

Variation in antibiotic treatment protocols used on large midwestern dairy farms

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Introduction

Antimicrobials are used on dairy farms to treat bacterial infections and are most used to manage mastitis. The aim was to describe variation in antibiotic treatment protocols on MI and OH dairy farms. We hypothesized that frequency, dosage and duration of antibiotic treatments would vary among farms.

Materials and methods

Herds (MI = 12; OH = 13) recording > 90% of antimicrobial treatments in dairy management software were enrolled in an antibiotic benchmarking program validation trial. Researchers visited farms (May-Sept. 2023) and generated a CSV file with events that farm workers indicated were treated with antibiotics. Events were classified as clinical mastitis (CM), non-specific clinical signs (CS), displaced abomasum (DA), dry off (DRY), feet and leg disorders (FLD), gastrointestinal disorders (GD), non-specific infections (INF), injuries (INJ), ketosis (KET), metritis (MET), milk fever (MF), miscellaneous treatment (MT), other events (OTH), reproductive disorder (RD), respiratory disorder (RESP), and retained placenta (RP). For Holstein herds, observed injectable antibiotics doses were compared to doses estimated for cows weighing 1,500 lbs (680 kg). Kruskal-Wallis and Wilcoxon Two-Sample tests were performed to compare doses, administration frequency and duration among farms and compared to label recommendations.

Results

Herds had an average of 2,808 (\pm 642) cows (158-12,500) and about 38% were > 3rd lactation. Average bulk tank somatic cell count was 159,200 (64,000-250,000 cells/mL). Milk production was 86 lbs/cow/day (\pm 4.25) for Holstein herds (n = 21) and 58 lbs/cow/day (\pm 2.17) for other breeds herds (n = 4). Among herds, the proportion of CM cases receiving IMM antibiotic treatment was 0% of cases (n = 6 herds), 1-50% (n = 6), 51-95% (n = 7) and > 95% (n = 6). Ceftiofur was the most used IMM antibiotic (n = 16 herds). Other IMM products used were amoxicillin (n = 5 herds), cephalosporin (n = 9), hetacillin (n = 6), and pirlimycin (n = 3). Average durations of IMM treatment were 4.6 days (\pm 0.29) for ceftiofur (n = 16 herds), 2.8 d (\pm 0.61) for amoxicillin (n = 5), 3.2 d (\pm 0.36) for cephalosporin (n = 9), 2.9 d (\pm 0.41) for hetacillin (n = 6), and 3.5 d (\pm 0.33) for pirlimycin (n = 6). Except for pirlimycin and ceftiofur, durations exceeded labels for all IMM products (P < .001). Injectable treatments for CM were reported in 11 herds with < 1 to 90% of cases receiving antibiotics. Proportion of cows treated at dry off was 0% (n = 2 herds), 1-50% (n = 5), 51-95% (n = 5), and > 95% (n = 13). Doses of injectable antibiotics used in Holstein

herds were less than estimated based on labels for ceftiofur, ampicillin, penicillin and sulfadimethoxine, and were greater for oxytetracycline (P < .001). Treatment of MET was recorded in 76% of herds using ampicillin (n = 11 herds), ceftiofur (n = 12), and oxytetracycline (n = 2). Antibiotics were used to treat CS (n = 9 herds), FLD (n = 18), MT (n = 6), OTH (n = 4), RP (n = 12), GD (n = 5), INF (n = 7), INJ (n = 4), and KET (n = 1). Of herds, 52% recorded antibiotic treatments for DA. Proportion of DA receiving antibiotics was 0-16% (n = 4 herds), while 9 herds treated > 80% of DA with antibiotics. Antibiotic treatments for RESP events (n = 18 herds) were recorded using ampicillin (n = 8 herds), ceftiofur (n = 14), oxytetracycline (n = 2), and sulfadimethoxine (n = 1). All RESP events received antibiotics and the proportion of cases treated was 1-50% (n = 4 herds), 51-95% (n = 4), and > 95% (n = 10). Among all herds and diseases, 5 antibiotics were used for systemic treatments, including ampicillin (n = 16 herds), ceftiofur (n = 18), oxytetracycline (n = 4), penicillin (n = 4) and sulfadimethoxine (n = 1).

Significance

Except for ceftiofur and pirlimycin, treatment durations for IMM antibiotics exceeded product labels. Based on estimated weight of Holstein cows, systemic antibiotic treatments were below label recommendations. Adherence to label recommendations of treatment protocols is important to improve antibiotic stewardship.

