Quantification of antimicrobial usage on dairy farms before, during and after the implementation of farmworker stewardship training

R. Portillo-Gonzalez,[1] DVM, MBA; A. Garzon-Audor,[2] DVM; R.V.V. Pereira,[2] DVM, PhD;
N. Silva-del-Rio,[2,3] DVM, PhD; B. M. Karle,[4] MS; G. G. Habing,[1] DVM, PhD, DACPVM

[1]Department of Veterinary Preventive Medicine, College of Veterinary Medicine,
The Ohio State University, Columbus, OH 43210
[2]Department of Population Health and Reproduction, School of Veterinary Medicine,
University of California, Davis, Davis, CA 95616
[3]Veterinary Medicine Teaching and Research Center, School of Veterinary Medicine,
University of California, Davis, Tulare, CA 93274
[4]Cooperative Extension, Division of Agriculture and Natural Resources,
University of California, Orland, CA 95618

Introduction

Antimicrobials are critical to preserving animal health and welfare. However, the development of antimicrobial resistance represents a public health threat. Veterinarians prescribe antimicrobials, but farmworkers are responsible for making on-farm treatment decisions and their training is vital to promote responsible antimicrobial use (AMU). This research project aimed to describe and quantify AMU on large dairy farms in Ohio and California and evaluate the impact of farmworker antimicrobial stewardship (AMS) training on those metrics. We hypothesized that farms, where AMS training was administered, would have significantly lower AMU compared to farms where training was not administered.

Materials and methods

We designed a quasi-experimental study with 18 conventional dairy farms enrolled in Ohio and California. Twelve farms received AMS training and 6 farms did not. AMS training included a 12-week training program focused on increasing the accurate diagnosis of cows requiring antimicrobial treatment. We quantified on-farm AMU by measuring the number of used drug bottles dispensed in a dedicated container provided by the research team. Treatment incidence using animal daily-doses (ADD) and the Poisson regression model was used to analyze AMU data.

Results

The mean disease incidence rate (DIR) in lactating cows was 2.2, 1.5, 1.0, 0.4, 0.3, 0.2 and 0.03/1,000 cow-days for mastitis, lameness, metritis, pneumonia, retained placenta, diarrheas and others (conjunctivitis, injuries and clostridial disease), respectively. The highest mean TI by antimicrobial class was cephalosporin 5.9, followed by penicillin 5.2, tetracyclines 0.5, lincosamides 0.2, and sulfonamides 0.1 (ADD/1,000 cow-days). The mean TI from the training group was 10.8 and although numerically lower, it was not significantly different compared to TI in the control groups at 14.3 ADD/1,000 cow-days (rate ratio = 0.77, CIs = 0.25-2.67). Among the trained farms using a within-treatment group analysis, no significant differences were observed in the mean TI pre-intervention 10.9 compared to the mean TI post-intervention 10.3 ADD/1,000 cow-days ($P = 0.99$).

Significance

This study estimated the TI for 18 conventional dairy farms located in 2 different states Ohio and California. This method was relatively easy to implement to calculate on-farm AMU on large dairy farms. There was substantial variation in the amount of AM used by the enrolled dairy farms. As previously reported in other studies, mastitis was the main health condition for on-farm AMU, and penicillin followed by cephalosporins were the most frequently used class of AMs by the enrolled dairy farms. Additionally, no significant differences in on-farm TI were observed between the Ohio farms compared to California farms. Despite the improvement in knowledge transferred among trained participants (unpublished data), no significant change in on-farm AMU was shown by the intervention farms compared to the control farms. Training for farmworkers to improve disease detection accuracy is a necessary component of AMS, but sustained progress will require a holistic approach. Additionally, the inclusion of psycho-social models that study the interaction between farmworkers' beliefs, societal-level factors, and environmental elements could help to shape human behavior and improve the responsible use of AMs at the farm level.