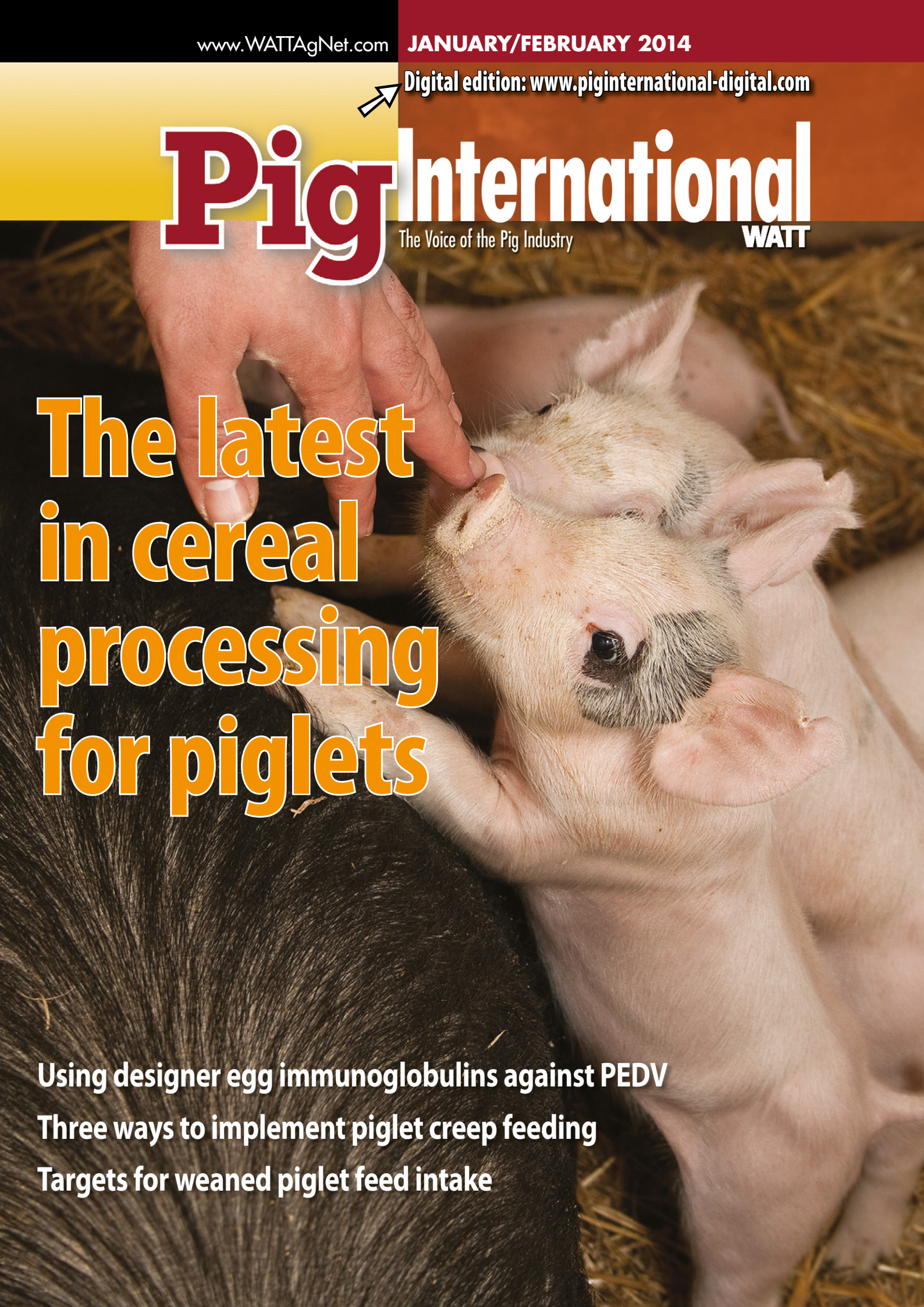
www.WATTAgNet.com JANUARY/FEBRUARY 2014

Digital edition: www.piginternational-digital.com

Pig International

The Voice of the Pig Industry

WATT



The latest in cereal processing for piglets

Using designer egg immunoglobulins against PEDV

Three ways to implement piglet creep feeding

Targets for weaned piglet feed intake

Five possible negative effects of zinc oxide on piglets

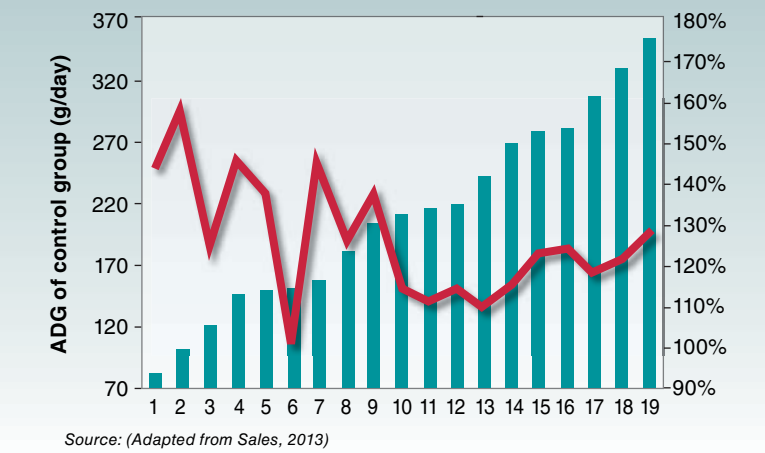
Zinc oxide used in high concentrations can increase growth and reduce diarrhea in piglets — but there is a downside from overuse.

BY AGATHE ROMÉO, R&D ANIMINE, AROMEO@ANIMINE.EU

» The effect of pharmacological levels of zinc oxide (ZnO) on piglet growth performance has been recently evaluated in a review involving 26 studies.
Results indicated a significant (P<0.05) and positive effect of zinc supplementation on growth, feed intake and feed efficiency as shown in Figure 1.

Several hypotheses exist regarding the mode of actions to bring about these beneficial results, but the real mechanism is not fully known. Nevertheless, optimal levels of zinc oxide are around 3,000 ppm Zn. However, such use of pharmacological zinc oxide dosages has potentially some negative consequences for piglet health.

FIGURE 1. RATE OF IMPROVEMENT IN AVERAGE DAILY GAIN (ADG) WITH 2-3000 MG/KG ZN FROM ZNO FOR THE FIRST TWO WEEKS AFTER WEANING



Source: (Adapted from Sales, 2013)

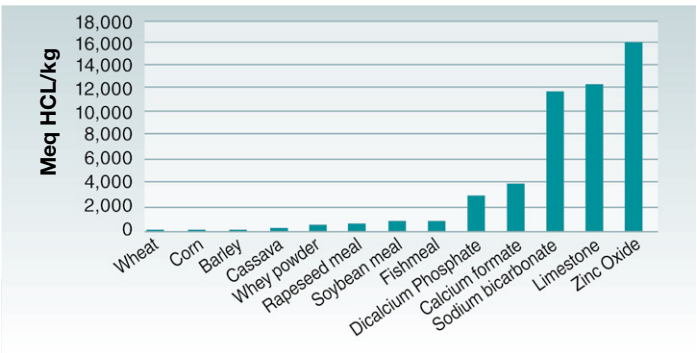
Results indicated a significant (P<0.05) and positive effect of zinc supplementation on growth, feed intake and feed efficiency.

1 Contamination by heavy metals

Impurities in commercial zinc oxide are a real problem when zinc quality is not strictly controlled. A study from the French institute, IFIP, indicated that cadmium concentration in

High levels of zinc oxide appear to be antagonistic with feed acidifiers, like organic acids.

FIGURE 2. ACID-BINDING CAPACITY OF SOME FEED INGREDIENTS



kidneys exceeds the regulatory limit (1 mg/kg) for human consumption when pigs are fed contaminated diets (0.5 mg Cd/kg diet) between 42 and 160 days. In that study, zinc was added at normal (nutritional) level. At a pharmacological dosage, contaminated zinc should be fed during a shorter period but cadmium level in the diet would be higher; some analytical results were up to 2.5 mg Cd/kg feed. Cadmium is known for of its organ toxicity and long elimination period (half-life); consequently if tissues are contaminated during the postweaning period it is possible to have elevated levels of cadmium in tissues at slaughter time. In Thailand, where zinc pharmacological dosages are allowed, as opposed to the European Union, a recent study on 214 pork kidneys from these areas showed more that 25 percent of pork kidneys were above regulatory values for cadmium concentration. Quite possibly, contaminated zinc oxide could have been the major source of dietary cadmium.

2 Nutritional interactions

High levels of zinc result in overproduction of metallothionein. This intestinal transporter binds preferentially to copper and may lead to a sub-deficiency of this trace mineral. Because of high safety margins, bioavailability of iron does not seem to be significantly affected by high levels of zinc.
Studies about interactions between zinc and phytase suggest that pharmacological dosages of zinc have a negative effect on phytase activity and consequently on phytate-phosphorus liberation. This implies a reduced effi cacy in phytase functions, and possible phosphorus deficiency for affected animals. The acid binding capacity of zinc oxide is the greatest among feedstuffs: Its acid-binding capacity at pH 4 is approximately 16,000 meq, compared with 13,000 meq for limestone flour and 12,000 meq for sodium bicarbonate, see Figure 2. Thus, high levels of zinc oxide appear to be antagonistic with feed acidifiers, like organic acids.

3 Zinc toxicity

Pharmacological usage of zinc oxide may benefit piglets postweaning, but according to the US National Research Council (NRC), it may affect piglet health if used for a long period. The negative effect of high doses of ZnO fed for prolonged period are well known in the field, but the exact mechanism is not clarifi ed, yet.

4 Environmental concerns

When the feed zinc concentration does not exceed 150 ppm, enrichment of zinc in the soil, from the resulting manure, does not exceed 3,000 µg/kg DM/year. In European conditions, using 3 kg ZnO per metric ton of feed during the first two weeks after weaning increases by almost 30 percent the total quantity of zinc excreted in the pig's growing life. Technological treatments of pig slurry accentuate the problem as they concentrate the zinc in the solid fraction, and the level in the by-product may then exceed the maximum zinc level authorized for organic fertilizers in the EU.

Related article: How to create a successful piglet feed **www.WATTAgNet.com/160308.html.**

5 Zinc and microbial resistance

Intensive usage of zinc in animal diets may favor the development of bacterial resistance. Bacteria regulate intracellular zinc concentration with a system of efflux pumps. These pumps can be specific to zinc or can evacuate other molecules like antibiotics. High levels of zinc tend to increase their synthesis, and the use of zinc oxide at pharmacological dosages may reduce the sensitivity of bacteria to antibiotics. A genetic coupling can also be observed, as genes of heavy metal resistance and genes of antibiotic resistance are sometimes associated. Consequently, the selection of bacteria resistant to zinc leads to the selection of bacteria resistant to some antibiotics. PIGI

HIGH PERFORMANCE

HiZox

Potentiated zinc oxide

LE ZINC OXIDE
AT LOW INCLUSION RATE

www.animine.eu

LOW INCLUSION RATE

EU Ecolabel
www.ecolabel.eu