Influence of the form and level of copper and zinc suplementation on mineral status of grower and finisher pigs

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Organic forms of copper (Cu) and zinc (Zn) induce higher growth rates than inorganic forms. The higher growth rates of pigs fed organic Cu and Zn are thought to be because organic forms of the minerals are absorbed better than inorganic forms (Coffey *et al.*, 1994) and that they may result in greater plasma mineral concentrations (Hahn and Baker, 1993) and/or higher organ mineral stores in pigs (Apgar *et al.*, 1995). However, an effect of mineral form on these indices has not always been demonstrated (Wedekind *et al.*, 1994). The aim of this experiment was to compare the effect of Cu and Zn fed in the form of Bioplex® or sulphate at two levels of dietary inclusion on the mineral status of growing and finishing pigs. The experiment was designed as a 2x2 factorial arrangement of treatments, with two mineral forms (organic and inorganic) and two inclusion levels (low and high). The study used 160 female pigs (Large White x Landrace) through the growing and finishing phases (25-107 kg live weight). The 'low' levels aimed to provide 25 ppm of Cu and 40 ppm of Zn per kg, while the 'high' levels aimed to provide 160 ppm of Cu and 160 ppm of Zn per kg. These levels were fed in diets formulated for the growing and finishing phases of growth. The mineral supplement incorporated in the diets contained Cu and Zn sulphate or Bioplex® Cu and Zn (Alltech Biotechnology P/L, Victoria, Australia) according to their required levels in each diet. Pigs were fed *ad libitum*. At 36 and 97 kg live weight (growing and finishing phases, respectively) blood samples were taken from a random sub-sample of four pigs per pen (five pens per treatment). At the end of the experiment the pigs were slaughtered as per commercial procedures, and one foretrotter per pig along with samples of liver and kidney were collected from the same pigs that blood was sampled from during the trial. Data were analysed by two-way analysis of variance.

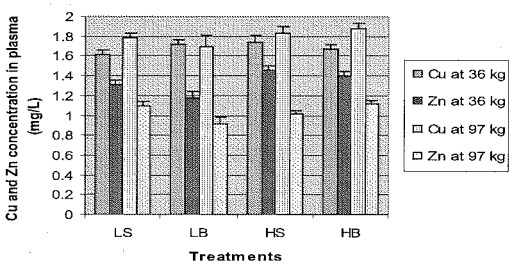
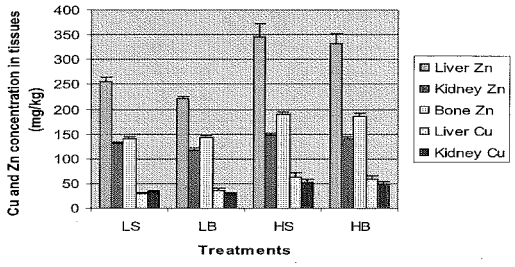


Figure 1. *Cu and Zn plasma levels (±SEM).*



*Cu and Zn levels in liver and kidney measured in 20 samples/ treatment, Zn in bone in 10 samples/treatment.

Figure 2. *Cu and Zn tissue levels* (±SEM).*

Levels of Cu and Zn in plasma were within the homeostatic ranges for pigs of this weight. At 36 kg, there were no differences in Cu levels between treatments but there was a significant main effect of inclusion level for Zn ($P=0.001$). At 97 kg, there was no effect of the diets on Cu levels but there was a significant interaction for Zn ($P=0.002$), with pigs fed LB having the lowest Zn levels (0.92 mg/L), which was similar to pigs fed HS (1.02 mg/L). Concentrations of Cu and Zn in the livers of pigs in all treatments and Zn in the bone of pigs in the low treatments were within the normal range. In addition, the levels of Cu and Zn in the kidneys of pigs in all treatments and Zn in the bone of pigs in the high treatments were high compared to normal levels (26-29 ppm, 56-112 ppm and 95-146 ppm dry weight for Cu and Zn in kidneys and Zn in bone, respectively). Cu and Zn in tissues were affected significantly by inclusion level ($P<0.0001$). Based on the indicators of Cu and Zn status analysed, a higher absorption for Bioplex® Cu and Zn compared to that of the sulphates was not evident. However a proper bioavailability study is required as factors like initial pig mineral status, assessed indicators of mineral status and composition of the diet may have influenced the response (Wedekind *et al.*, 1994).

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