Algae improves sow immune transfer and piglet performance

The transfer of passive immunity from sow to piglet is crucial and constitutes the first line of protection of the new born piglets. Weaning is one of the most sensitive periods within pig production systems. Piglets at this age encounter several stressors simultaneously and they are not fully developed immunologically.

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This moment of risk, in which passive immunity from sows is already almost consumed and the piglets' own immune system is still immature, rendering them highly vulnerable to infectious agents and intestinal disorders, is called the 'immunity gap'. After this risky period, the animal will build its natural immunity increasing the antibody levels.

Improving sow immune status through feed

Sow prolificacy and the number of piglets weaned per sow are the key drivers of pig farm profitability.

Increasing the number of born piglets is correlated with lower body weight of piglets and lighter piglets consume less colostrum.

Colostrum, and to a lesser extent milk, contains molecules with specific immune function, like immunoglobulin G (IgG) or immunoglobulin A (IgA). A lower intake of colostrum is highly related to poor immune status of piglets, higher neonatal mortality and lower pre-weaning performance.

In the current context of hyperprolific sows, light piglets and reduction of the use of antibiotics, there is a lot of interest in improving the immune status of young piglets through higher transfer of passive immunity.

Recent research has pointed out the potential of in-feed marine macroalgal polysaccharides as a reliable agent for immune activation in sows through its impact on colostrum and milk composition and the transfer of immune molecules to piglets.

Immunomodulating activities of macroalgal extracts

Parietal polysaccharides of seaweeds present structural complexity and unique composition that make them very reactive and explain 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 macroalgal polysaccharides to support immune and gut barrier functions.

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

A research project in collaboration with INRA, France, led to the demonstration of the effect of MSP IMMUNITY on immune mediators in pig in vitro models (IPEC-1), including the identification of the metabolic pathways involved in this activation.

Berri et al. (2016) first highlighted that MSP IMMUNITY could influence the gene transcription of a broad array of immune mediators (cytokines and chemokines) involved in defence mechanisms within the adaptive immune response, among others, the recruitment and activation of antigen-presenting cells, such as dendritic cells, the differentiation and proliferation of different populations of lymphocytes, both B and T, while inducing immune tolerance thanks to its anti-inflammatory properties.

Supporting maternal immune transfer

Transfer of maternal immunity is paramount for piglet protection. Since colostrum is a transudate from the blood, improving sow's immune status by supplementing feed with immunomodulating agents can positively impact colostrum quality and increase the transfer of immune components to the piglets.

A scientific trial was carried out to assess the effect of MSP IMMUNITY on colostrum and milk composition. For that purpose, gilts were given feed supplemented with the green macroalgal extract during late gestation. Gilts were vaccinated with a bivalent vaccine containing Pasteurella multocida and Bordetella bronchiseptica strains.

The immune transfer was evaluated by measuring IgG anti-Bordetella bronchiseptica levels in gilts' serum (at day 23 pre-farrowing) and in colostrum (within six hours of the beginning of farrowing) and IgA levels in milk at day seven and 21 post-farrowing.

The results showed that MSP IMMUNITY has the capacity to increase significantly IgG anti-Bordetella bronchiseptica levels (marker of atrophic rhinitis vaccine uptake) in the colostrum via an increased transudation from the serum. In addition, this trial demonstrated that supplementation of feed

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with MSP IMMUNITY improved lactogenic immunity expressed by higher levels of IgA at day seven and day 21 post-farrowing.

The mechanism of action underlying the immunomodulating activity of MSP IMMUNITY could be explained as induction of the proliferation and migration, through the already established entero-mammary pathway, of the differentiated B lymphocytes secreting antibodies from the intestine to the mammary gland.

Effect on sow litter performance

The scientific results showed that the addition of MSP IMMUNITY to primiparous sows' feed improved the transfer of lactogenic immunity (through the colostrum and milk), which will provide the newborn piglets with protection against infections and reduce the use of antibiotics.

In addition, the benefits of Algimun supplementation in sow feed was evaluated on the colostrum quality and on litter performance in a commercial trial conducted in France.

Sows were divided into a control group (without supplementation) and a test group (supplemented with Algimun at an inclusion rate of 1kg/ton of feed from seven days before farrowing to weaning at 21 days).

The number and body weight of piglets at birth was homogenised by sow and treatment.

Piglet viability, growth performance and veterinary treatments needed per litter were recorded. Samples of colostrum were collected to analyse immunoglobulin G content.

The results showed that the piglets from supplemented sows presented a higher body weight at weaning when compared to piglets from control sows (+360g, $P = 0.056$) (Fig. 1) and better ADG (+18g/day, $P<0.05$).

In addition, the litters from sows supplemented with Algimun needed fewer veterinary treatments (-25%, $P<0.01$) (see Fig. 2).

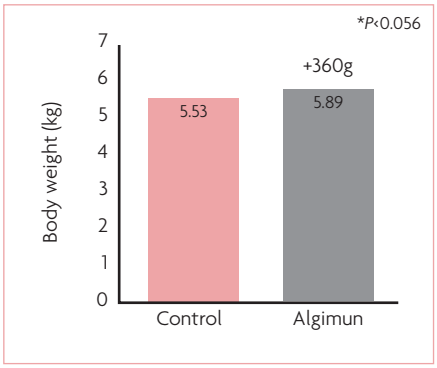

Fig. 1. Piglet body weight (kg) at weaning (day 21).

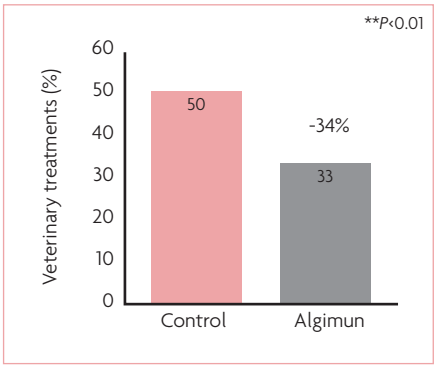

Fig. 2. Litters that received a veterinary treatment (%).

Sows supplemented with Algimun presented better immune status (+25% of IgG levels in colostrum when compared to control animals) that favourably affected the technical results of their litters, generating a 10% higher net benefit (+€7.75/sow).

In short, Algimun, a macroalgae based solution, can be used as a natural alternative in-feed strategy to support maternal immunity transfer and set up active immunity in piglets and improve their performance. ■

References are available from the author on request