

508P Effect of dietary addition of iron sulfate in broilers diet on water-soluble phosphorus excreted, minerals digestibility and bone mineralization. P. Floradin*, F. Guay, and M.-P. Létourneau-Montminy, *Laval University, Quebec, QC, Canada.*

Soluble P is highly bioavailable to macrophytes and algae and therefore readily affects water quality. Phosphates are commonly removed from municipal and industrial wastewater by precipitation with multivalent metals such as iron (Fe). In a previous trial it has been shown that the addition of iron sulfate encapsulated can reduced the excretion of water-soluble P (WSP) in excreta without modifying P retention and growth performance. The impact Fe encapsulated added in broiler diet on WSP excretion in litter was the subject of the present trial. In addition, the effect of iron encapsulated or not using a spray-chilling method was also tested in terms of growth performance, apparent jejunal and ileal (AID) digestibility of calcium (Ca), Fe, P and phytic P (PP), kidneys and liver Fe content, and bone mineral content (BMC) of tibia (DXA, Discovery W; Hologic Inc., Waltham, MA, USA). The experiment was divided in 3-phases feeding program (0–10, 10–21, 21–34 d) using 5 diets that meet all nutritional requirements except Fe: a positive control (C+); C+ supplemented with 33 and 60 ppm Fe sulfate encapsulated (FeE1 and FeE2), and C+ supplemented with 33 and 60 ppm Fe sulfate non-encapsulated (FeNE1 and FeNE2). Two thousand 7 hundred (2700) 1 d-old Cobb-500 male broilers were assigned to 1 of 5 diets and distributed in 60 pens of 45 birds each. Six birds per pen were euthanized by cervical dislocation at d 30 and 31. Data were analyzed as a randomized complete block design with PROC MIXED of SAS to test the impact of 1) Fe addition (C+ vs other), 2) Fe Encapsulation (FeE1-FeE2 vs FeNE1-FeNE2), 3) Dose effect of FeE (FeE1 vs FeE2), and 4) Dose effect of FeNE (FeNE1 vs FeNE2). It should be noted first that iron in the C+ diet was higher than expected (~300 ppm). Overall ADG was reduced (C+ vs other, $P = 0.05$) by iron addition except in birds receiving FeE1 (FeE1 vs FeE2, $P < 0.05$). Similarly, BMC was reduced with iron addition (C+ vs other, $P = 0.02$) except in FeE1 (FeE1 vs FeE2, $P = 0.009$). A significant increase in AID of total P ($P < 0.001$), PP ($P = 0.01$), Ca ($P < 0.001$) and Fe ($P < 0.001$) was observed with the addition of Fe (C+ vs other). These effects were stronger with FeNE (FeE vs FeNE) for total P ($P < 0.001$) and PP ($P = 0.01$). Iron did not significantly affect WSP concentration in the jejunum, ileum, but increase WSP in the litter (C+ vs other, $P < 0.001$). These results suggest that Fe addition reduces growth performance and does not insolubilize the P in the litter. This is partly due to the adverse effect of high Fe concentration on bone mineralization and remodeling, inducing an increase in urinary excretion of P. The increase of P digestibility with iron addition needs further investigation.

Key Words: water soluble-phosphorus, iron sulfate, apparent ileal digestibility, broiler