Approaches to reduce antibiotic resistance in the pork supply chain

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Content

- Can slaughterhouse data be used for the purpose of antibiotic reduction?
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- Research
  - Serology in slaughterhouse blood
    - Generic: Salmonella, Mycobacterium avium, Toxoplasma
    - Specific: tool for herd health management
- Conclusions
Record-High Antibiotic Sales for Meat and Poultry Production

Antibiotic overuse is breeding new, resistant strains of bacteria that infect people. But industrial farms haven’t gotten the message.

In 2011, 29.9 million pounds of antibiotics were sold in the United States for meat and poultry production. Yet, in the same period, only 7.7 million pounds of antibiotics were sold to treat sick people in the United States.

Antibiotic use: selection of resistance
Communicating populations of resistance

Sales of antibiotics in The Netherlands (1999-2012)
Success/Risk factors to reduce

**Why did usage increase?**
- Farm health insurance system
- Business model of veterinarians
- Low costs
- Simple intervention measure
- ....

**Why could it decrease?**
- Data bases & bench marks
  - e.g. Red/yellow card systems
- Abolishment critical antibiotics
- Public debate
- ....

Basic principle: healthy pigs and hygiene

- Fixed relation with piglet supplier
- Rodent control
- Hygiene at entrance

- All-in-all-out Non-mixing of group
- Cleaning & Disinfection

- Internal biosecurity
- Vaccination
  - Good colostrum / Good feed
  - Good housing conditions
  - Robust animals

- External biosecurity
Study purpose

All pigs end up in the slaughterhouse. Data and materials of these pigs can be and are easily collected.

- Can blood collected at the slaughterhouse be used to support farm health management?
  - Is there heterogeneity between farms?
  - Does serology predict performance of the farms?
  - Can data be transformed into information?

Blood collected in the slaughterhouse

Biosecurity and specific infections

- Serology from other monitoring/surveillance systems
  - Blood collected: for verification of chain control
  - Salmonella → routes: pigs, rodents, flies / internal transmission
  - Mycobacterium avium → routes: peat, bird droppings, surface water
  - Toxoplasma → routes: cats, rodents, whey

- Serology of specific pathogens for the purpose of farm health management
Important reasons for antibiotic usage in pig: risk factors

- Piglets: streptococci
- **Porcine Respiratory Disease Complex**
  - Bacterial
    - Mycoplasma hyopneumoniae
    - Actinobacillus pleuropneumoniae
  - Viral
    - Porcine Circovirus type 2
    - PRRS - virus
    - Swine Influenza virusses
- Gut Health
  - PIA – Ilietis
  - Swine dysentery

→ Clinical or Sub-clinical

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**Material & Methods**

- 600 slaughterhouse blood samples (No. 15, 5, 5, 5)
- Four fattening periods (May 11 to April 12)
- 20 herds (Southeast Bavaria)

Production system, stable size, distance between farms, quality management system etcetera

Average daily growth rate, feed conversion rate, usage of antimicrobial drugs etcetera

Cut-offs – pos./neg.
- PRRSV - S/P ≥ 0.40
- PCV2 – OD ≥ 0.454
- H1N1 – S/P ≥ 0.40
- Mhyo – S/P ≥ 0.30
- APP 2 – OD ≥ 0.30

Serological indicator

Percentage of positive samples

Percentage of pigs with middle and high pneumonia (> 10% surface)

Cough, Paleness, Respiratory distress, Herd weight heterogeneity

Probability of occurrence

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Results

Sum of percentage of positive samples per parameter and herd

Figure showing differences between farms, some with high serology and others with low serological responses.
Results

Serology on slaughterhouse blood

- Percentage of pigs with pneumonia (> 10% surface)
- Average Daily Growth Rate
- Average Feed Conversion Rate
- Usage of antibiotics

Pearson correlation coefficient is .847 (p < .000)

Graph showing positive correlation between positive serology and pneumonia percentage
Results
Serological indicator and average daily growth rate

Graph showing negative correlation between positive serology and daily growth

Pearson correlation coefficient is \(-0.493\) (p = 0.029)

Results
Serological indicator and average feed conversion rate

\[ R^2 = 0.470 \]

Graph showing positive correlation between positive serology and feed conversion ratio

Average Feed conversion rate
Pearson correlation coefficient is \(0.543\) (p = 0.013)
Serological indicator and antimicrobial drug usage* (Yes = used; No = not used)

Graph showing negative correlation between positive serology and use of antibiotics

The pork supply chain

Feed Producer → Multiplier Farm → Fattening Farms → Slaughter house → Farrow-to-finish

Information:
- Pathological findings
- Slaughter data
- Blood collected
- (Salmonella, Risk Based Meat Inspection)
Conclusions: ways to go

- Focus on preventive herd health management on farms
  - Healthy pigs
    - Colostrum, vaccination, feed
  - Improved internal- and external biosecurity
- Use data in the chain to make information
  - Use slaughter data
    - To monitor health
    - To verify biosecurity
    - To benchmark against other farms

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