Resistance and New Rules on Antibiotic Use in Agriculture

Bo Norby, DVM, MPVM, PhD
Associate professor

Department of Large Animal Clinical Sciences
Michigan State University
Antibiotic resistance

 Increasing attention to antibiotic resistance within the past couple of decades

 Has become very important issues for human health and food animals production, perhaps for different reasons
What is antibiotic resistance?

β “Antimicrobial resistance is the ability of microbes to grow in the presence of a chemical (drug) that would normally kill them or limit their growth.”

(NIH NIAID)

β In other words, resistance allows resistant bacteria to survive antibiotic treatment

http://textbookofbacteriology.net/themicrobialworld/bactresanti.html
Bacteria share resistance genetic material

- Mutations conferring resistance
- Sharing resistance genes
Resistance is not a new phenomenon!

Alexander Fleming in Nobel Price acceptance speech: (1945)

• “It is not difficult to make microbes resistant to penicillin in the laboratory by exposing them to concentrations not sufficient to kill them, and the same thing has occasionally happened in the body. The time may come when penicillin can be bought by anyone in the shops. Then there is the danger that the ignorant man may easily underdose himself and by exposing his microbes to non-lethal quantities of the drug make them resistant.”
Time from antibiotic entered the market until resistance was detected

FIGURE 6-1 Resistance to antibiotics develops rapidly. The beginning of the arrow is when a given antibiotic was introduced to the clinic and the tip of the arrow is when the first clinical case of resistance to it was reported. Adopted and expanded from Wong and Pompliano, 1998.
Human and societal impact of resistance
Antibiotic resistance is one of the greatest threats to human health worldwide.

- Economic growth, PH, agriculture, economic, and national security.

- Impact on U.S. economy in excess of:
  - $20-30 billion in direct health care cost
  - $35 billion in lost productivity
Reports and action plans......
Recommendations to mitigate bacterial resistance

- Eliminate use of medically important antibiotics
- Foster stewardship of antibiotics
- Non-traditional therapeutics
- Understand environmental factors facilitating AMR
- Accelerate Research to Develop New Antibiotics, Other Therapeutics, Vaccines, and Diagnostics
Animal agriculture’s contribution to human illnesses and deaths

Do we know how much Ag contributes to illness and death in humans?

We don't, and it is exceedingly complex and I'd argue impossible to estimate.

However, it happens, we just don't know how widely it happens.

Where does agriculture fit in?
Little information on resistance and its impact on food animal diseases

- Some information on resistance in cattle pathogens
- Increasing resistance to 3 or more antibiotic classes in bovine respiratory disease pathogen (*M. haemolytica*) submitted to Kansas state university diagnostic lab.
  - 42% in 2009 (55 isolates)
  - 46% in 2010 (155 isolates)
  - 63% in 2011 (179 isolates)

- Little info on treatment failures due to resistance
Impact of antibiotic resistance on agriculture

- Baytril poultry approval withdrawn in 2005
- Cephalosporin order of Prohibition, January 2012
  - Restriction in use of cephalosporins
Impact of antibiotic resistance on agriculture

- Limitations and stricter rules for use of certain antibiotics
- GFI 209, 213 & VFD
  - Medically important antibiotics
  - Cease use of medically important antibiotics for production uses by January 1, 2017
Impact of antibiotic resistance on agriculture

- All use of antibiotics in feed will be VFD
- No extra-label use
- All use of antibiotics in water will be prescription
- Resistance in food animal pathogens
  - Sparse information on impact of resistance on treatment failures
The future

- To maintain the availability of antibiotics, we should
  - Improve stewardship (judicious use) by collaboration between veterinarians and producers
  - Continue to emphasize and improve preventive measures to reduce infectious diseases

- FDA has announced that they will evaluate uses of antibiotics in feed for which there isn’t a ‘duration of use on the label
Thank you for your time!

Questions?
Ceasing production use of antibiotics, National-level intervention, Denmark

Figure 4.1. Consumption of antimicrobial agents and growth promoters in animal production, number of pigs produced and prescribed antibacterials in humans, Denmark

DANMAP 2011