

Project Title:	Prevalence, Quantity and Antibiotic Resistance Profiles of <i>Salmonella enterica</i> at Slaughter in Response to Antibiotic use Early in the Cattle Feeding Period
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Background

The threat of antimicrobial-resistant bacteria and the implications for human health is an area of research that has been receiving a great deal of attention in both the media and scientific community. In the Centers for Disease Control and Prevention report, “Antibiotic Resistance Threats in the United States, 2013,” *Salmonella* is listed as a microorganism of serious threat. *Salmonella* outbreaks are most associated with poultry and eggs; however, beef has also been implicated as a source of infection. The use of antibiotics in food animals may contribute to dissemination of antimicrobial-resistant bacteria through the food chain. One of the major concerns is that many antibiotics used in food animals are also important in human medicine. Strict regulations or bans on the use of antimicrobials in agriculture could have devastating effects on animal health and create food safety issues.

The objective of this study was to determine the effects of tulathromycin and ceftiofur treatment on the prevalence, quantity, and antimicrobial resistance of *Salmonella* in feedlot cattle immediately following treatment and at slaughter.

Methodology

Individual fecal samples were collected at an experimental feedlot at West Texas A&M University in Canyon, Texas. The randomized and controlled field trial was comprised of 134 steers in three different treatment groups to assess the impact of ceftiofur and tulathromycin use. Twelve pens (11(12) steers/pen) were assembled of steers blocked by starting weights. Cattle fecal samples from days 0, 7, and 56 (initially; days 14, 28, 99 and pre-slaughter to follow) were enriched and plated to selective media to identify *Salmonella* positive samples. Spiral plating onto brilliant green agar with novobiocin was used to obtain crude estimates of *Salmonella* quantities. Antibiotic susceptibility was performed for 11 different antimicrobials by the micro-broth dilution method using the Sensititre® automated inoculation delivery and fluorometric plate reading system. Genotypic antimicrobial susceptibility profiles will later be determined by whole genome sequencing of *Salmonella* isolates. Sequencing data will be analyzed for the presence of antimicrobial resistance genes using the online database Resfinder. *Salmonella* serotypes will be determined using whole genome sequencing data and short read sequence typing for bacterial pathogens (SRST2). Hide swabs (1m²) and subiliac lymph nodes were/will be sampled at slaughter and similar analysis conducted as described for fecal samples.

Findings

Use of antibiotics early in the feeding period has a limited impact on the ecology of *Salmonella* in the feces of cattle at later periods. Observed effects are transient, and while they may favor more resistant strains of *Salmonella*, the reversion is generally to a more susceptible population of *Salmonella*.

Implications

The dynamics of the *Salmonella* population in cattle during the feeding period and at slaughter has important food safety implications. This study suggests that by the time antibiotic-treated cattle are sent to slaughter that fecal bacterial populations have returned to baseline conditions. The prevalence and quantity of *Salmonella* in hide swabs is nearly identical across all treatment groups at slaughter suggesting a reversion to the local environment. In early findings, it appears there may be a sparing effect of antibiotic use on the quantity of *Salmonella* in lymph nodes at slaughter.

Table 1. Prevalence of *Salmonella* positive fecal samples across treatment groups and sampling days (YR1).

Treatment Group	Day 0 #positive (%)	Day 7 #positive (%)	Day 56 #positive (%)
Control	29/53 ¹ (54.7)	9/54 (16.7)	23/54 (42.9)
Tulathromycin	16/40 (40.0)	12/40 (30.0)	27/39 ² (69.2)
Ceftiofur	14/40 (35.0)	6/40 (15.0)	27/39 ² (69.2)

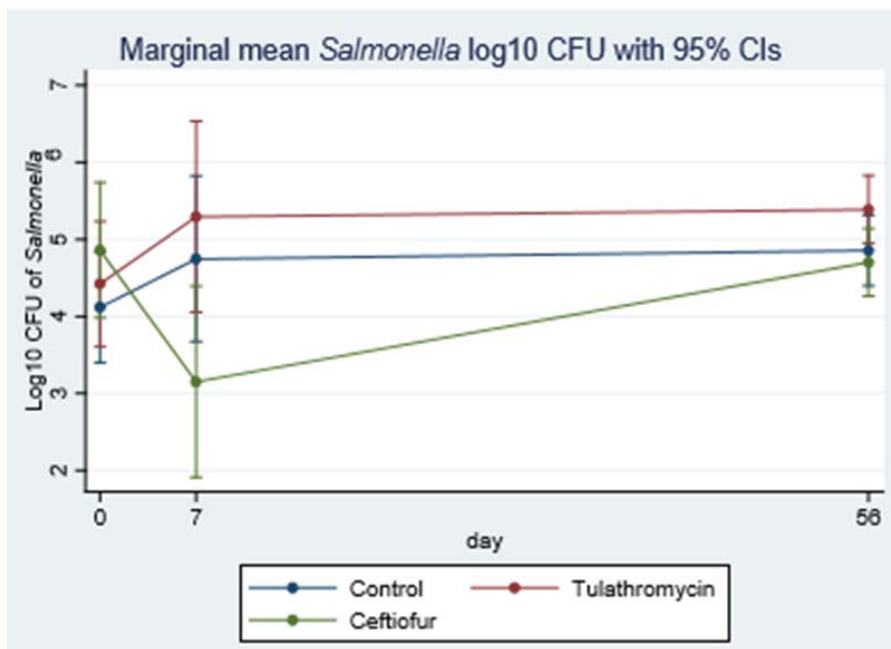


Figure 1. Marginal means of *Salmonella* counts from spiral plating fecal samples (among positive steers) with 95% confidence intervals across treatment groups and sampling days.