

Impact of Ceftiofur Use on the Recovery of *Salmonella* and Resistant *E. coli* in Dairy and Beef Cattle Populations

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Introduction

The use of the third generation cephalosporin, ceftiofur, is common in animal agriculture for the treatment of a wide range of production-limiting disease conditions. The therapeutic use of ceftiofur in livestock can select for the blaCMY-2 genetic element in the intestinal flora. The presence of resistant organisms is a potential public health threat to the consumer. This project investigated the impact of ceftiofur removal from cattle populations and the meat products they produced.

The working hypothesis is that the use of ceftiofur in food animal populations selects for the emergence and rapid dissemination of third generation cephalosporin resistant microorganisms, leading to the potential risk of food-borne zoonotic pathogen transfer via the food chain.

Materials and Methods

Two farms, each with established beef and dairy cattle populations, were sampled monthly over an 18-month period. At each farm, 50 fresh fecal samples were collected from both beef and dairy populations. In addition to the fecal samples, fresh meat samples were collected weekly from the harvested populations. Both meat and fecal samples were screened for *Escherichia coli* harboring the blaCMY-2 genetic element using selective media and *Salmonella* spp.

Results

Overall, *E. coli* with the blaCMY-2 phenotype were recovered from 1,411 (46.4%) of 3,038 total fecal samples.

Of these, 605 (38.1%) of 1,588 dairy cattle fecal samples and 806 (55.6%) of 1,450 beef cattle fecal samples contained the blaCMY-2 genetic element. Variation in the presence of the blaCMY-2 genetic element between farms was observed. From ground beef samples, one of 470 coarse ground samples was culture-positive for *E. coli* with the blaCMY-2 phenotype.

As for the *Salmonella* culture results, 254 (8.4%) isolates were recovered from 3,038 fecal samples. Of these samples, 206 (13.0%) of 1,588 dairy samples and 58 (4.0%) of 1,450 beef samples were *Salmonella*-positive. With regards to the ground beef samples, 10 (0.02%) of 470 samples were culture-positive for *Salmonella* spp.

Significance

E. coli carrying the blaCMY-2 phenotype were frequently present in animal populations where ceftiofur was used; however, recovering *E. coli* carrying the blaCMY-2 phenotype from the resulting meat samples collected was uncommon. In light of the current issues facing veterinary use of antimicrobials, the potential implications of antimicrobials used to therapeutically treat livestock needs to be thoroughly investigated. This study is important because it examines an essential class of drugs, third generation cephalosporins, used in both human and veterinary medicine.