



## Natural Therapy for Treating Intestinal Inflammation in Farm Animals: Promises and Pitfalls

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### Editorial

Intestinal inflammatory diseases are very complex disorders, with economic implications and affecting the animal welfare and well-being. These types of disorders, manifesting both at human and animals are characterised, from scientific point of view, by an excessive cell-mediated response that leads to an impairment of the barrier function of the gut, leading finally to the intestinal inflammation, with all the associated symptoms: diarrhoea, vomiting, pain, reduced appetite, decrease of body weight. The intestinal tract is the largest interface through which human and animals interact with their environment. Four protective barriers maintain the integrity of this interface: epithelial, chemical, microbiological and immunological barrier. Under normal conditions, the stimulation of the mucosal immune system by gut microbiota determines a state of “low-grade physiological inflammation”, a status of continuous activation of the mucosal immune system in response to commensal microorganisms, and in case of needs, also towards pathogens. Mucosal homeostasis requires a continuous balance between pro- and anti-inflammatory components. The disruption of one or more of intestinal barriers can lead to chronic inflammation which is a hallmark of intestinal disorders. The goal of the treatments applied in this case is the reduction of inflammation and establishing a normal gastro-intestinal function. There are two main ways for treating the intestinal inflammation:

- The classical medicine, based of anti-inflammatory drugs, suppressors of the immune system and antibiotics;
- Natural therapy approaches using natural products (prebiotics, antioxidants, probiotics, dietary fiber, lipids).

Since the European Union interdict the in-feed antibiotic growth promoters, many studies have investigated various nutritional approaches for preventing or reducing gut disorders and deleterious effects of inflammation in farm animals. New and novel dietary strategies are clearly required if the farmers proposed to maintain, or improve, their economic competitiveness within Europe and world markets. The supplementation of the animal diet with ingredients rich in bioactive compounds with antimicrobial properties in order to counteract the intestinal inflammation was lately investigated. Prebiotics are selectively fermented ingredients that allow specific changes in the composition and/or activity of the gastrointestinal microflora, e.g. the selective stimulation of the indigenous beneficial microflora and increasing the defence and resistance potential of the animal and human organism. Polyphenol extracts from a variety of plants have been shown to have immunomodulatory and anti-inflammatory effects. It was shown that the dietary intake of polyphenols derived from green tea can ameliorate intestinal inflammation in the colon of a mouse model. Other studies showed that polyphenols from apple conferred protection against colitis and dampened pro-inflammatory cytokine expression in colon of treated mice.

Another promising way to reduce the amplitude of intestinal diseases is the use of probiotics (bacteria and yeast). The definition of

probiotics stated that they are ‘mono- or mixed cultures of live micro-organisms which, when applied to animal or man, beneficially affect the host by improving the properties of the indigenous microflora’. They help the host with nutritional assistance, maturation of immune system, protection of mucosal barrier function and prevention of injurious effects caused by xenobiotics and pathogens. Maintenance of the intestinal mucosal homeostasis and promotion of gut health by probiotics offer potential therapeutic benefits in the prevention and/or treatment of many gastrointestinal diseases. The mechanisms by which probiotic organisms confer therapeutic effect may be multiple, including mutual competitive interactions with both commensally and pathogenic flora, dialogue with the epithelium and varying effects at the level of the immune response. Both *Lactobacilli spp.* and *Bifidobacterium spp.* are frequently applied as probiotics.

The nutritional control of intestinal inflammation in farm animals is not easy to achieve. However, important progress has been made in understanding this complexity at the gastrointestinal tract level, with reference to the physiology, microbiota and local immune system. Based on this knowledge, stimulating beneficial bacteria and (or) bacterial metabolites through the consumption of fermentable carbohydrates (prebiotics) in the diet is clearly one major option. Recent studies of the effects of some probiotics on gastrointestinal tract health also look promising, but the responses show strain specificity. By contrast, there is still the need for a basic knowledge of the development of mucosal immunity in order to envisage practical nutritional approaches to control the regulator and effector arms of immune responses.

Therefore, there is a significant level of uncertainty in the use of prebiotics and probiotics for the treatment of different gastrointestinal diseases. It appears that it is imperative to evaluate the capacity of prebiotics in the modulation of inflammatory responses and also to distinguish different strains of probiotics and their combinations in the formulation of alternative therapy and to understand the cellular and molecular mechanisms that underlie the beneficial role of different probiotics prior to use therapeutic application of probiotics in gastrointestinal diseases. Prebiotics and probiotics could represent a valid “armamentarium” to modulate gut microbiota and, probably, to cure intestinal inflammation. Further studies are necessary to better characterize the exact role of prebiotics and probiotics in intestinal

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inflammation, their specific mechanisms of actions, including a direct effect on mucosal homeostasis or healing. Since they are becoming a legitimate therapeutic option, it is necessary to determine which

probiotic strains have the greatest efficacy, whether they are more effective alone, or in conjunction with other pro- or prebiotics, and what their half-life is in the gastrointestinal tract.