The use of yeast cell wall in swine production: a natural alternative

Consumers are increasingly aware of the benefits of healthy eating, which make it essential to seek solutions that aim to maintain public health and food safety. The withdrawal of antibiotics as performance enhancers and the rational use of the therapeutic form in animal production is a pressing issue all over the world, not only from consumers but also from the scientific community and international regulatory bodies.

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The impact of antibiotics on the gut microbiota has been more recently investigated and researchers have shown that, in addition to altering the composition of the microbiota, antibiotics can also affect the gene expression, protein activity and the overall metabolism of the intestinal microbiota. Microbial changes caused by antibiotics, in addition to increasing the immediate risk of infection, can also affect basic immunological homeostasis in the long-term. The use of antibiotics as growth promoters also 'hides' the potential challenges that animals may face, such as sanitary problems (cleaning and disinfection, water quality); problems with vaccination plan (application, periods, dosage); nutrition (ingredients of poor quality or variation thereof, mycotoxins, nutritional imbalance, among others); reduction of passive immunity (maternal antibodies); management, among other factors.

Thus, a strict health plan, among other plans, is indispensable. The use of vaccines and feed additives can help in pathogen control, intestinal health, immune status improvement, performance, and biosafety of the final product. The purified yeast cell wall (Saccharomyces cerevisiae) stands out not only for its high efficiency but also for being an economically viable solution.

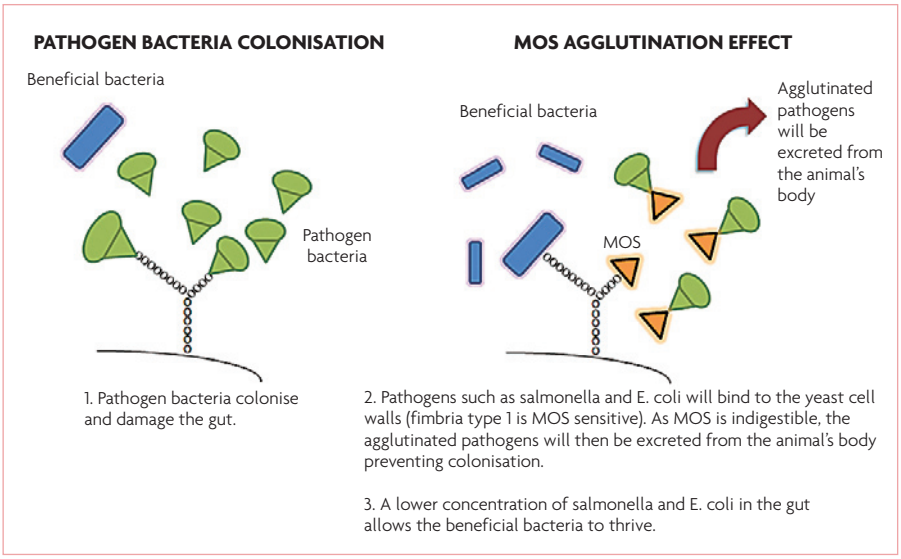

Fig. 1. The mode of action of mannan oligosaccharides (MOS).

One of the main points that determine the effectiveness of a yeast wall is the β-glucan and mannan oligosaccharides (MOS) ratio. The higher the concentration of β-glucans, the lower the cell wall degradation in the gut, that is, the better its effectiveness as a 'functional fibre'. The purified yeast cell wall (YCW) has a BG:MOS ratio close to 2:1, whereas those obtained from primary fermentation have a 1:1 ratio.

The β-glucans are known as modulators or stimulants of the immune system because when they come in contact with phagocytes, which recognise β-1,3 and 1,6 bonds, they stimulate them to produce certain cytokines that initiate a chain reaction to induce immunomodulation and improve the responsiveness of the innate immune system. This type of response is especially important in early-growth animals, reproductive phases, stress periods and environmental challenges by acting as a prophylactic agent, raising animal resistance and reducing subsequent damage (such as reduced performance and high mortality rates). Intensive animal production is an extremely challenging environment; thus strengthening the immune system can be one of the key points for increased productivity.

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Table 1. Piglets' intestinal integrity parameters after seven and 14 days post-challenge. *E. coli was inoculated (9.8 X 10^8 CFU/mL) on the first day of the experiment. Values with different letters are significantly different at 95% confidence level. [1, 2]significance compared to the time of slaughter and compared to baseline. [a, b]significance compared between treatments on each slaughter day.

		Day 7		Day 14	
Parameter	Baseline	Control	YCW	Control	YCW
Mucosal thickness	15.23[1]	15.42[1a]	13.98[1a]	13.82[1a]	16.06[1a]
Crypt depth	5.14[1]	7.19[2a]	7.02[2b]	6.96[2b]	7.47[2a]
Villus length	9.92[1]	7.84[2a]	6.60[2b]	6.63[2b]	6.77[2a]
Villus width	2.07[1]	3.56[2a]	3.22[2a]	3.06[2a]	3.59[2a]
Surface area	87.60[1]	95.10[1a]	71.24[1b]	69.96[1b]	81.13[1a]

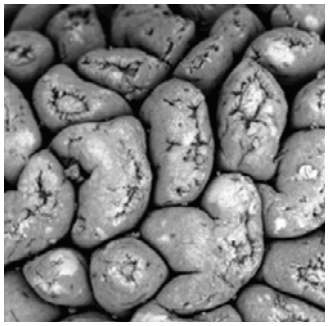
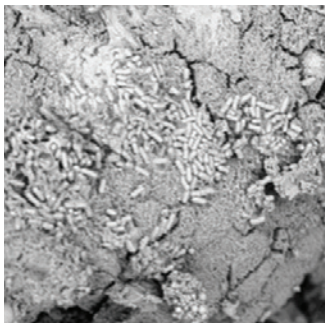


Fig. 2. SEM photographs of intestinal sections showing the differences between the treatments at seven days post-challenge. Left, control and, right, yeast cell wall.



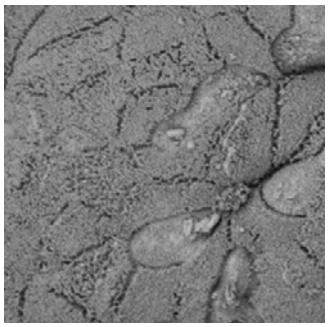


Fig. 3. SEM photographs of intestinal sections showing the differences between the treatments at 14 days post-challenge. Left, control and, right, yeast cell wall.

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MOS is known for its ability to agglutinate pathogens (which have type 1 fimbriae), such as several Gram-negative strains (salmonella and E. coli).

MOS provides a binding site for pathogens to prevent colonisation of the intestinal epithelium and these agglutinated bacteria will be excreted along with the indigestible part of the fibre. Improving and modulating the innate immune system and also reducing the pathogen contamination can be one of the strategies to combat infections, decrease mortality, and increase productivity (Fig. 1).

In a study from the Philippines published by Alcantara et al. (2015), the weaned piglets at 28 days of age were challenged with E. coli (oral, 9.8 X 10^8 CFU/mL) and divided into two groups, control and supplemented with YCW (ImmunoWall from ICC Brazil, at 2kg/MT).

The supplemented group presented an improvement in the intestinal integrity (Table 1 and Fig. 2), decreased the diarrhoea frequency, E. coli count in jejunum (-33%) and faeces (-66%), and resulted in few bacteria adhered to the surface of the villus (Fig. 3), compared to the control group.

These results show that the yeast cell wall has an effective action against pathogenic micro-organisms and consequently improves the intestinal health of the animals.

The purified yeast cell wall stands out from the other products because it is scientifically proven through several laboratory and field studies that assure the high concentration of MOS and β-glucans, giving an additive with guaranteed results of performance and great cost/benefit.

The benefits include the modulation of the immune system, improved intestinal integrity, and a balance of the microbiota, which prevents the harmful action of pathogens present in the field, representing an effective alternative to performance-enhancing antibiotics. ■

References are available from the authors on request