

## How can veterinary epidemiology contribute to sustainable animal production?

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## Some definitions

### Epidemiology

... studies the distribution of disease in human populations and the factors determining that distribution...  
(*Encyclopædia Britannica*, 2007)

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## Some definitions

### Veterinary Epidemiology

... studies the **distribution** of "disease" in animal **populations** and the **factors** determining that distribution...

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## Veterinary Epidemiology

- How common is the "disease"?
- How is it spread?
- How do we diagnose it?
- What impact does it have?
- What causes it?
- How do we control it?

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## Some definitions, cont'd

### Sustainable development

... economic planning that attempts to foster economic growth while preserving the quality of the environment for future generations...  
(*Encyclopædia Britannica*, 2007)

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## Some definitions, cont'd

### Sustainable development

... encompasses economic, ecological and societal aspects

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## Sustainable animal production

- Food supply
- Animal health and welfare
- Environmental impact
- Resource management
- Economics
- Product quality and safety
- Consumer concerns
- ...

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## Animal health and welfare

- Important, but...
- Preventing rather than treating
  - Identify "web of causation"

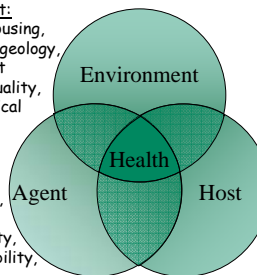
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## The epidemiological triad

Environment:  
weather, housing,  
geography, geology,  
management  
noise, air quality,  
food, chemical

Agent:  
infectivity,  
pathogenicity,  
virulence,  
immunogenicity,  
antigenic stability,  
survival



Host:  
age, sex, breed,  
conformation,  
genotype,  
nutritional status,  
physiologic condition,  
pathologic status

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## Animal health and welfare

- Important, but...
- Preventing rather than treating
- Epidemiological research:
  - Study design
  - Sample size
  - Analyses
    - Diagnostic tests
    - Associations

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## Animal health and welfare

- Important, but...
- Preventing rather than treating
- Epidemiological research:
  - Controlling BVDV in Scandinavia (e.g. Lindberg et al. 2006)
  - Controlling enzootic pneumonia in Switzerland (e.g. Stärk 2001)

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## Animal health and welfare

- Important, but...
- Preventing rather than treating
- Epidemiological research
  - Monitoring, surveillance
    - Sampling strategy
    - Comparable frequency measures
    - Diagnostic tests
    - Outbreak investigations

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## Animal health and welfare

- Important, but...
- Preventing rather than treating
- Epidemiological research
- Monitoring, surveillance
- Population-based health management ("herd" health)
  - assess the health states and needs
  - implement and evaluate interventions

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## Environmental impact

- Emissions
  - Acidification
  - Eutrophication
  - Greenhouse gas emission
- Low-emission production systems
- Efficiency - life cycle assessment

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## Efficient dairy production?

- Age at calving - 2 to 2.5 years
- Productive life - 2.5 lactations
- Increase productive life!
- Risk factors
  - Calving age, season (e.g. Evans et al. 2006)
  - Diseases (e.g. Schneider et al. 2007)
  - Housing (e.g. Bielfeldt et al. 2006)
  - ...

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## Environmental impact

- Emissions
  - Acidification
  - Eutrophication
  - Greenhouse gas emission
  - **Antibiotics and hormones**
- Healthy animals
- Strategies of non-use of antimicrobial drugs (Vaarst et al. 2006)

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## Environmental impact

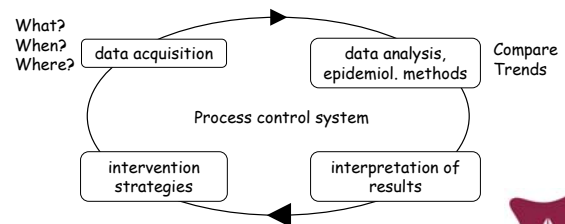
- Emissions
  - Acidification
  - Eutrophication
  - Greenhouse gas emission
  - Antibiotics
- Use of resources
- ...

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## Product quality and safety

- Pre-harvest food safety



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## Consumer concerns

- Increased interest in organic livestock farming
- Environmentally sound (?)
- Animal health and welfare?
  - Parasites in poultry (e.g. Kijlstra & Eijck 2006)
  - Parasites in pigs (e.g. Machold et al. 2007)
  - Mastitis in cows (e.g. Fall et al. 2007)

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## Epidemiological vs experimental research

- Associations  $\neq$  causality
- Less controlled environment
- + Natural environment, "real world"
- + Sample size



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## Veterinary Epidemiology

- If you can't measure it, you can't manage it
- Data driven
- Information systems needed!

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## Sustainable animal production

- Livestock farming system approach
- Multidisciplinary
- Veterinary epidemiology one part

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Thank you for your attention!

