Effects of In-Feed Chlortetracycline Prophylaxis of Beef Cattle on Animal Health and Antimicrobial-Resistant *Escherichia coli*

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Abstract
Concerns have been raised that in-feed chlortetracycline (CTC) may increase antimicrobial resistance (AMR), specifically tetracycline-resistant (TET') *Escherichia coli*, and third-generation cephalosporin-resistant (3GC') *E. coli*. We evaluated the impact of a 5-day in-feed CTC prophylaxis on animal health, TET' *E. coli*, and 3GC' *E. coli*. A "control group" of cattle (n = 150) received no CTC, while a "CTC group" (n = 150) received in-feed CTC (10 mg/lb of body weight/day) from the 5th to the 9th day after feedlot arrival. Over 25% (38/150) of the animals in the control group developed illnesses requiring therapeutic treatment with antimicrobials critically important to human medicine. Only two animals (1.3%) in the CTC group required such treatments. Fecal swab and pen surface occurrences of generic *E. coli*, TET' *E. coli*, and 3GC' *E. coli* were determined on five sample occasions: arrival at the feedlot, 5 days post treatment completion (5 dpt), 27 dpt, 75 dpt, and 117 dpt. On 5 dpt, TET' *E. coli* concentrations were higher for the CTC group than control group (P < 0.01). On 27 dpt, 75 dpt, and 117 dpt TET' *E. coli* concentrations did not differ between groups. 3GC' *E. coli* occurrences did not differ between control and CTC groups on any sample occasion. For both groups generic, TET', and 3GC' *E. coli* occurrences were highest on 75 dpt and 117 dpt, suggesting that factors other than in-feed CTC contributed more significantly to antimicrobial-resistant *E. coli* occurrence.

Importance
The occurrence of human bacterial infections resistant to antimicrobial therapy has been increasing. It has been postulated that antimicrobial resistance was inevitable, but the lifespan of the antimicrobial era has been prematurely compromised due to misuse of antimicrobials in clinical and agricultural practices. Direct evidence relating the use of antimicrobials in livestock production to diminished human health outcomes due to antimicrobial resistance is lacking, the United States Food and Drug Administration has taken an approach to maximize therapeutic efficacy and minimize selection of resistant microorganisms through judicious use of antimicrobials. This study demonstrated that prophylactic in-feed treatment of chlortetracycline administered for five days to calves entering feedlots is judicious as this therapy reduced animal morbidity, reduced the use of antimicrobials more critical to human health, and had no long-term impact on the occurrence of antimicrobial-resistant *E. coli*.


*The study reported here in this Research Brief was not funded by the beef checkoff, but is made available to expand the usefulness of this checkoff-funded website for those interested in beef safety.*