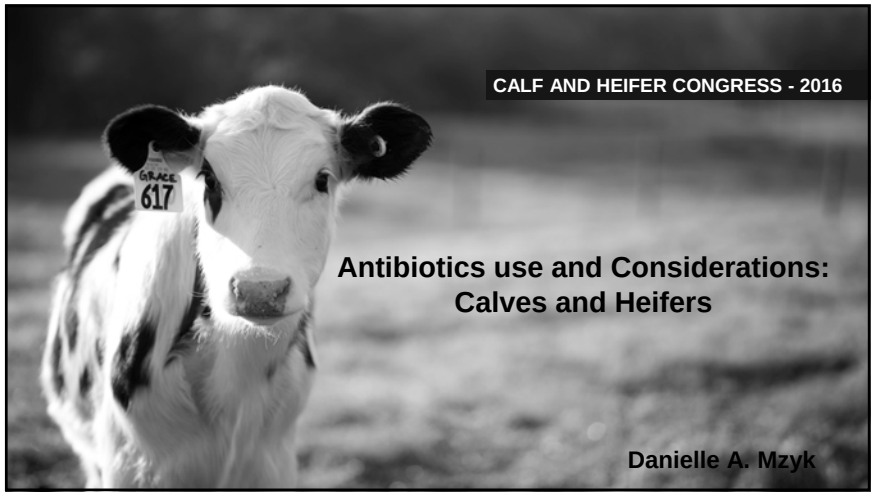


CALF AND HEIFER CONGRESS - 2016

Antibiotics use and Considerations: Calves and Heifers

Danielle A. Mzyk

FARAD
Food Animal Residue Avoidance and Depletion

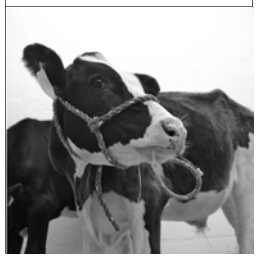
NC STATE
VETERINARY MEDICINE

FDA
Center for Veterinary Medicine

Today's Presentation

- **Classification of Calves**
  - Define 'Preruminant'
    - Veal vs preruminant vs ruminant calves
- **On Farm antibiotic use**
  - Preweaned heifers
  - Weaned heifers
- **Define Medicated Feed**
  - Medicated milk replacer
  - Use of Waste milk as feed
- **Antimicrobial Decision Making in Different Age Calves**
  - Tetracyclines
  - Cephlasporins
  - Fluoroquinolones
  - Macrolides
- **Veterinary Feed Directive**
  - Impacts on Calf Raisers

CLASSIFICATION OF CALVES



VEAL CALVES

Bob Veal, Formula Fed

- Immature cattle (including dairy breeds) lacking a functional rumen and intended for meat production
- Recognized as a distinct regulatory class, due to proximity to slaughter, handling, housing

PRERUMINANT CALVES

Non-lactating dairy cattle, dairy calves, suckling calves

- Classes of dairy cattle have not yet, or would never produce, milk for human consumption
- Includes: replacement dairy heifers, replacement dairy bulls, and dairy calves
- Female or male dairy breed cattle being fed a ration that includes milk or liquid milk replacer and which are not intended for veal production

RUMINANT CALVES

- Functional rumen
- Not fed milk replacer
- Replacement heifers, steers

On farm antibiotic use

Preweaned Heifers	Weaned Heifers	Adult Cattle
• Diarrhea • Respiratory disease	• Respiratory disease • Ionophores	• Dry cow therapy • Mastitis • Lameness • Respiratory disease

NAHMS dairy – 2011

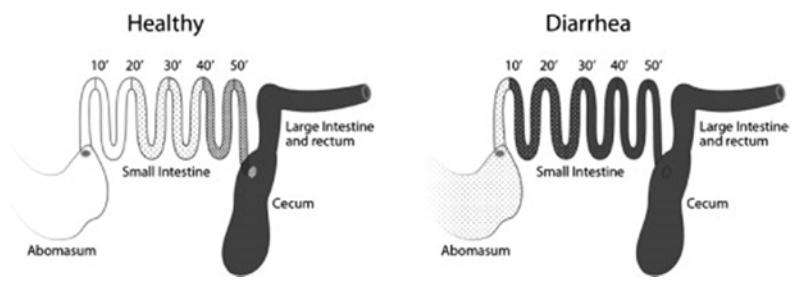
MOST COMMONLY USED – PREWEANED CALVES

Treatment of Diarrhea
- noncephalosporin beta-lactams, cephalosporins, “other” or unknown

Treatment of Respiratory Disease
- Macrolides, Florfenicol, Flouroquinolones

ANTIBIOTICS AND SCOURS

- Previous studies - lack of efficacy data in decreasing incidence of scours
- Some drugs (neomycin) increase rates of diarrhea
- Recent studes showed increase in incidence (31%) of diarrhea in calves fed medicated milk replacer vs non medicated



Adapted from Smith GW. Antimicrobial Decision Making for Enteric Diseases of Cattle. Vet Clin North America: Food Animal Practice. 31(1) 47-60

NAHMS dairy – 2011

MOST COMMONLY USED – WEANED CALVES

Treatment of Diarrhea
- noncephalosporin beta-lactams, sulfonamides, florfenicol, “other” or unknown

Treatment of Respiratory Disease
- Macrolides, Florfenicol, Flouroquinolones

Medicated Feed

- **Definition:** Any **feed** which contains drug ingredients intended or presented for the cure, mitigation, treatment, or prevention of disease of animals other than man or which contains drug ingredients intended to affect the structure or any function of the body of animals other than man
- **Definition of Feed:** Includes milk replacer and milk from cows

"Waste" Milk

Feed contaminant: means any biological, chemical (including radiological), or physical agent that if present in feed has the potential to cause illness or injury to animals or humans.

Waste Milk: Considered a 'Medicated feed'

- **Any extra label use of a medicated feed is illegal in major food producing species.**

Why is Waste Milk an Issue?

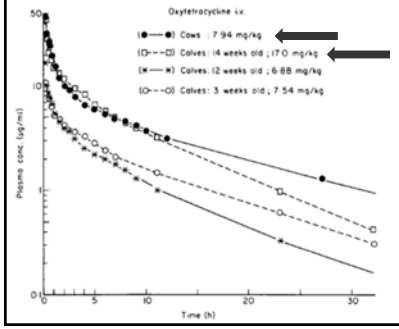
- **Intramammary Antibiotics**
  - Bioavailability: extent and rate a drug is absorbed into systemic circulation
  - More bioavailable, more likely to enter circulation = higher likelihood for residues
  - Pasteurization does not change drug concentration significantly
- **Extra Label Drug Administration to Lactating Dairy Cattle**
  - Florfenicol
  - Tulathromycin

Antimicrobial Decision Making in Different Age Calves

- **Diarrhea and respiratory disease is the leading cause of calf mortality**
- **Designing rational and efficacious protocols for both prevention and treatment common pathogens is critical**
- **Considerations of Age and Disease in determining which antimicrobial to use**

Tetracyclines

- **Age: Rate of drug elimination in young animals is much slower**
  - Combination of decreased clearance mechanisms and increased volumes of distributions



- Suggests in order to obtain equal pharmacokinetics in adult cattle and preruminant calves, the calves may require twice the dose of cattle of oxytetracycline IM or IV.
- This however, is just plasma concentrations – may be different from a tissue and residue avoidance point of view

Cephalosporins

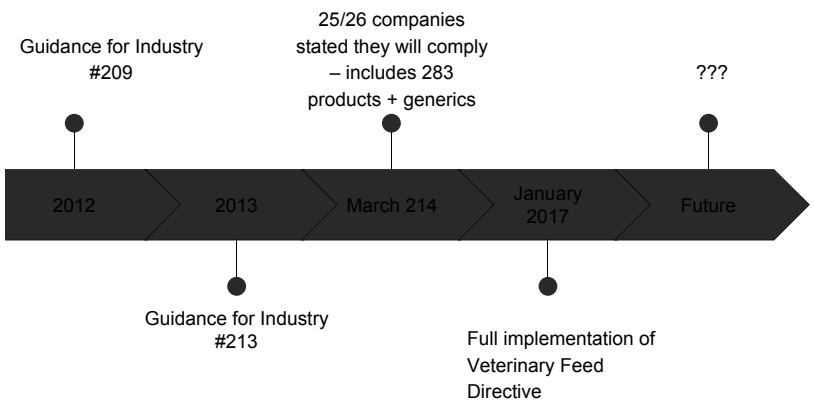
- **Prohibition of the extra label use of cephalosporins in major food-produ animals was enacted by the FDA in April 2012.**
  - One exception: drugs may be used for an extra label disease indication (something on the approved label), as long as the use of the drug adheres to a labeled dosage regimen (i.e., dose, route, frequency, and duration of administration) approved for tl particular species and production class.
- **Formulations are different in calves**
  - Pharmacokinetics of different formulations of cephalosporins in neonatal calves showed longer terminal half-lives in plasma as compared to adult cattle and these varied between formulations
    - Clearance of ceftiofur (sodium) in calves of different ages found that neonatal calves had a plasma elimination half-life of almost **3 times greater than that of older calves.**
    - Suggests that neonatal calves may need higher dosages to reach efficacious doses (however, this is illegal)

NC STATE Veterinary Medicine

Fluoroquinolones

- **The extra label use of fluoroquinolones in food-producing animals was prohibited by the FDA in 1997**
  - two approved fluoroquinolones approved for use in cattle including danofloxacin and enrofloxacin
  - Neither of these drugs are approved by the FDA for use in veal calves and are als prohibited from extra label use
- **Recent study on age impacts of distribution of danofloxacin**
  - Demonstrated similar PK parameters between 3 week old and 6 month old
  - Differences noted in distribution, but not plasma pharmacokinetics
- **LEGAL ISSUE**
  - **Enrofloxacin:** Allowed in young calves (and calves intended for dairy production)
  - **Danofloxacin**: NOT allowed in preruminant calves intended for dairy production (states on the label)

NC STATE Veterinary Medicine



VFD for Calf Raisers

Veterinary Oversight	Drugs NOT under VFD	ELDU = Illegal
Requires veterinary authorization, VCPR for distribution, and use of VFD drugs in animal feed Medicated Milk Replacers – oxytetratcycline, neomycin	Coccidiostats in milk replacers (Monensin) – unless formulated with medically importnant antibiotics	Production purposes Must follow label – no changes in concentration/dose allowed

Next Steps to Prepare for VFD

- Valid Veterinary – Client –Patient Relationship
- Re-examine and establish protocols for use of medicated feeds
- Discuss needs with veterinarian and nutritionist

Concluding Comments

1. Antibiotic use plays an important role in dairy calf health and welfare
   - Age and disease need to be considered when choosing antibiotics for use in calves
2. Industry is progressing – waste milk/Medicated feed
3. Change is coming – Be prepared!

NC STATE
Veterinary Medicine
Population Health and Pathobiology

Danielle A. Mzyk
dalindqu@ncsu.edu
919-636-8063