

Patented seaweed technology helps immunity and production

Modern broiler production has dramatically changed in recent years driven by an increasing consumer demand. Broilers face several challenges throughout their production cycle and their immune requirements vary depending on the physiological status and external influencing factors.

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Among these external factors, environmental stressors, such as temperature or stocking density, management practices, for instance vaccination programs, feed stress, such as transitions or presence of toxins (mycotoxins), can greatly impact the animal's immune and technical performance. This situation is aggravated if the birds already present a low immune function.

The use of antibiotics has played a major role in improving broiler health and productivity over the last decade. The efficacy of in-feed prophylactic antibiotics in increasing animal growth rate and reducing mortality from clinical diseases is well documented.

However, it has been shown that the use of antibiotics in food-producing animals contributes to a

reservoir of drug-resistant bacteria capable of transferring antimicrobial resistance (AMR) to pathogenic bacteria in both animals and humans.

As a result, many countries worldwide have banned, or are implementing new regulations towards a ban, the inclusion of antibiotics in broiler diets as a routine means of growth promotion.

An increasing number of countries are also implementing 'antibiotic free ever' production, trying to also eliminate the therapeutic use of antibiotics.

This trend has resulted in an intensive research effort to identify alternative bioactive compounds that are able to promote animal health and performance.

Most of the options available on the market rely on different mechanisms targeting the same goal: preventing any alteration in the intestinal bacterial composition (dysbiosis), thus maintaining a balanced microbiota in the gut.

The modulation of the animal's immune function is another strategy leading to a higher degree of resilience against external aggressors such as infectious agents.

The goal is to enable animals to better cope with daily challenges. Recent research has pointed out the potential of in-feed marine macroalgal polysaccharides as a reliable solution to strengthen animal defences.

Marine macroalgal polysaccharides

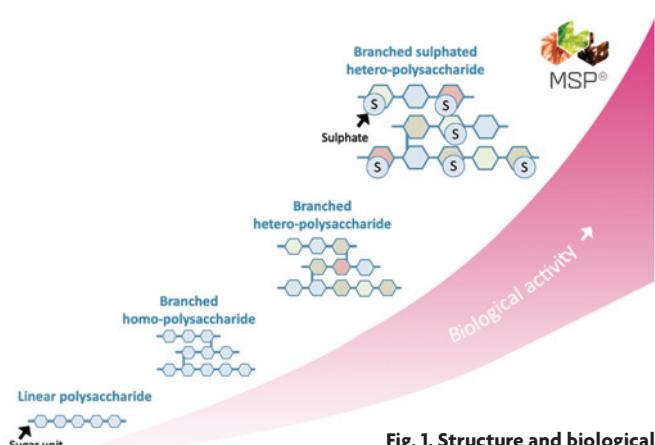


Fig. 1. Structure and biological activity of Olmix MSP.

Fig. 2. Production of immune mediators. Degree of stimulation compared to control (Intestinal cell model, Berri et al, 2016; 2017).

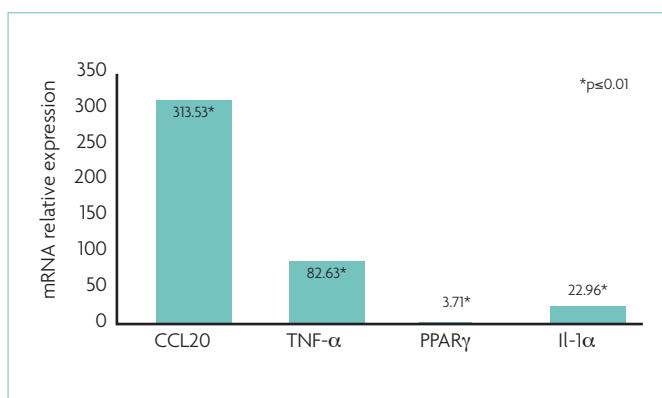
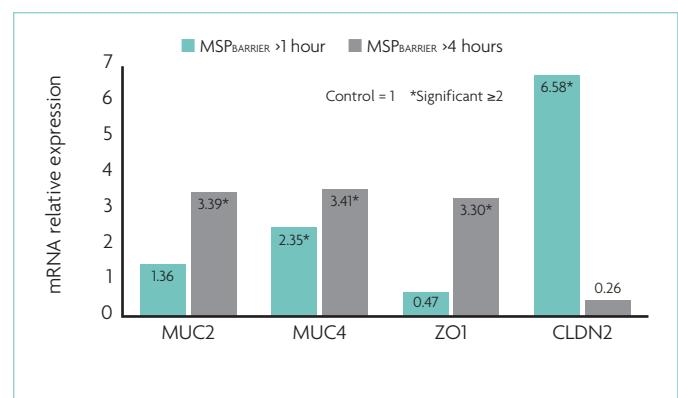


Fig. 3. Production of gut integrity and permeability components. Degree of stimulation compared to control (Intestinal cell model, IBD, 2017).



Continued from page 7
supporting the barrier function and enhancing local immune responses in the gastrointestinal tract will have a positive impact on the systemic immune status of the animals and overall performance.

Macroalgal extract specificities and Olmix Group technology

The cell wall of marine macroalgae is mainly composed of water soluble sulphated polysaccharides which present a complex structure.

The molecular weight and several structural specificities, the branched conformation, the presence of different types of sugars and more particularly rare ones (xylose and rhamnose) and the presence of functional sulphated groups contribute to the unique biological activities of algal polysaccharides. Among others, modulation of the immune responses and reinforcement of the intestinal barrier function.

Sulphated polysaccharides are characteristic of macroalgae (they are not found in terrestrial plants, nor microalgae or yeast cells walls). The aforementioned structural traits of marine sulphated polysaccharides present phylogenetic analogies with animal's glycosaminoglycans (GAGs), like heparin. This fact explains their high degree of reactivity and specific biological activities in animals.

Olmix Group (France) has been involved in the development of marine biotechnologies for more than 20 years and has set up a full macroalgae biorefinery process (from collection at the seashore to

	Weight (g/day 35)	FCR (day 35)	ADG (g/day)	Net benefit (€/chicken)
Control	1.903	1.68	54.0	–
Algimun	1.946	1.65	55.2	+0.03 (+0.53/m ²)

Table 1. Trial results showing the improvement in performance with the use of Algimun.

final products) focused on the extraction and use of specific macroalgae polysaccharides (Olmix MSP) to support animals facing modern production challenges.

Olmix Group's innovative technology and marine bioactive ingredient extraction know-how led to the development of an in-feed product, Algimun, which is based on the combination of two biologically active macroalgal extracts: MSPIMMUNITY, which constitutes an innovative modulating agent that reinforces innate and adaptive immune responses; and MSPBARRIER, which enhances the barrier function of the intestinal mucosa.

The effects of a specific green algal extract (MSPIMMUNITY) were evaluated using the epithelial cell-line IPEC-1 in order to simulate the interaction of the extract with the intestinal mucosa when administered orally.

MSPIMMUNITY modulates the immune response by interacting with membrane receptors, specifically toll-like receptors 4 and 2 (TLR4 and TLR2) and this interaction leads to a rapid activation of transcription factors that control the gene expression of an array of immune response mediators (cytokines and chemokines).

These immune mediators are involved in several biological

mechanisms such as recruitment and activation of phagocytic cells (macrophages, neutrophils and dendritic cells); proliferation and differentiation of B- and T-lymphocytes and effector lymphocytes; and intercellular communication by synthesis of immune mediators.

Therefore, MSPIMMUNITY participates in the modulation of the defence activities linked to both innate and adaptive immune responses.

The enhancement properties of a specific red algal extract (MSPBARRIER) on the intestinal barrier function were assessed in-vitro in two colonic epithelial cell lines in physiological and inflammatory conditions.

Enterocyte-like Caco2 cells and mucus-secreting HT-29 MTX cells were used for tight junction and mucin evaluation respectively.

MSPBARRIER has shown to upregulate the expression of different target genes that are essential for optimal functioning of the tight junctions via improving the interaction existing between the plasma membranes of two adjacent cells (transmembrane proteins) and the maintenance of the tight junction assembly (scaffolding proteins).

In addition, MSPBARRIER has been shown to upregulate the expression

of mucin targeted genes that have crucial roles in the regulation of epithelial cell differentiation (membrane-bound), the establishment of the mucus layer (gel-forming) and the prevention of pathogen colonisation.

MSPBARRIER plays a role in the maintenance of gut mucosa integrity which is the first line of defence against pathogens and toxins by rendering the tight junctions stronger and the mucus layer more functional.

Synergistic activity for optimum efficacy in the field

Algimun can be used as an in-feed compound that is able to promote health and performance of broilers, especially in the starter and grower phases, where production pressure is at the highest point, but also to slaughter.

Applied through feed supplementation (in a large scale trial involving more than 400,000 standard broilers – 10 repetitions – in France), Algimun was shown to improve broiler performance (+2% ADG, -2% FCR, +3% PEF), while reducing mortality rate (-4.5%) with a return on investment of more than five for the integrator (€+0.03/broiler).

Algimun algal bioactive compounds boost the animal's immune function and reinforces the intestinal barrier function. The use of Algimun can play an important role within the reduction of antibiotics in the feed. ■

References are available from the author on request