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CalfScience: Extension Education at Many Levels

Dale A. Moore

Director

Veterinary Medicine Extension

Professor

Department of Veterinary Clinical Sciences

damoore@vetmed.wsu.edu

Kathlyn Tellessen

Extension Coordinator

Veterinary Medicine Extension

ktellessen@vetmed.wsu.edu

William M. Sischo

Professor

Department of Veterinary Clinical Sciences and School for Global Animal Health

wmsischo@vetmed.wsu.edu

College of Veterinary Medicine

Washington State University

Pullman, Washington

Abstract: The issue of antimicrobial resistance in food animal agriculture was addressed by conducting clinical trials to assess alternatives to antimicrobials in dairy calf-raising and developing outreach to three different audiences. Current research was integrated into Extension programs for calf-raisers, animal science and veterinary students, and food animal veterinarians. A complex issue such as resistance in bacteria from the use of antimicrobials in food animal agriculture requires an integrated approachâ from the science to its translation to judicious drug use on-farm but also a wide reach, to multiple audiences.

Introduction

Antimicrobials are important tools for food animal health but could potentially result in selection for resistant bacteria. Although the real impact of antimicrobial use in food animals on development of resistance in human and zoonotic pathogens remains unknown (Phillips et al., 2008), the perception that use of these drugs in animals is a significant cause of resistance in human bacterial pathogens is widespread (Silbergeld, Graham, & Price, 2008), suggesting that animal industries be actively engaged in developing fact-based approaches that encourage careful use of antimicrobials and support the spread and adoption of these practices.

Purpose

A multi-year project supported by the USDA Integrated Food Safety Program and industry-related collaborators focused on research and educational programs to implement prudent use of antimicrobials in pre-weaned dairy heifer and bull calves. The project focused on: 1) research describing the dynamics of antimicrobial resistance on large calf-raising operations, 2) testing strategies and alternatives to antimicrobial use, and 3) developing multi-audience outreach programs. The combined efforts of this integrated research and Extension program is *CalfScience*.

Activities

The foundation of *CalfScience* included eight research projects on the development of antimicrobial resistance in the enteric flora of neonatal calves and testing alternatives to their use (Berge, Atwill, & Sischo, 2003; Berge, Lindeque, Moore, & Sischo, 2005b; Berge, Atwill, & Sischo, 2005a; Berge, Moore, & Sischo, 2006a; Berge, Moore, & Sischo, 2006b; Berge, Besser, Moore, & Sischo, 2009c; Berge, Moore, Besser, & Sischo, 2009b; Berge, Hancock, Sischo, & Besser, 2009a). Results of these and other research findings were incorporated into outreach programs for three audiences: dairy producers and calf raisers, food animal veterinarians, and animal science and veterinary students. The framework for delivering the program included a website and seminars.

The *CalfScience Producer Course* emphasized non-antibiotic or judicious antimicrobial use to achieve four goals for calf health: less than 2% pre-weaning losses, saving money on product costs, growing heifers to perform, and preserving the effectiveness of antibiotics for future use. Two delivery formats were developed: an educational booklet and an online course (using Adobe Presenter®) at <http://vetextension.wsu.edu/courses/calfscience/producers/index.htm>. A questionnaire helped evaluate the course marketed to producers and calf-raisers in the West through an email newsletter, practicing veterinarians, and industry representatives.

The *CalfScience Veterinary Continuing Education Course* was developed for dairy veterinarians in the western United States and focused on judicious drug use and research findings on alternatives to antimicrobials in calf management. The course was delivered as a 50-minute online course (using Adobe Presenter®) and a 90-minute seminar. Email and mail databases of veterinarians in California, Idaho, Oregon, and Washington were used to promote the online curriculum. The seminar was offered in southern California, central Washington, and northwestern Washington. Post-program evaluations for the seminar were used to assess usefulness of the program.

The *CalfScience Student Course* targeted animal science and veterinary students. The objectives were to instruct college students about public policy issues surrounding antimicrobial resistance, use of antimicrobials in animal agriculture, research to address the issues, and how research can be used to make science-based farm management decisions about antimicrobial use. Instructors from seven western universities were contacted, and faculty visited each school to present the seminar and provide instructors a *Calf Science Course CD* that included: a course quiz, PowerPoint Evaluation Form, PowerPoint Presentation, Course Evaluation, Class Exercises, and a Trainer's Guide. In-residence presentations were evaluated using a retrospective pre-post questionnaire (Davis, 2003). The course was also provided on the website <http://vetextension.wsu.edu/courses/calfscience/students/index.htm>.

Results and Discussion

The producer course was presented, in parts, at nine producer meetings and on the WSU *Calfscience* website. Between September 2008 and August 2009, based on Web usage statistics, over 500 individuals visited the online producer course.

The veterinary course was presented to three veterinary groups. When asked how much of the content was new to them, over 54% reported that more than 75% was new, and 85% indicated it was relevant to their practice. Most agreed that as a result of the course, they could better serve their calf-raising clients (96%), were confident in their ability to apply the new knowledge (96%), and better understood the issue of antimicrobial resistance (93%). Fifty-three percent thought the course was *excellent*, 44% thought it was *good*. Written comments about the course included:

- "Outstanding!"
- "Great program"
- "Well organized" and
- "Very informative & cutting edge (ahead of information that is publically available)."

The *CS Student Course* was presented to over 250 students from seven western universities: California State University-Fresno, California Polytechnic State University-San Luis Obispo, California Polytechnic State University-Pomona, Western University College of Veterinary Medicine, Oregon State University, Washington State University, and Central Washington University. From that population, we collected 224 completed evaluations. Students were in a number of majors: Animal/Dairy/Meat Science (66.36%), Biology/Zoology (9.09%), Ag Business/Business (7.73%), and Veterinary Medicine (4.55%). Most material was new to 80% of the students. Students were asked to evaluate their knowledge or competence before and after the course to using a scale of *Expert, Good, Fair, Poor, and No Experience* (Table 1).

Table 1.

Percentage of Student Self-Ratings of Knowledge or Competency Before and After a *CalfScience* Seminar (N=224)

Rate your knowledge / competency with the following:	Percent Responding						
	Before/ After	Expert	Good	Fair	Poor	No Experience	No Response
Recognize issues with antibiotic resistance in animal	Before	0	13	36	22	27	0
	After	8	66	22	2	1	0

agriculture.							
Can identify factors that affect pre-weaning calf health.	Before	0	12	19	23	44	1
	After	9	62	22	5	1	0
Can list ways antibiotic resistance develops in bacteria.	Before	4	18	27	24	26	1
	After	11	50	32	5	1	0
Can define key factors in colostrum feeding.	Before	1	11	20	20	47	0
	After	13	49	32	5	0	0
Know steps in targeted therapy management.	Before	4	12	26	56	0	1
	After	4	29	42	18	3	1
Value the role of antibiotics in calf milk / replacer.	Before	0	10	23	26	39	1
	After	8	46	33	6	0	2
Can list ways to decrease diarrheal disease in calves.	Before	0	8	15	25	51	0
	After	5	36	41	13	3	1
Realize the value of preserving the effectiveness of antibiotics.	Before	5	24	24	18	27	2
	After	17	58	19	3	1	2
Understand importance of a clean calf environment.	Before	9	37	27	13	13	0
	After	39	53	4	2	1	1
Can describe aspects affecting passive transfer of immunity.	Before	1	13	23	26	35	1
	After	7	42	32	15	2	2
Feel confident discussing current research on antibiotic resistance	Before	1	4	16	33	43	2
	After	4	30	47	13	3	3

There were significant trends for increasing level of self-rated competence or knowledge after the course for each evaluation item (Chi-square test for trend; $P < 0.01$) (Table 1).

Conclusions

The *CalfScience* outreach program focused on three audiences with the same science-based messages. College students in animal and veterinary science represent future producers and dairy advisors, and veterinarians are dairy producers' primary source of herd health information and dairy beef food safety (Jensen, English, Menard, 2009). From a research translation aspect, programs designed like *CalfScience* bridge the gap between key research findings and application to industry problems and provide for a multiple-audience approach to a public policy issue.

Implications

Modern Extension programs are issues-focused, can be delivered through a variety of mechanisms, and can reach multiple, diverse audiences. *CalfScience* can serve as a model for issues-based integrated research and Extension programs.

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