Replacing zinc oxide to build resilient pigs and a sustainable environment

There is little debate about zinc oxide's (ZnO) benefit to piglets in swine operations. Proven to help control postweaning diarrhoea (PWD) in pigs, ZnO has been a staple in swine operations for decades. But in recent years, the harmful environmental effects of ZnO have been brought to light, creating a sweeping international demand to do away with its use altogether.

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The European Union (EU) and Asia are leaders in this movement, limiting ZnO use with an impending ban in the EU taking effect in 2022.

Producers now face the challenge of raising healthy piglets without ZnO. Anticipating this shift away from ZnO, the industry is exploring solutions that provide the same benefits of ZnO without the harmful environmental effects.

How ZnO impacts the environment

Pig manure is often used as an organic fertiliser on fields, and the composition of pig manure is becoming increasingly important to ensure environmental integrity.

When pigs are fed ZnO, the majority of zinc ions pass through their body and into their stool.

In fact, pigs absorb only 14% of ZnO with the remaining 86% excreted in manure. That means most ZnO fed in pig diets is eventually spread on fields and soaked into the soil.

This poses a larger environmental issue as zinc ions have the potential to accumulate in soil and contaminate water sources used for human consumption.

Because zinc is a heavy metal, it is considered an environmental pollutant and health hazard. This has driven the global demand to end the use of ZnO and transition to other products.

Table 1. The effect of sow treatments on piglet 10-day body weights.

Sow treatment	Control	Celmanax	P value
Sows (number)	29	30	–
10 day body weight (kg)	2.412[b]	2.624[a]	0.025

[ab] means within the same row with different superscripts differ.

Sow/creep feed	Control	Celmanax	ZnO	Celmanax + ZnO	P value
Piglets (number)	192	181	165	180	–
Weaning body weight (kg)	5.028[b]	5.28[a]	4.948[b]	5.12[ab]	0.025

[ab] means within the same row with different superscripts differ.

Table 2. Effect of sow and creep feed treatments on piglet body weights at weaning.

Healthy gut, healthy pig

Producers around the world are scratching their heads wondering where they will find products as effective as ZnO. They want to maintain health and resiliency among piglets, and that starts from the inside out.

From birth, piglets face challenges that can compromise their productivity and growth, so improving gut health in piglets prior to weaning is especially important.

Weaning is a stressful time and can contribute to dysfunctions in the intestine and immune system that lead to limited growth and decreased performance. The gut is the first to be exposed to pathogens, making it vital to build a resilient gut before sickness strikes.

Insufficient maturation of the immune system in the young pig makes it susceptible to these pathogens leading to an imbalance within the gastrointestinal tract of a piglet.

Decreased gut health can lead to PWD, decreased weaning weight, increased antibiotic use and piglet mortality. Maintaining gut health improves the overall health of piglets. A healthy gut allows nutrients to be absorbed more easily and provides better protection against pathogens, diseases and infections within piglets. A healthy gut lining improves productivity, leading to more profitability on the farm.

No more ZnO, so now what?

Many products have entered the market to take the place of ZnO. Front runners in maintaining gut health integrity are Refined Functional Carbohydrates (RFCs), derived from enzymatic hydrolysis of yeast combined with yeast culture. When introduced into pig diets, RFCs have a host of benefits that create resiliency in swine operations.

From supporting growth of beneficial bacteria, such as Lactobacillus and Bifidobacterium, to reducing mycotoxin damage to the gut, RFCs improve animal productivity.

RFCs bind to pathogenic bacteria, blocking their receptors and preventing the disease-causing bacteria from attaching to the intestinal wall, all while supporting beneficial bacteria.

RFCs are made up of:

- **Mannan-oligosaccharides:** Short sugar units of mannose that support growth of beneficial bacteria.
- **Mannose:** A monosaccharide that binds to E. coli and salmonella.
- **Beta glucans:** Sugar units from yeast cell wall that reduce

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the effects of mycotoxins and improve immune function

When consumed, RFCs deactivate certain pathogens and bind to others that are harmlessly transferred through the digestive system and excreted. Through management of natural microbial bacteria in the digestive system, feed additives like RFCs are a way to maintain the immune system and animal efficiency.

The proof is in the study

In a study done by Arm & Hammer, feeding RFCs, in both sow lactation diets (Table 1) and piglet diets (Table 2), improved 10-day and weaning body weights when compared to the control or ZnO group.

In the same study, Celmanax supplementation in nursery rations improved feed intake, growth rate and body weight (P<0.001) but did not affect feed efficiency (P=0.521) compared to ZnO containing treatments (Table 3).

The study concluded that piglets fed RFCs performed better than piglets fed ZnO. Supplementing RFCs in diets increased piglet weight through the end of the nursery phase.

This has the potential to decrease the number of days for pigs to reach slaughter weight, resulting in improved profitability.

Piglet treatment	Control	Celmanax	ZnO	Celmanax + ZnO	P value
Pens (number)	11	11	10	10	–
Start body weight (kg)	4.986	5.177	4.943	5.104	0.864
Finish body weight (kg)	13.132^{ab}	13.554^{a}	11.965^{c}	12.816^{b}	<0.001
Average daily gain (g/day)	291^{ab}	299^{a}	251^{c}	275^{b}	<0.001
Average daily feed intake (g/day)	372^{ab}	387^{a}	318^{c}	361^{b}	<0.001
FCR (g/g)	1.296	1.305	1.305	1.329	0.521
Average mortality (%)	3.63	1.52	5.58	4.39	–
Treated piglets/total piglets	0.278	0.295	0.446	0.35	–

^{ab} means within the same row with different superscripts differ.

Table 3. Effect of treatments fed in the nursery phase on piglet performance.

When fed to sows in lactation diets, RFCs have been found to increase immunoglobulin in colostrum, reduce preweaning piglet mortality and increase piglet weaning weight. Ultimately, RFCs prepare the piglet for transition into nursery.

Feeding for resiliency

Improving the gut health of piglets allows better partitioning of energy for growth, making pigs resilient and productive. By getting ahead of the curve and promoting gut health in piglets from birth, producers are saved from the headache of playing catch-up when piglets get sick.

In addition, feed additives like RFCs are helping to create a more sustainable environment. ■

References are available from the author on request