# Innovative dietary immunomodulator increases performance

The weaning period is one of the most sensitive periods within pig production systems. Piglets at this age simultaneously encounter several stressors and not being fully immunologically developed makes them highly vulnerable to infectious agents.

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As a consequence, weaned piglets may present health issues that will negatively impact their performance and may lead to death.

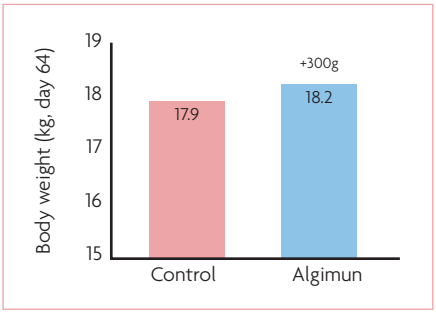
## Alternative to in-feed antibiotics

Antibiotics have played a major role in promoting pig's health and productivity over the last decades. The efficacy of in-feed prophylactic antibiotics in improving animal growth performance, while reducing mortality from clinical diseases, is well documented.

However, it has been shown that the usage of antibiotics in food-producing animals contributes to a reservoir of drug-resistant bacteria capable of transferring anti-microbial resistance to pathogenic bacteria in both animals and humans.

Consequently, many countries worldwide have banned or are implementing new regulations aimed at banning the inclusion

**Fig. 1. Improvement in bodyweight with the use of Algimun.**




of antibiotics in pig diets as a routine means of growth promotion. This trend has urged an intensive research effort to identify alternative bioactive molecules that are able to promote animal health and performance.

Most of the alternatives available on the market rely on different mechanisms aimied at the same goal: preventing intestinal dysbiosis, by 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 in animals against external aggressors.

Recent research has pointed out the potential of in-feed marine macroalgal polysaccharides as a reliable alternative to in-feed antibiotics in animal production.

## Barrier and immune function of the intestinal mucosa

The immune function is one of the most important activities carried out in the gut mucosa. While playing a barrier role towards microbes and toxins, the gut mucosa hosts high counts of immune cells which determine local immune responses.

Approximately 70% of the total number of immune cells are residents of the intestinal tract (gut associated lymphoid tissue, GALT). The gut mucosa is considered a dynamic physical barrier that prevents pathogen colonisation. The main components that determine gut integrity and permeability are the mucus layer which is mainly composed of glycoproteins known as mucins, secreted by the goblet cells; and the tight junctions which are protein complexes that seal the paracellular pathway between two adjacent epithelial cells.

Thereby, 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 extracts specificity

Parietal polysaccharides of seaweeds present structural complexity and unique composition that makes them very reactive and explains their biological activities towards animals.

The complexity and reactivity of seaweed polysaccharides derive from the nature of the sugar units, which are diverse and sometimes rare, like uronic acids, xylose and rhamnose, the variety of glycosidic bonds leading to their branched structure and the presence of sulphate groups.

Furthermore, their polyanionic structure and solubility increases their reactivity and facilitates their recognition by host cells. Sulphated polysaccharides are characteristic of macroalgae (they are not found in terrestrial plants, nor fresh water microalgae or yeast cell walls).

Olmix Group, France, has been studying marine biotechnologies for more than 20 years and has focused on the extraction and use of specific macroalgae polysaccharides to support gut health and immune function in animals. Olmix Group marine bioactive ingredients extraction know-how has led to the development of an in-feed product, Algimun, which is based on the combination of two biologically active macroalgal extracts: MSP IMMUNITY, a green algal extract

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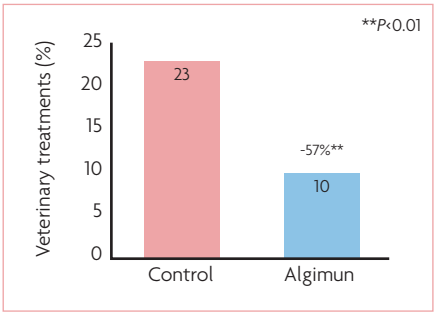
**Fig. 2. Health performance.**



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that reinforces innate and adaptive immune responses; and MSP BARRIER, a red algal extract, which enhances the barrier function of the intestinal mucosa.

## Supporting gut barrier and immune functions thanks to MSP

A research project in collaboration with INRA led to the demonstration of the effect of MSP IMMUNITY on immune mediators in pig models, including the identification of the metabolic pathways involved in this activation.

Berri et al. (2016) first highlighted that MSP IMMUNITY could influence the gene expression of several immune mediators (cytokines and chemokines) involved in innate and adaptive immune mechanisms, among others, macrophage activity stimulation, recruitment and activation of phagocytic cells, differentiation and proliferation of T- and B-lymphocytes, while inducing immune tolerance thanks to its anti-inflammatory properties.

Olmix Group conducted a set of experiments in collaboration with Intestinal Biotech Development (France, 2017) in order to assess the effect of MSP BARRIER on the intestinal barrier function using in-vitro models, mucus-secreting HT-29 MTX cells for evaluation of the effects on mucins and enterocyte-like Caco-2 cells for the evaluation of the effects on tight junctions.

Results showed that MSP BARRIER upregulates the gene expression of scaffolding proteins and transmembrane proteins which are essential for optimal functioning of the tight junctions.

In addition, MSP BARRIER upregulates 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.

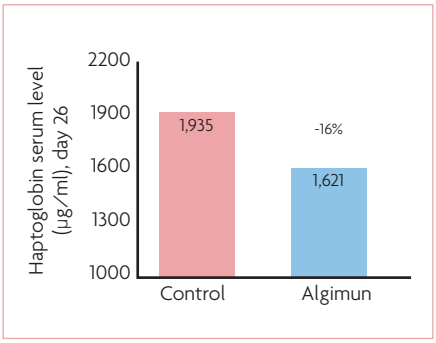


**Fig. 3. Haptoglobin is an acute phase protein, measured as an index of inflammatory status. Haptoglobin serum concentration was higher in the control group than the Algimun group on day 26.**

MSP BARRIER plays an important 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 a more functional mucus layer.

## Synergistic activity for optimum efficacy in the field

In short, Algimun can be used as a natural alternative in-feed compound that is able to promote health and performance of pigs in the nursery phase. In a trial carried out in France on piglets from gilts, the use of Algimun in post-weaning improved the health status of the piglets when compared to the control animals as shown by a decreased inflammatory status (-16% haptoglobin level at 26 days of age) and less number of animals needing a medical treatment (-57%, P<0.01). Animals faced this stressful period better and showed improved performance (+300g at 64 days, -1pt FCR) with high profitability: ROI = 3:1. Algimun algal bioactive compounds boost animal's immune responses and reinforce 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