

**Title:** Assessing the role of medium chain fatty acids as an alternative to medically important antibiotic NPB #17-049

**Investigator:** Dr. Cassandra Jones

**Co-investigators:** Roger Cochrane MS, Dr. TG Nagaraja, Dr. John Pluske, Dr. Amachawadi, Dr. Mike Tokach, Dr. Megan Niederwerder, Dr. Jason Woodworth, Dr. Steve Dritz, Dr. Chad Paulk, and Dr. Charles Stark

**Institution:** Kansas State University

**Date Submitted:** June 11, 2018

### Scientific Abstract

Research has demonstrated that medium chain fatty acids (MCFA) can serve as reduction strategies for bacterial and viral pathogens in animal feed and ingredients. However, it is unknown how the type or level of MCFA impact bacteria growth. Furthermore, it is not known if MCFA can serve as an antibiotic alternative to therapeutic doses of antibiotic used in the swine industry. The objective of this study was to assess the role of medium chain fatty acids as an alternative to medically important antibiotics by 1) evaluating fatty acid concentrations of commercially-available or based MCFA products and evaluation of bactericidal activity through the development of a low-cost benchtop model and 2) compare the efficacy of MCFA vs. therapeutic chlortetracycline supplementation in feed for disease-challenged pigs.

From the first objective, it was determined that the MIC of MCFA varied among bacteria species. The lowest MIC of the MCFA was 0.43% of a 1:1:1 blend of C6:0, C8:0, and C10:0 for *Campylobacter coli*, 0.25% C12:0 for *Clostridium perfringens*, 0.60% 1:1:1 blend for generic *Escherichia coli*, 0.53% C6:0 for ETEC, and 0.40% C6:0 for *Salmonella* Typhimurium. It was also noted that the commercially based product containing higher concentrations of C6:0 or C8:0 had lower MIC in gram negative bacteria.

For the second objective, 100 entire male pigs (initially  $14.1 \pm 1.6$  lb BW and weaned at 22 days of age) were used in a 29-day disease challenge study. Pigs were allowed 5 acclimation days, followed by 2 days of disease challenge with enterotoxigenic  $\beta$ -hemolytic *Escherichia coli*, serotype O149:K91: K88 (ETEC). After the challenge, pigs were allotted to a diet with 1 of 5 treatments: 1) Control with no additives, 2) 400 g/ton CTC (Chlortet 200G, Eco Animal Health, London, United Kingdom), 3) 1.08% of a 1:1:1 blend of C6:0, C8:0, and C10:0 (Nuscience Group, Drongen, Belgium), 4) 3.93% developmental Product A (Nuscience Group, Drongen, Belgium), and 5) 1.04% developmental Product B (Kemin Industries, Des Moines, IA). Treatments 3, 4, and 5 were included at rates to derive a 1% MCFA concentration in finished feed. Pigs were fed treatment diets for 14 days following the disease challenge to mimic a therapeutic dose of CTC and fed a common diet from d 14 to

---

These research results were submitted in fulfillment of checkoff-funded research projects. This report is published directly as submitted by the project's principal investigator. This report has not been peer-reviewed.

---

For more information contact:

National Pork Board • PO Box 9114 • Des Moines, IA 50306 USA • 800-456-7675 • Fax: 515-223-2646 • pork.org

---

21. There was no difference ( $P > 0.10$ ) of dietary treatment on growth performance from d 0 to 7 or d 14 to 21. From d 7 to 14, pigs fed diets supplemented with CTC, 1:1:1 blend, or Product B had improved ( $P < 0.05$ ) F:G compared to those fed the control diet, with pigs fed diets with Product A being intermediate. A treatment  $\times$  day interaction for the ETEC fecal shedding was observed ( $P < 0.05$ ), which was driven by pigs fed diets with CTC having decreased ( $P < 0.05$ ) fecal shedding on d 7 than 14, while those fed diets with Product B having greater ( $P < 0.05$ ) fecal ETEC shedding on d 1 than d 14. While other disease markers, such as fecal score, plasma urea nitrogen, and haptoglobin, decreased ( $P < 0.05$ ) with time, they were not affected ( $P > 0.05$ ) by dietary treatment.

Overall, the inhibitory efficacy of MCFA varies among bacteria species. This suggest that MCFA mixtures may provide a wider spectrum of bacterial control. It was also noted that supplementing ETEC-challenged nursery pigs with MCFA-based dietary treatments led to similar growth performance as a therapeutic dose of 400 g/ton of CTC. As commercial products containing MCFA become available for livestock, it is important to consider the interaction between MCFA chain length and concentration on the potential to effectively mitigate various feed-based bacteria.