Influence of producers' attitudes, perceived norms, and perceived behavioral control for practicing prudent use of antimicrobials on New York dairy farms

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Introduction

Targeted communication concerning the judicious use of antimicrobials is vital to address public health concerns such as residues and resistance. Understanding dairy farmers' behavior, motivations, and barriers toward antimicrobial use can influence how veterinarians translate research into practice and guide effective ways of implementing protocols. A multidisciplinary team investigated behavioral tendencies toward antimicrobial use by administering a survey modeled with the Reasoned Action Approach (RAA). The RAA is a framework from social psychology containing the constructs attitude (A), perceived norms (PN), and perceived behavioral control (perception of the ease or difficulty of a behavior; PBC), and is used in combination with structural equation modeling (SEM) to determine what drives intentions (I). The objective of the survey was to provide direct and indirect measures of these constructs to determine importance of and associations with intention to use antimicrobials prudently.

Materials and Methods

A printed survey was sent to all 4,970 dairies registered with the NYS Department of Ag & Markets in February 2018. Fourteen questions were on demographics and 12 were belief statements using a 5-point bipolar Likert-type scale to collect answers. For example, an indirect attitude question began with "How important are the following motives for using antibiotics prudently?" Responders then selected the importance of milk production, job satisfaction, etc. on a sliding scale. STATA (StataCorp LLC, College Station, TX) was used for analysis. Confirmatory factor analysis was first used to estimate a measurement model of the latent variables by assigning observed indicators (direct measures) to their constructs A, PN, PBC, and I. SEM was applied to estimate a model with causal relationships to investigate the impact of A, PN, and PBC on I. Multiple indicators and multiple causes (MIMIC) models were then used to determine the effects of beliefs (indirect measures) on their underlying constructs.

Results

Of the 412 responders, 89% were conventional dairies eligible for analysis. Six were excluded for missing data. The effective sample size was 359. Owners represented 91% of responders and half were 41-60 years old. A third of the responders had 50-99 cows, while there were approximately 15% of responders in each of the following categories: <50, 99-199, 200-499, and >500. A third treated all clinical mastitis cases with antibiotics and 70% treated all cows at dry-off.

Specification of the SEM resulted in 2 separate constructs for A, instrumental (cognitive; IA) and affective (experiential; AA), and one construct for perceived norm (injunctive norm, IN). Collinearity was present when entering multiple constructs. The SEM with all constructs indicates the highest causal relationship for PBC on I (β=0.48). The regression weights (β) for AI, AA, and IN were 0.23, -0.06, and 0.25, respectively. Thus, producers who are confident in being able to use antimicrobials prudently expressed a positive intention. However, attitude and perception of others also had influence, but to a lesser extent.

MIMIC models showed that the most important attributes of IA were increasing profitability, decreasing risk of residues, and increasing herd health. Contributing attributes of AA were job satisfaction, decreasing resistance, and increasing milk production. For IN, the attributes were opinions/approval of family, peers, veterinarians, and milk processors. Finally, for PBC, attributes focused on saving money on labor and treatment and ability to fit into the daily routine.

Significance

Producers' perceived control, attitudes, and social pressures explained intention to use antimicrobials prudently. The best approach for adoption of practices might be presentation of examples of successful strategies by other producers, particularly in peer groups. In addition, veterinarians should provide the tools and guidance needed to produce economic gain and positive experiences when using the tactics.