Challenges and strategies to improve piglet health and performance

Weaning is a challenging period for the piglet and involves many stress factors, such as the new environment, new social interaction and a change of diet. Pigs are handled and regrouped many times during their productive lives, but during the weaning period the consequences of this stress can lead to high production losses.

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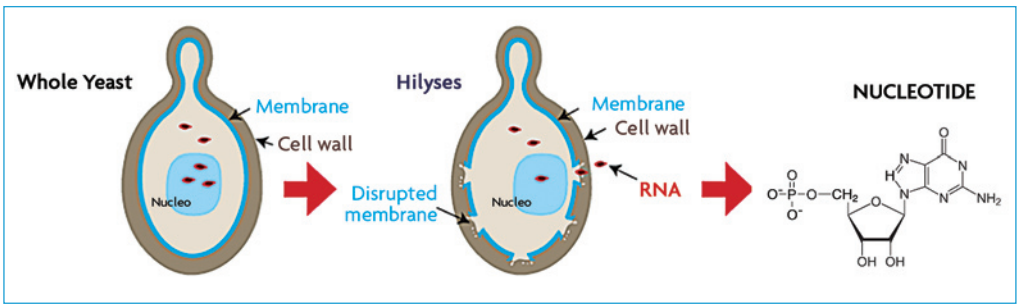

Fig. 1. RNA hydrolysis from Saccharomyces cerevisiae yeast.

After birth, the piglet is highly dependent on specific and non-specific immune factors present in maternal colostrum and milk.

Commercial weaning occurs between 17-28 days of age, when the piglet's immune system is still immature and their circulating antibodies reach the lowest levels (around 28 days).

This period is called the 'immunity gap' or 'post-weaning gap', where the piglet is more susceptible to intestinal challenges because their acquired immune system has not had time to develop fully. After that, the antibody level gradually increases as the animal builds its natural immunity.

At the same time, the piglet's digestive system has some limitations, such as insufficient secretion of enzymes, hydrochloric acid, bicarbonate and mucus, factors that interfere with proper digestion and absorption of nutrients.

The stress of change from milk (highly digestible) to solid feed (less digestible, more complex feed) can result in a decrease in feed intake and water.

According to Brooks et al. (2001), 50% of weaned piglets consume the feed until 24 hours post-weaning and 10% start to eat 48 hours post-weaning. The lower digestibility diet (depending on the quality of the ingredients used) can act as a substrate for pathogenic bacteria proliferation and result in health and enteric problems, such as diarrhoea.

In this period, the intestinal microbiota leads to dramatic changes in the composition 7-14 days after weaning and should generate resistance or competitive exclusion.

The sows' environment, nutrition, health status and general condition will have a direct impact over neonatal and post-weaned piglets with a direct impact on piglet development during gestation, physical contact post-birth (transmission of microbiota) and colostrum and milk during lactation.

Colostrum has a high concentration of total solids and protein but only low levels of fat and lactose. It also contains high levels of immunoglobulins (IgG, IgA, and IgM) and the concentration declines with lactation time.

There are some other cells from the immune system in colostrum and milk, including neutrophils, lymphocytes, macrophages, and epithelial cells from mammary glands, and leukocytes which stimulates the development of cellular immunity of the neonates. This means the health of the sow will have a direct impact on the passive immunity transmission.

The natural richest source of nucleotides and nucleosides is human breast milk; the second is sow's colostrum and milk. Although the nucleotides are not considered essential nutrients, they play an important role in several metabolic processes, particularly in some body tissues and stages of animal life.

The free nucleotides and nucleosides can be readily absorbed by the enterocytes in the intestine, and are especially important in tissues of rapid cell proliferation and limited capacity for de novo synthesis (major route of nucleotide production), such as intestinal epithelial cells, blood cells, hepatocytes and cells of the immune system.

This means the free nucleotides can be used by the salvage pathway, where the body can synthesise nucleotides with less energy consumption, as a result of recycling bases and nucleotides from metabolic degradation of nucleic acids from dead cells or the diet.

However, when the endogenous supply is insufficient, exogenous (dietary) nucleotide sources become semi-essential or 'conditionally essential' nutrients. This especially occurs in animals in rapid growth phases (early stages), reproduction, stress, and disease challenges.

Table 1. Total RNA concentration (mg/mL) in colostrum and milk of sows. [ab]Means in a row with the same letter superscript do not differ at P≤0.10 by Tukey's test.

Samples	Hilyses (kg/MT)				SEM	Probabilities
	0	4	8	12		
Colostrum	1.28	1.33	1.51	1.43	0.32	0.478
Milk day 11	0.81[b]	1.09[a]	1.10[a]	1.07[a]	0.14	0.002
Milk day 20	0.78[b]	0.89[ab]	0.94[a]	0.95[a]	0.13	0.100

A natural alternative

As the health and nutrition of the sow is directly linked to piglet health and development, studies have shown the benefits of feed additives that can have an impact on sow health and performance and their progeny. One natural alternative is the use of Hilyses, produced by ICC Brazil that contains hydrolysed RNA from Saccharomyces cerevisiae yeast.

Saccharomyces cerevisiae yeast is used in the fermentation of sugar cane juice to obtain ethanol. After fermentation, the yeast cells undergo a process of separation and washing, following by autolysis of the cell membranes where the cellular contents are poured into the medium. Yeast RNA can also be 'broken' into smaller fractions by some specific enzymes which are added, resulting in free nucleotides and nucleosides.

This final product contains highly digestible amino acids, peptides and polypeptides of short chain length, and glutamine, so it is highly recommended for animal feed (see Fig. 1). There is also yeast mannan oligosaccharide (MOS, effective tool in preventing diarrhoea caused by contamination of salmonella and E.

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coli), and high levels of β-glucans (immunostimulant, and activates the T-cells presents in the gut, triggering the activation of the innate immune system).

To understand the benefits of Hilyses, Vitagliano et al. (2014) studied the supplementation in sow diets at four levels of inclusion (0, 4, 8 and 12kg/MT) for three days prior farrowing until piglets were 21 days of age (at weaning). The number and body weight (BW) of piglets at birth were equalised by sow and treatment (number of piglets per sow: 10.48, initial piglet weight: 1.70kg, litter weight/sow: 17.79kg). Samples of colostrum and milk were taken to analyse the total amount of RNA present (Table 1).

The results showed (Table 2) that the supplemented sows had a positive effect on milk production (7.33kg or 4.82%, on average) and the total concentration of RNA in milk (0.277mg/mL or 34.2%, on average, at 11 days), which consequently increased the number of piglets weaned (0.68 or 7.31%, on average), the BW of the litter at weaning (1.59kg or 2.83%, on average), body weight gain (BWG) of the litter at weaning (1.79kg or 4.70%, on average) and reduced mortality (real -3.80% or -43.28%, on average) in relation to the control unsupplemented group.

Samples	Hilyses (kg/MT)				SEM	Probabilities
	0	4	8	12		
No. of weaned piglets	9.35[c]	9.67[b]	10.20[a]	10.23[a]	1.04	0.072
Piglet weight at weaning (kg)	5.99	5.86	5.77	5.60	5.93	0.1432
Litter weight at weaning (kg)	56.01[c]	56.66[c]	58.85[a]	57.28[b]	1.01	0.063
Litter BWG (kg)	38.07[c]	39.42[b]	40.36[a]	39.80[ab]	0.58	0.027
Milk production (kg)*	152[b]	158[a]	161[a]	159[a]	5	0.042
Mortality (%)	8.78[c]	5.74[b]	5.12[ab]	4.08[a]	1.30	0.061

Table 2. Piglet performance and mortality. *Milk production estimated as 1kg of milk = 4kg of litter weight gain. [abc] Means in a row with the same letter superscript do not differ at P≤0.10 by Tukey's test.

Hilyses can be used as a tool in sow diets combining the nutritional benefits helping in the transmission of nucleotides by milk and reducing mortality and improving the performance of piglets at weaning.

However, Hilyses also contains the fully available intracellular content and offers high amounts of small chain polypeptides and free amino acids. These nutrients are readily available for absorption in the gut and metabolism utilisation. Among these amino acids, there are high levels of glutamic acid (glutamine and glutamate), which gives large support to the gut (as amino acid and energy source) and also has excellent palatability, leading to an increase in feed intake.

The nucleosides guanosine monophosphate (GMP) and inosine monophosphate (IMP) also contribute to improving palatability. Stimulating the feed intake, there is consequently a better resistance to the challenges and also a higher BWG.

The benefits in supplementing the piglets during the nursery phase are a decrease in enteric problems, an improvement in gut integrity (such as the relationship of villus height:crypt depth, mucosal thickness, and villus surface area), improvement in immune system responses (increase in levels of IgA) and subsequent improvements in performance (higher BWG).

Hilyses can be used as a strategy to help piglets by improving health and passive immunity and milk quality in sows and directly affecting the innate immune responses, decreasing the pathogens in the gut and providing nutrients with high digestibility and nucleotides. ■

References are available from the authors on request