extent. In contrast, the frequency of this type of diagnosis in animals is growing at an extremely rapid pace. The ones observed most often are: sudden cardiac death syndrome in broiler chickens, ascites, tibial dyschondroplasia, perosis (slipped tendon), rickets, cannibalism, feather pecking, round heart disease (RHD) or spontaneous aortic rupture in turkeys. In the event of any of the aforementioned conditions, the specific therapeutic treatment is not determined. These diseases are not related with the presence of infectious agents (bacteria, viruses, fungi, parasites), thus the use of antibiotics is not effective. For example, in periods of intensive growth of the body of birds, very often they show abnormal



functioning of the cardiovascular system. To prevent the onset of symptoms like ventricular arrhythmias or rupture of blood vessels, preparations may be used containing, among other things, copper ions to prevent the formation of intravascular blood clots, vitamin C which seals the blood vessels, or natural salicylates lowering blood pressure and regulating functioning of the heart. To prevent the development of such disorders or reduce the severity of their course, one must deploy appropriate prophylactic therapy, containing, among others, appropriate herbal substances, and ensure adequate technological and nutritional parameters.

The Result is What Counts

Common usage of antibiotic growth stimulators made it possible to gain better production results among breeding animals. As a consequence, this practice gave birth to bacteria completely immune to some antibiotics. The lack of susceptibility stems from the so-called multidrug resistance pumps in the cellular wall. Prolonged application of the same medicament leads to creating a memory record of it and immediate removal from the cell. However, the plant world also knows antibacterial substances that have not changed for centuries. Oregano, garlic or rosemary extracts can inhibit growth and development of popular pathogens, such as *E. coli*, displaying various pro-health properties (Brenes & Roura, 2010).

Why are bacteria not immune when it comes to plant extracts? One extract consists of several active substances and hundreds of excipients. Becoming immune with respect to hundreds of substances is much more difficult than one. At the same time, the said synergism of plant active substances makes it possible to combine natural extracts with pure and isolated active substances.

Summary

Herbal extracts include various important active substances affecting the operations of the entire organism, both animals and people. Their activity has been known for centuries, but they have gained wider recognition only now, in the era of common drug usage. Using herbs as more than antibiotic growth stimulators in animal nutrition deserves particular attention. Especially today, when bacterial immunity toward antibiotics is increasing, the use of natural substances seems to be the way to limit the excessive use of antibiotics, which are crucial for saving human life and health.



Albert Nakielski, DVM, Specialist of Poultry Diseases.

Albert graduated from Veterinary Sciences of University of Olsztyn and focuses on turkeys and broilers in his current practice. As a co-owner of AviPoint veterinary clinic he currently cares, among others, for large part of farms of the largest turkey integrator in Poland. He shares his knowledge and experience with BioPoint,

being the company's main consultant in the bird diseases area. His publications are being published in the specialist press in Poland and abroad.



Andrzej Juszcuk, M.Sc. Biotechnology.

Andrzej graduated from Industrial Biotechnology at the University of Warmia and Mazury in Olsztyn. His interests are focused around application of herbal active substances in feed additives. Currently he works for BioPoint as a Product Development Specialist, responsible for R&D as well as quality control of products.