RESEARCH ABSTRACT

PUBLIC HEALTH/WORKER SAFETY

Title: Development of a practical, cost-effective, easy to administer prebiotic intervention to reduce carriage of zoonotic pathogens on the farm and entering the abattoir – **NPB #14-077**

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Scientific Abstract: The gut of food-producing animals is a reservoir for human foodborne pathogens. Thymol is bactericidal against pathogens including *Salmonella* and *E. coli* but its rapid absorption from the proximal gut reveals a need for protective technologies to deliver effective concentrations to the lower gut where the pathogens mainly colonize. Thymol-β-D-glucopyranoside (hereafter referred to as beta-D-thymol) is more resistant to absorption than free thymol in everted jejunal segments because of its β-glycosidic bond and thus could potentially function as a prebiotic, being undegradable in the proximal gut but hydrolysable by microbial beta-D-thymol-hydrolyzing enzymes in the distal gut. This study was conducted to determine the effective dose of beta-D-thymol against pathogenic *Salmonella* and *E. coli* and to determine if oral administration of doses intended to deliver these effective concentrations to the cecum and rectum of pigs can effectively reduce intestinal carriage of *Salmonella* and *E. coli*. Results from in vitro dose titration studies have identified efficacious doses of beta-D-thymol against *Salmonella, E. coli* and *Campylobacter* during culture with porcine gut bacteria, with concentrations of beta-D-thymol needed to achieve efficacious reductions of *Salmonella* or *E. coli* being 6 to 9 times higher than that (1 mM) needed to effectively kill *Campylobacter* species. The increased susceptibility of *Campylobacter* to beta-D-thymol may be a consequence of its dependence on amino acid fermentation as free thymol is thought to inhibit this activity. Results from live animal studies were not successful in achieving significant reductions in cecal and rectal concentrations of *Salmonella, E. coli* or *Campylobacter,* possibly because hydrolysis and absorption of beta-D-thymol and free thymol may still be sufficiently rapid within the proximal small intestine to preclude their delivery to the cecum and large intestine. Additionally, it is possible also that uptake and internal compartmentalization of beta-D-thymol by gut bacteria, or its lipophilicity, may sequester the beta-d-thymol away from hydrolytic enzymes thus preventing the release of free thymol. Comparison of antimicrobial resistance profiles between *E. coli* isolates or multidrug resistant *Salmonella* strains did not support a hypothesis that exposure to beta-D-thymol or thymol may co-select for antimicrobial resistance. Additional research is currently underway to try and learn how to overcome obstacles preventing delivery of efficacious amounts of beta-D-thymol to the lower gastrointestinal tract.