Overview of strategies to reduce antimicrobial usage in pig production

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Overview

• Background and context
• Some definitions
• Options for reducing antimicrobial usage
• Discussion
Background (1)

- Antimicrobials are used since the 1940s
- Increasing resistance problems
  - cross-resistance
  - co-resistance

WHO, 2011
Background (2)

- Antimicrobials are widely used in livestock production
  - Therapeutic use
  - Prophylaxis, metaphylaxis
  - Growth promotion
- Effect of withdrawal
  - Disease
  - Welfare

WHO, 2011
Definition

• Antimicrobial resistance (AMR) is resistance of a microorganism to an antimicrobial medicine to which it was originally sensitive. Resistant organisms (they include bacteria, fungi, viruses and some parasites) are able to withstand attack by antimicrobial medicines, such as antibiotics, antifungals, antivirals, and antimalarials, so that standard treatments become ineffective and infections persist increasing risk of spread to others (WHO, 2013)
Context (1)

- International organisations issued strategies to reduce antimicrobial resistance
Context (2)

- Governance
- Guidelines

- Legislation
  - Registration of substance
  - Licensing of personnel
  - Prescription-only

- Prudent usage
  - Diagnosis
  - Appropriate substance, formulation
  - Correct dosage
Summary of strategies
Monitoring

- European Medicine Agency (EMA) data

Fig. 3. Amounts of veterinary antibiotics sold in 2007 per kg biomass of pig meat, poultry meat and cattle meat produced, plus estimated live weight of dairy cattle.

WHO, 2011
Data are essential to assess interventions

**Fig. 5.** Quinolone-resistant multiresistant S. Typhimurium DT104, United Kingdom, 1992–1997

- Source: European Centre for Disease Prevention and Control et al. (21). WHO, 2011
It can be done!

**Fig. 6.** Sales of antibiotics for therapeutic use in farmed fish in Norway versus produced biomass

Source: Markestad & Grave (39). WHO, 2011
Summary of strategies
Unspecific interventions

- Good farming practice
- Feed ingredients
- Feed additives
- Farmer belief and attitude
Good farming practice

- Sanitary measures
- Biosecurity
- High-health programmes
- Good practice
  - Record keeping
  - Animal health management
  - Veterinary medicines
  - Feeding and watering
  - Environment and infrastructure
  - Animal product handling

OIE, 2009
Feed ingredients

• Feed composition
  – Digestible crude protein

• Protective diets
  – Fermentable protein
  – Protein-carbohydrate ratio

• Protein source
  – Plant source
  – Animal source

Impact on microbiome?
Feed additives

• Zinc

• Probiotics
  – Live microbial feed supplements
  – Bacillus, yeast and lactic-acid producing bacteria

• Prebiotics
  – Ingredients increasing gut health
  – Organic acids (formic, lactic or benzoic acid)
  – Chinese herbs
    phytogenic feed additives
Farmer behaviour model
(hypothetical, Ajzen’s theory of planned behaviour)
Summary of strategies
Specific interventions

- Vaccination
- Resistance breeding
Vaccination

• Some successful examples
  • *Mycoplasma hyopneumoniae*
  • *Lawsonia intracellularis*
  • porcine circovirus (PCV) 2

• Many aspects yet to be quantified
  • Impact of vaccination schedule and other factors Impact on antimicrobial usage yet to be quantified
  • Impact of production system
  • Economic effectiveness under field conditions
Resistance breeding

• Disappointing in the past
• Novel technologies may facilitate progress
  – Full genome sequencing
  – Genotyping
• Resistance vs. tolerance?
  – Resistance: reduced pathogen burden, prevention of infection and growth
  – Tolerance: Limit impact of pathogen, resilience
Summary of strategies

- Unspecific prevention
- Hygiene Husbandry
- Feed Water
- Farmer attitude
- Biosecurity
- Economics
- Public health risk
- Governance Legislation Guidelines
- Specific prevention
- Innate immunity
- Vaccination
- Food security
- Usage
- Resistance

- Monitor
Questions for the group

• Are there additional approaches to reduce antimicrobial usage?
• Is there additional information/evidence to be added to the approaches?
• Can the focus group report specific examples/case studies?
• What are the most promising approaches? Which approaches should the focus group be exploring?
• Is there evidence that some interventions will work in certain husbandry systems or climate zones or industries while being less effective in others?
• Expected future changes in pig production that might have an impact on antimicrobial usage and/or on the effectiveness of strategies of usage reduction?
Selected references

• OIE: Guide to good farming practice for animal production food safety

• WHO Europe: Leaflet on antimicrobial resistance