Antibiotic Use by Dairy Farmers in South Carolina: A Pilot Evaluation of Knowledge, Attitudes, and Practices

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Background

- Inappropriate use of antibiotics in humans **and** animals contributes to decreased antimicrobial susceptibility in bacteria
- Antibiotics in animals have been used in high doses over short periods of time to treat sick animals and in low doses prophylactically over longer periods to prevent disease and promote growth in cattle, poultry, and swine
- Administration of low dose antibiotics in farm animals, especially swine and poultry, for prolonged periods of time can significantly increase selection of resistant bacteria (Ungemach, Muller-Bahrdt, & Abraham, 2006)

Background

- Antibiotic resistance is “the ability of bacteria to resist or be unaffected by the effects of medication” (CDC, 2007)
- Dairy and poultry farmers and butchers shown to have increased drug-resistant bacteria through genetic mutations and natural selection of altered microbials (Black, 1984; van den Bogaard, Willems, London, et al, 2002)
- In light of recent concerns about emerging zoonoses (WHO, 2007), it is important to explore dairy farmers’ knowledge and practices regarding use of antibiotics

Background

- *Prudent use* of antibiotics = “decreasing unnecessary or inappropriate antibiotic use in humans and animals … to decrease the misuse and overuse of antibiotics, so that the efficacy of antibiotics is preserved for as long as possible” (CDC, 2007)
- U.S. Department of Agriculture (2007) suggests farm management practices that can help reduce the need for antimicrobials:
  - Vaccines
  - Proper nutrition and diet
  - Improved operational procedures
    - Buying animals from herds with higher health status
    - Pre-arrival testing of animals
    - Use of quarantine facilities
    - Elimination of contaminated feed and water

Public Health Concern

- Over the last decade, almost every type of bacteria has become stronger and less responsive to antibiotics
- Inappropriate use of antibiotics in humans and animals contributes to drug-resistant bacteria
- Resistant bacteria can be transferred from animals to humans causing public health concerns about misuse of antibiotics

American Veterinary Medical Association

- "When the decision is reached to use antimicrobials for therapy, veterinarians should strive to optimize therapeutic efficacy and minimize resistance to antimicrobials to protect public and animal health."

  -AVMA position on prudent antibiotic use (1998)

Study Rationale

- Farmers are often administering antibiotics for preventive reasons
- Following an educational intervention about antibiotic use on dairy farms, 51% discontinued use of medicated milk replacer (Raymond et al., 2006)
- There has been no previous study of South Carolina dairy farmers' knowledge about antibiotic resistance and their protocols regarding proper antibiotic use

Current Collaboration

- University of South Carolina (USC) and the South Carolina Department of Health and Environmental Control (SCDHEC)

- *Get Smart: Know When Antibiotics Work on the Farm* program funded by Centers for Disease Control and Prevention (http://www.cdc.gov/narms/get_smart.htm)

- Project consisted of two phases:

(1) Development and pilot-testing of a survey instrument on dairy farmers' knowledge, attitudes, and practices of appropriate antibiotic use, and

(2) Examination of farmers' needs for health education to encourage prudent use of antibiotics on South Carolina dairy farms

Get Smart on the Farm Activities

1) Distribute current practices and educational materials
2) Fund sites and provide technical assistance to develop, implement, and evaluate local campaigns
3) Support development and testing of veterinary medical curricula for students
4) Fund a national advertising campaign promoting the appropriate use of antibiotics
5) Develop an efficient and accurate means of measuring antimicrobial use in veterinary medicine and agriculture

Study Objectives

- To develop a survey to test South Carolina dairy farmers' current practices and knowledge about appropriate antibiotic use and antibiotic resistance in dairy cattle.

- To explore South Carolina dairy farmers' information sources and resource needs about prudent use of antibiotics and antibiotic resistance.

Methods: Recruitment

- Of 82 dairy farms currently operational in South Carolina, a convenience sample of 45 dairy farms (55%) were contacted and farmers invited to participate
- Recruited via information letters and telephone by SCDHEC consultant
- Total of 42 dairy owners/farmers from 34 farms agreed to participate
- 20 farmers from 19 farms participated in interviews; 22 farmers from 15 farms participated in one of four focus groups
- All interested dairy farmers were included, however, they were not eligible to participate in both interviews and focus groups

Interview Methods



Survey Development

- Survey of 30 multiple-choice questions on antibiotic use and dairy herd management practices developed by USC and SCDHEC
- Survey based on literature about herd management and antibiotic use on dairy farms, and modified using other state surveys and assistance from a local veterinarian

Interview Sessions

- Cognitive interviewing style
- Participants were asked to respond verbally and in writing
- Interviews were audio-taped to ensure important findings not overlooked

Data Analysis

- Frequencies and chi-squares
- P value set at 0.05

Focus Group Methods

- Participants asked for their current information sources about proper antibiotics use on the farm, barriers to obtaining information, and their interest in additional education
- Sample focus group questions:
  - In your opinion, what specific type of information would you as dairy farmers need and like to be receiving about antibiotic resistance?
  - What is the best format for receiving this information (e.g. print materials, educational video, seminars)?
  - Are there any current resources that you refer to on a regular basis about antibiotic resistance? If so, which ones?
- Digitally recorded focus groups transcribed and organized into QSR NVIVO
- Coding guided by emerging ideas and by existing literature about issues related to antibiotic use and resistance and barriers to seeking health-related information
- Quotes representing emerging themes noted and recorded to validate authors' interpretation of the data

Interviews / Surveys

- Surveys based on literature review and herd management questionnaires
- Included 30 multiple-choice and open-ended questions
  - 10: farm procedures
  - 10: antibiotic protocols
  - 3 questions: sources of antibiotic information
  - 5: opinions about antibiotic resistance
  - 2: farm worker education levels

Survey Results

- Preferred information sources about antibiotic use:
  - Veterinarians (100%)
  - Other dairy farmers (50%)
- Education level of workers administering antibiotics
  - 6th Grade or Less = 7%
  - 7th to 11th Grade = 33%
  - High School + = 60%

Survey Results

- All farmers determined need for antibiotics in livestock using symptom assessment (100%)
- Few farmers (32%) had written protocols
- Who is administering antibiotics? (Check all that apply.)
  - 95% (19 of 20) = Owner/Manager
  - 45% (9 of 20) = Milker/Farm Worker
- Extra-label usage of antibiotics reported by farmers (55%)
  - Under Vet's instructions? YES (100%)
- Was course of treatment completed as prescribed?
  - 50% (10 of 20) = Always
  - 50% (10 of 20) = Sometimes

Survey Results

- Dairy farmers who had **not** spoken with their vets about antibiotic resistance (65%) were significantly more likely to strongly disagree with the following survey statement: “If a cow has an infection that is resistant to antibiotics, this could be a threat to my farm workers” (X^2=21.778, df=8, p=.005)
- 70% who **received** information about antibiotic resistance from veterinarians in the past 6 months knew that resistance could occur in both animals and humans compared to individuals who did not receive this information (X^2=7.546, df=3, p=.04)
- 70% of farmers agreed that: “Antibiotics become less effective the more they are used”
- Overall, most farmers (86%) were **not concerned** that overuse of antibiotics in animals could result in antibiotic resistance among farm workers

Focus Groups

- 4 sessions, 2 hours each
- Audiotaped
- Where?
  - health departments, old restaurant
- What?
  - Information sources and preferences for educational resources
  - Presented print resources and video on antibiotic resistance

Focus Group Themes

Categories	Themes
1. Current Knowledge	(a) Lack of knowledge about antibiotic resistance (b) Reliance on experience in decision making about antibiotic use
2. Information Sources	(a) Credibility of animal health information sources (b) Desire for less technical information (c) Need for culturally appropriate and bilingual information (d) Importance of content format
3. Information-Seeking Barriers	(a) Lack of time to seek out appropriate information (b) Limited finances for veterinary consultations

1a: Limited Knowledge

- *"We notice a lot of resistance… there's got to be resistance. You could give a whole bunch and it doesn't work … even for chronic pneumonia…"*
- *"Well, mastitis, sometimes it's just like nothing - if it's a staph [infection], a lot of times it seems like nothing works. As far as anything else like maybe foot wart or something like that, foot rot or if they got pneumonia, one or two shots and they're about over it."*

1b: Reliance on Experience

- *"…like the rest of you, I've been doing it all my life."*
- *"If she [cow] is looking better, I don't give the whole regimen. I've managed several different dairies. I grew up on a dairy. I've used antibiotics on cows all my life, okay? And these are mistakes that I've seen people make and that I have made myself in the past."*

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2a: Source Credibility

- *"The vets give us more good information than anybody … I think a lot of times the vet can tell you stuff that he sees out in the field and out in his practices, how efficient the drug is working or which one is doing a good job."*
- *"I just thought of another resource we have. We do have meetings and some of these drug reps come … And they will just push their product … They will feed you if you sit there and listen to their sales pitch."*

2b: Need for Less Technical Information

- *"Yeah, it's a lot of fluff in that thing and it doesn't tell you anything … Like when you're reading an encyclopedia, which I don't do normally, but, I mean, you're looking for some specific answer to you, to a dairy herd or whatever, and you're not finding it."*
- *"A lot of times we count on people who don't read or can't read them [labels]. But we expect them to be able to make those kinds of decisions and send the milk on down the line and then expect it to be safe."*

2c: Need for Bilingual Information

- *"And in the dairy industry, a lot of times you're dealing with Hispanic labor. So now you've got communication barriers, you've got the language barrier, and you've got cultural issues which we must address."*
- *"Now, that was a good point about not only having words but having pictures, especially for some of the [Hispanic] workers who can't speak English."*

2d: Importance of Information Format

- *"You're milking, and the last thing you want to do in the milk barn is say: okay, my next step is section 5 and flip it out. I mean, what's more practical for you? So if we have that poster printed, that might be something [helpful]. And then it's on the wall and it's near the shelf where you have the antibiotics."*
- *"I would rather it be a poster to where it was right there in front of them because they're going to have to look at it … because not each of the workers is going to have their own reference guide … they need something that they can go to right away."*

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3a: Lack of Time

- *"If you're going to have an educational meeting, it would depend on the time of the year. So when you're busy, you know, you got a couple hundred acres of silage to cut … [too busy]."*
- *"A lot of the dairy farmers, especially down there in Bamberg have to work around the harvesting of cotton as well. We didn't exactly choose this period of time. This was just what we were given, and we do it."*
- *"It's not hard work. It's long hours -- 70 or more hours per week … Cows don't take the weekends off!"*

3b: Limited Finances

- *"And a lot of times you can't afford a vet on a sick cow. I don't know how a lot of people are around here, but we diagnose them a lot of times. And we may diagnose correctly. But we can't afford it."*
- *"A vet would be used a lot more in our place if it was financed, to be honest with you. Because I guess in my mind, what it boils down to is: it's hard to afford a vet bill."*

Dairy Farmers' Recommendations for Communications Campaign

- As requested by farmers, health resources and intervention programs should be bilingual (English and Spanish) and in plain language
- Use clear diagrams (e.g., laminated posters)
  - Text accompanied by visuals has been shown to influence comprehension over 40% more than text alone
  - Simple and relevant illustrations and diagrams can improve individuals' comprehension and retention of health risk information

Study Limitations

- Relatively small sample (n=42 from 34 farms)
  - Information gained from this population will apply to other SC dairy farmers
- We did not set out to discuss the role of specific antibiotics
  - Future work should involve education about common antibiotics used on dairy farms

Next Steps …

- Educational intervention being developed incorporating information needs of farmers
  - Will hopefully lead to decreased misuse of antibiotics and improved understanding of antibiotic resistance
  - Modified survey will serve as pre/post intervention assessments
- As dairy farmers' **most trusted source** of animal health information, **veterinarians will play a significant role** in the success of educational interventions on antibiotic resistance in South Carolina!

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