Effects of two copper sources on oxidative stress, inflammation, and gene abundance on growing pigs

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How therapeutic doses of Cu improve growth has not been fully elucidated. A trial was performed to test the hypothesis that therapeutic Cu supplementation will affect oxidative stress, inflammation, and gene expression, but these effects will be different depending on the Cu source used. A total of 120 pigs (initial BW:11.5 ± 0.98 kg) were randomly allotted to 3 treatments with 8 pens per treatment during 28 days. Treatments were a negative control diet (NC, 25 mg Cu/kg) and two diets including 250 mg/kg of Cu from $CuSO_4$ or Cu_2O. Pigs' weight and feed intake were recorded at day 1 and 28. On day 28, 8 pigs per treatment were sacrificed to obtain samples of serum, liver tissue, and jejunum tissue to analyse oxidative stress markers, malondialdehyde (MDA), cytokines concentration, and gene expression of 56 intestinal genes related with barrier function (BF), immune response (IR), gut hormones, gut enzymes, and nutrient transport (NT). Pigs fed with the high levels of Cu had greater ($P < 0.05$) growth and feed intake than pigs fed the NC diet; and showed increased ($P < 0.05$) gene expression related to intestinal BF (CLDN15, MUC2, and TFF3) and NT (SLC39A4, SLC5A1, and SCLC11A2), but reduced ($P < 0.05$) abundance of genes related to the IR (CXCL2, IL-6, IL-8, and TGF-β1) compared with pigs fed the NC diet. Among sources, $CuSO_4$ showed greater ($P < 0.05$) MDA levels in liver, and serum concentrations of TNF-α ($P < 0.05$) and IL-1β ($P < 0.10$) than the other treatments. Supplementing therapeutic doses of Cu increases growth and feed intake which could be explained by the increase of genes related to NT and BF, and the reduction of genes related to IR. Also, supplementing pigs with Cu_2O induces less lipid oxidation and inflammation than pigs fed diets containing $CuSO_4$.