

# Bacterial Disease Challenges: Perspectives from Swine Veterinarians

Presidential Advisory Council on Combating Antibiotic-  
Resistant Bacteria

May 3, 2017 - Washington, DC

Dr. Locke A. Karriker, DVM, MS, DACVPM

Professor and Director, Swine Medicine Education Center  
Dr. Douglas and Ann Gustafson Professor of Excellence in Veterinary Teaching  
Iowa State University College of Veterinary Medicine

# Caveats

- Based on a mix of subjective observations and objective data
- Broad generalities
- Any of the details can be influenced by the specific case circumstances

# Definitions

- Mortality – deaths, easy to count without training, very crude measure, represents an extreme of possible outcomes, a subset of the population. Older mortality is more expensive.
- Morbidity – sickness, wide range of indicators, can be difficult to observe directly, may represent more cost than mortality even though animals survive. Longer morbidity is more expensive.
- Stressors – concurrent deficits that require pig to adapt
- Co-factor – concurrent disease or deficit to which the pig can not successfully adapt

# Challenges and Uses

- Epidemic, rapidly progressing, primary bacterial pathogens in populations
  - Emergency response required
  - Higher **morbidity**
  - Higher **mortality**
  - *Actinobacillus pleuropneumonia*
    - chlortetracycline, tiamulin, tilmicosin, enrofloxacin, ceftiofur
  - *Escherichia coli*
    - enrofloxacin, oxytetracycline, gentamicin, neomycin
  - *Salmonella choleraesuis*
    - ceftiofur, oxytetracycline, florfenicol

# Challenges and Uses

- Endemic, fulminant, primary bacterial pathogens in populations
  - Constant challenge, worsened by stressors
  - Higher morbidity
  - Lower mortality
  - *Lawsonia intracellularis*
    - chlortetracycline, tylosin, lincomycin
  - *Mycoplasma hyopneumoniae*
    - lincomycin, enrofloxacin, tulathromycin, tilmicosin
  - *Erysipelothrix rhusiopathiae*
    - penicillin, tylosin

# Challenges and Uses

- Ubiquitous, opportunistic, secondary bacterial pathogens
  - Always present, generally needs co-factor
  - Unpredictable morbidity
  - Unpredictable mortality
  - *Haemophilus parasuis* – most if not all pigs exposed at birth
    - ceftiofur, enrofloxacin, tulathromycin
  - *Streptococcus suis* – most if not all pigs exposed at birth
    - ceftiofur, enrofloxacin, florfenicol
  - *Pasteurella multocida*
    - tylosin, oxytetracycline, chlortetracycline, ceftiofur

# Scenarios of Greatest Concern

- Disease close to marketing (harvest) date
  - Most expensive
  - Least number of antibiotic tools
  - At the limits of preventive immunity, especially killed vaccines
  - Most likely to be a food safety issue
- Population disease dynamics versus individual animal pathology
  - Larger population = wider range of infection timelines; treatments have to be continue longer
  - Drug study populations = 6 identical pigs; pork production population = 1,250 diverse pigs
- Limiting antibiotics reduces welfare

# Scenarios of Greatest Concern

- Immune compromising viral diseases (serve as co-factors)
  - Influenza A Virus of Swine (IAVS)
    - Infects and limits/eliminates one of the two primary innate defenses of the lungs
    - 22.8% to 55% of farms depending on season and phase of production
  - Porcine Reproductive and Respiratory Syndrome virus (PRRSv)
    - Infects and limits/eliminates the other primary innate defense of the lungs
    - APHIS (2009): 71.1% of farms positive for the virus
  - Porcine Circovirus Type 2 (PCV2)
    - Replicates in, and destroys a variety of immune cells
    - Ubiquitous



# Regulatory Impacts

- Veterinary oversight provides veterinarians with more opportunities to engage owners and influence treatment choices
- Population structure (static v. dynamic), size and housing (indoor v. outdoor) influence the clinical severity of disease and need for drugs
- Flexibility on dose and treatment duration provides veterinarians with opportunities to reduce potential for resistance
- Reducing access to antimicrobials reduces animal welfare
- Prevention, control and treatment label indications are **all** necessary
  - *Streptococcus suis* example

# Alternatives to Antibiotics

- Biosecurity
  - THE most important health intervention in swine medicine
  - Broad non-specific benefits
  - Poor alternative when disease epidemiology is poorly understood
- Vaccination
  - Preferred when technology is available
  - Poor alternative when immune system is targeted by the disease
- Elimination
  - Manipulations of animal immunity, exposure, herd dynamics supplemented with antibiotics and vaccines when available
  - Poor alternative when barriers to re-infection are not available

# Scenarios of Greatest Concern

- Immune compromising viral diseases (serve as co-factors)
  - Influenza A Virus of Swine (IAVS)
    - Infects and limits/eliminates one of the two primary innate defenses of the lungs
    - 22.8% to 55% of farms depending on season and phase of production
  - Porcine Reproductive and Respiratory Syndrome virus (PRRSv)
    - Infects and limits/eliminates the other primary innate defense of the lungs
    - APHIS (2009): 71.1% of farms positive for the virus
  - Porcine Circovirus Type 2 (PCV2)
    - Replicates in, and destroys a variety of immune cells
    - Ubiquitous

~~Vaccination~~  
~~Elimination~~  
**Biosecurity**

~~Vaccination~~  
**Elimination**  
**Biosecurity**

**Vaccination**  
~~Elimination~~  
**Biosecurity**



**SMEC**

**SWINE MEDICINE**

**EDUCATION CENTER**