Usage of slow release hydroxy trace minerals in piglets to support weaning health

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Background and objectives

Although reported requirements for trace elements in piglets are rather low, high dosages of these compounds are used for their known growth promoting effects. Using high concentrations of trace elements implies certain risks. Besides the environmental impact and possible antimicrobial resistance, the stability of other feed ingredients (e.g. fat) might be compromised by the presence of reactive compounds such as free copper (Luo et al., 2005). The rapid release of reactive copper can also induce oxidative stress to the gut (greater malondialdehyde concentrations) and has negative effects on gut morphology (reduced duodenal villus height), as proven by Fry et al., 2012. Alternatively, hydroxy compounds as a new source of trace elements provide a slower release throughout the digestion process. This slow release is ensured by the covalent hydroxy-bonds, which are stable and only slightly soluble. Gradual release of the active trace elements will prevent the previously mentioned negative effects of high reactivity (Fry et al., 2012). To investigate effects of these hydroxy elements on growth and health parameters, the following study in piglets was performed, comparing $CuSO_4$ and Hydroxy-Cu (TBCC: tribasic copper chloride) as a source of copper in piglet diets.

Material and Methods

In this trial, 192 piglets were assigned to 48 pens containing 6 different treatments (8 replicate pens per treatment). Basal starter and grower diets were fed, for 20 and 25 days respectively, differing in source and concentration of copper (Table 1). Initial weight of the piglets was 9 kg. Individual body weights were measured on day 20 and day 55, and feed intake was collected at pen level. Consistency of the feces was scored during the first two weeks using a 1 to 5 scale (from hard to loose feces).

Results

Feeding high Cu concentrations (150 ppm), either from $CuSO_4$ or from TBCC, resulted in significantly improved ADG in starter phase and a higher bodyweight on day 20 (Table 1). Also feed intake in this period was affected by copper dosage. Fecal consistency in all treatment groups was good (mean scores of 2.35 and 3.1 during week 1 and 2 respectively). Feed conversion over the total period was the lowest for the group fed 150 ppm Hydroxy-Cu (FC=1.52) and differed significantly from the group fed 150 ppm $CuSO_4$ (FC=1.60). Figure 1 of the ADG during the trial shows the numerically better results for TBCC as Cu-source compared to $CuSO_4$.

Treatment	Cu-source	Added Cu	BW d20
A	Hydroxy-Cu	15 ppm	12.4^{a}
B	Hydroxy-Cu	100 ppm	12.9^{ab}
C	Hydroxy-Cu	150 ppm	13.5^{b}
D	CuSO4	15 ppm	12.7^{ab}
E	CuSO4	100 ppm	13.2^{ab}
F	CuSO4	150 ppm	13.6^{b}

Table 1: Different treatments (Cu-source and -concentration) and related body weight on day 20

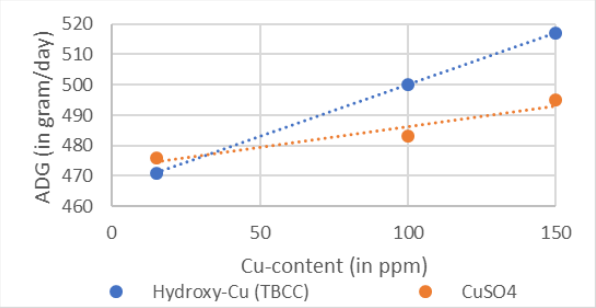

Figure 1: Average Daily Gain over the whole trial period (55 days)

Conclusion and discussion

In piglet diets, TBCC seems to be an adequate replacement for $CuSO_4$. Using slow release hydroxy trace minerals gives a solution to avoid the negative consequences of high concentrations of reactive elements while guaranteeing performance of weaning piglets.

References

Luo X.G., Ji F., Lin Y.X., Steward F.A., Lu L., Liu B. and Yu S.X.. 2005. Effects of dietary supplementation with copper sulfate or tribasic copper chloride on broiler performance, relative copper bioavailability, and oxidation stability of vitamin E in feed. Poultry Sci., 84 (6):888-893.

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