SQM® Iron and its influence on gut pathogens in animal production

Maximized performance in animal production requires optimum health status. The phasing out of antibiotics as growth promoters, and the restricted use of antibiotics for therapeutic interventions, have created the need for new tools to minimize gut pathogen growth. Even low level of colonization by pathogenic microbes can cause "subclinical" infections, which can result in considerable loss of profitability to producers, as they observe suboptimal performance but are unable to determine the root cause of the problem.

The vast majority of pathogenic microbes have a high requirement for iron to augment their growth rates. For instance, McIntosh and Earhart, back in 1977, showed that *E. coli* have requirement for high levels of iron. Additionally, Osman et al. (2013), described how *Clostridium perfringens* grows at accelerated rates when sufficient iron is provided. Also, currently there is application of this knowledge at the clinical level, as doctors are using iron chelates prior to antibiotic regimens in hospital treatments for infection (Thompson et al., 2012).

With this information in mind, QualiTech began exploring how SQM Iron could influence the growth rate of different pathogens. QualiTech initially evaluated the growth rates of *E. coli* (Ec), *C. perfringens* (Cp) and *E. acervulina* (Ea) in subclinical exposure studies. Figures 1-5 show the impact of SQM Iron on reducing pathogen influence in broilers when compared to iron sulfate. Figure 5 shows the influence on *Salmonella* growth in the broiler growth study.

Figure 1. Intestinal lesion score in broilers by iron source and pathogen exposure

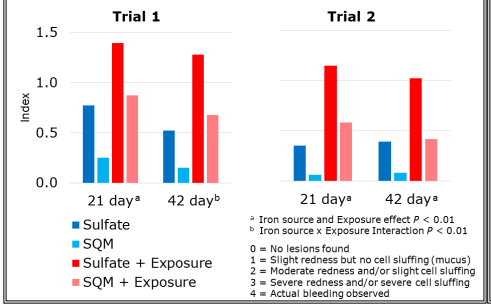


Figure 2. *Clostridium perfringens* counts in broilers by iron source and pathogen exposure

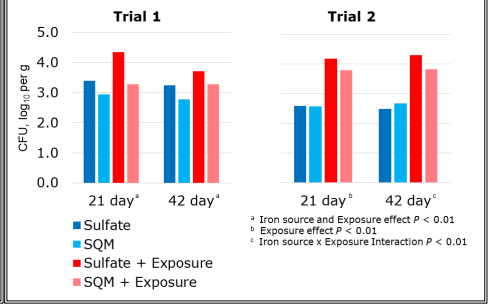


Figure 3. *Eimeria acervulina* (Coccidia) counts in broilers by iron source and exposure

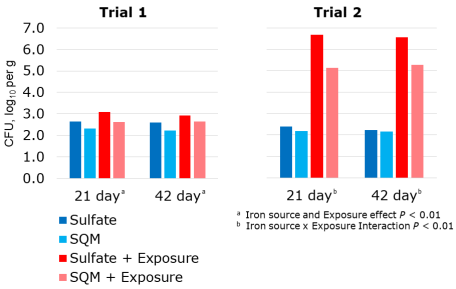


Figure 4. *E. coli* counts in broilers by iron source and exposure

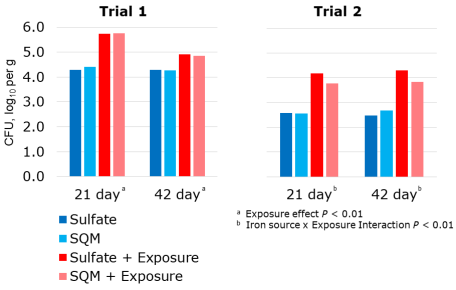
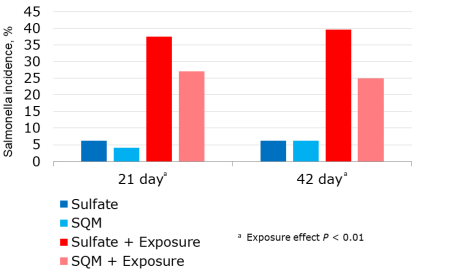


Figure 5. *Salmonella* incidence in broilers by iron source and pathogen exposure



QualiTech followed up these broiler trials with pure culture growth studies conducted at the University of Minnesota. Figures 6-9 show that with SQM Iron as the sole iron source in the media, Ec (*K12 and APECO2*) and *Salmonella (Reading and Typhimurium)*, had reduced growth rates compared to media that had iron sulfate as its sole iron source.

To learn more about the benefits of SQM protected minerals®, contact QualiTech at 800-328-5870 or qualitechco.com.

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Figure 6. *E. coli* K12 growth *in vitro* by iron source

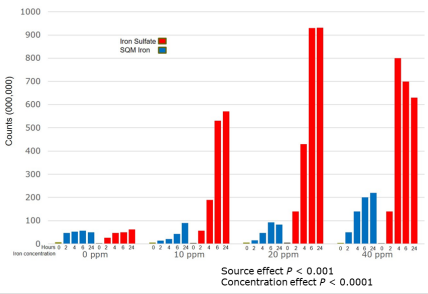


Figure 7. *E. coli* APECO2 growth *in vitro* by iron source

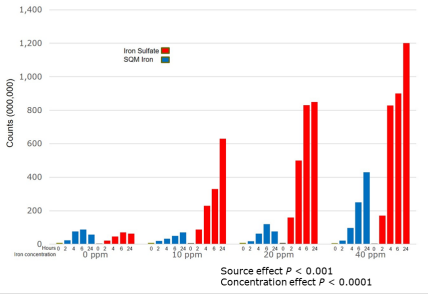


Figure 8. *Salmonella reading* growth *in vitro* by iron source

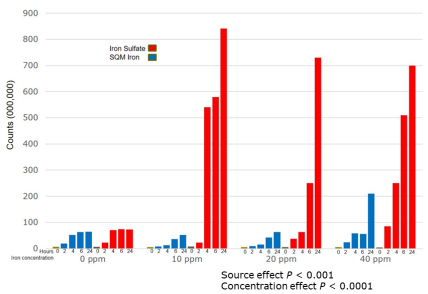


Figure 9. *Salmonella typhimurium* growth *in vitro* by iron source

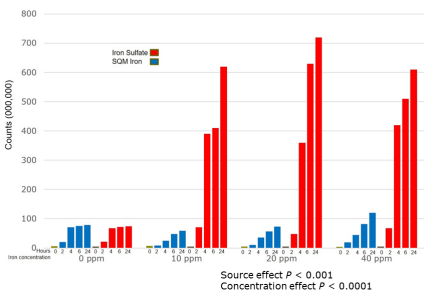


Figure 12. Fecal pathogen counts in broilers - **private research**

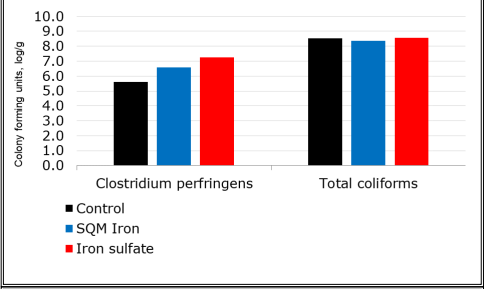
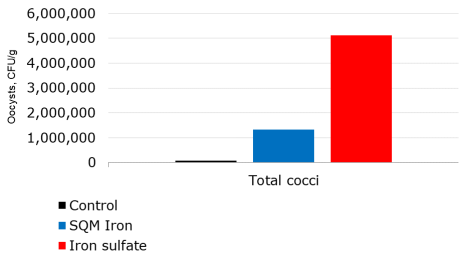


Figure 13. Fecal cocci counts in broilers - **private research**



Additional live animal studies have been conducted to evaluate pathogenic growth counts. A commercial broiler study (Figure 10) showed a reduction in Cp and Ec counts at 21 and 42 days. Numerical reductions in Total cocci counts and Ea counts were observed as well (Figure 11). Research conducted at a private research facility showed numerical reductions in Cp and Total coliforms counts in non-exposed broilers during a production cycle (Figure 12) with numerical reductions in cocci counts as well (Figure 13). This study also looked at the overall value of iron addition to a diet. It was observed that pathogen growth was most limited when no iron was available. However, iron is a required nutrient for optimum broiler growth, therefore SQM Iron can provide a dual benefit of optimized iron availability and control of pathogen growth.

Figure 10. Pathogen growth in broilers by iron source and day - **commercial study**

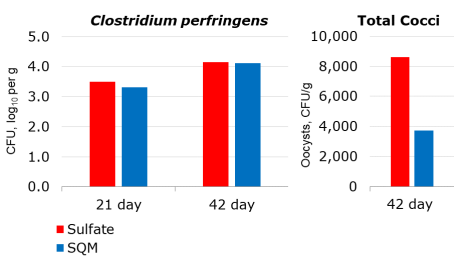
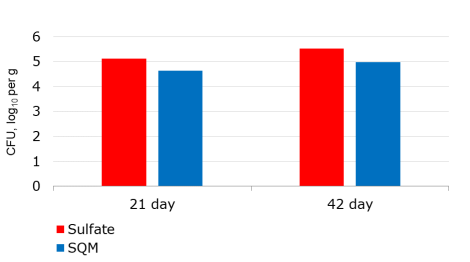
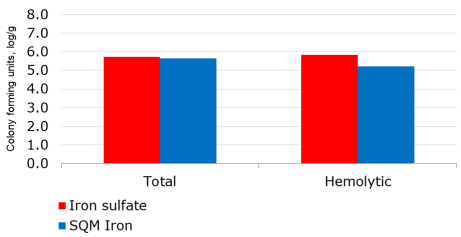


Figure 11. *E. coli* growth in broilers by iron source and day - **commercial study**



Results with baby pigs have also been promising. One recent study showed a numerical decrease in total and hemolytic Ec (Figure 14). These results are of interest to expand research efforts on strategies to help develop a healthier breed/ farrowing herd, resulting in higher performing weaned piglets.

Figure 14. Total and hemolytic *E. coli* in piglets by iron source



QualiTech is dedicated to delivering the value of SQM Iron to optimize livestock performance. To learn more about the benefits of feeding SQM Iron, please contact QualiTech at info@qualitechco.com or visit us at qualitechco.com