Iron toxicity in piglets

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Introduction
Administration of iron preparations to piglets is a routine procedure for prevention of anemia. It has been demonstrated that experimentally produced vitamin E deficiency in piglets is associated with lowered resistance to iron and that pigs born to vitamin E deficient gilts are more susceptible to iron toxicosis. This susceptibility has been termed iron hypersensitivity or iron toxicity. Due to reports within the industry of post-weaning mortality as a result of iron toxicity, an investigation was initiated to evaluate iron levels in piglets across PIC pure lines. In order to rule out iron hypersensitivity as a result of vitamin E deficiencies, vitamin E and selenium levels were also determined. Iron toxicosis was observed across PIC pure lines in piglets that were not deficient in vitamin E or selenium when iron was administrated at industry accepted levels of 200 mg.

Materials and methods
To determine baseline iron values across PIC pure lines, tissue sets from 70 pre-weaning mortalities were submitted to the University of Minnesota Diagnostic Laboratory for toxicology analysis and histopathology. Tissue sets were composed of two liver samples, one fresh or frozen and one fixed in formalin, from piglets that had received one 200 mg intramuscular injection of iron at day one of age. Samples were not submitted on mortalities that had received an iron injection less than three days prior to death. Once results were obtained (Figure 2) and evaluated, iron dosage to subsequent litters was lowered to 150 mg. Twenty-five additional pre-weaning mortality samples were then submitted (Figure 3). Once piglets dosed with 150 mg of iron reached eighteen days of age, packed cell volumes (PCV) were determined on eight piglets (Table 1). Piglets with a PCV of less than twenty percent are considered anemic. Iron dosage in subsequent litters was lowered to 100 mg after results were evaluated. Twenty-five additional pre-weaning mortalities were then submitted (Figure 4) along with blood from eight eighteen day old piglets for determination of PCV (Table 2).

Results and discussion
We have demonstrated that across PIC pure lines, one 200 mg injection of iron at day one of age produced toxic iron levels (Figures 1 and 2), while vitamin E (Figure 5) and selenium (Figure 6) were within normal limits. Pigs injected with 100 mg of iron dextran at days 1-3 are expected to have 600-2000 ppm Fe at days 1-3; 100-130 ppm at day 10; 60-100 at day 20; and 25-40 at day 30. In addition, one 150 mg injection of iron administered at day one of age resulted in toxic levels of iron in pre-weaning mortalities that were submitted for diagnostics (Figures 1 and 3). PCV
values of the eight piglets sampled were within normal limits when 150 mg of iron was administered once at day one of age (Table 1). Administration of 100 mg of iron at day one of age resulted in iron liver levels that were closer to normal limits (Figures 1 and 4). PCV values were also within normal limits when 100 mg of iron was administered at day one of age (Table 2). PIC genetic nucleus farms and one sireline nucleus farm are currently administering one 100 mg injection of iron at day one of age without subsequent anemia or negative effect on production parameters.

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References
**Figure 4:** Liver iron level ranges and averages by age group for piglets administered 100 mg of iron dextran at day one of age

![Liver iron levels by age group](image)

**Figure 5:** Percent piglets by liver vitamin E (HPLC) levels (all mortalities included)

![Liver vitamin E levels by piglet](image)

**Figure 6:** Percent piglets by liver selenium (fluorescent method) levels (all mortalities included)

![Liver selenium levels by piglet](image)