



# Integrated surveillance

## *From farm to fork*

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# Outline

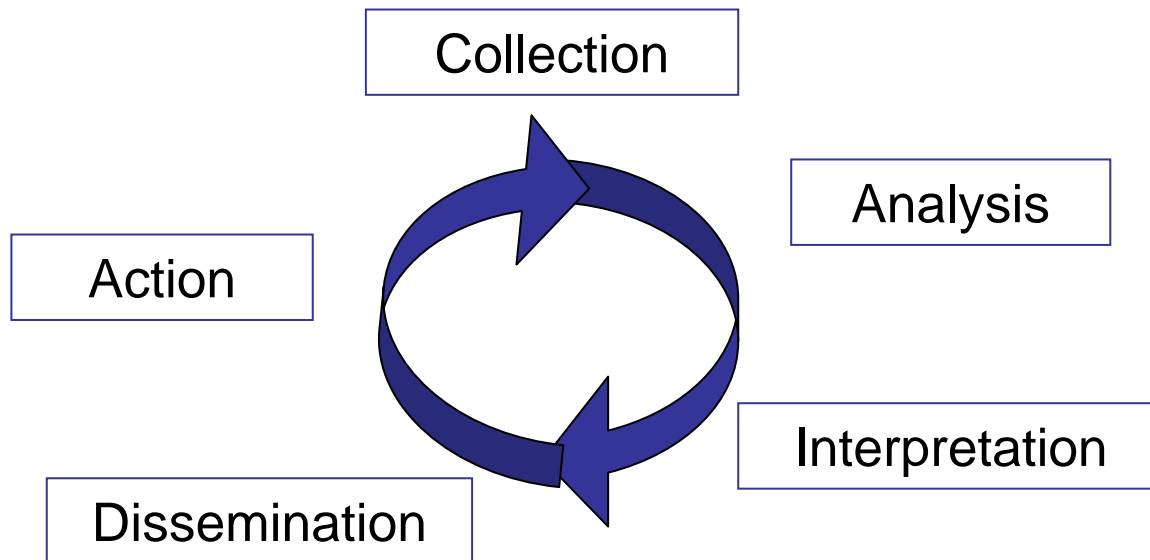
## Integrated surveillance

- Definition
- Rationale
- Danish example
- Plans in Canada and BC



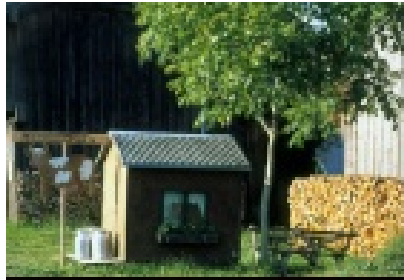
# Integrated foodchain surveillance

Collection, analysis, interpretation and dissemination of data to identify sources of human disease in food and animals in order to prevent and control them

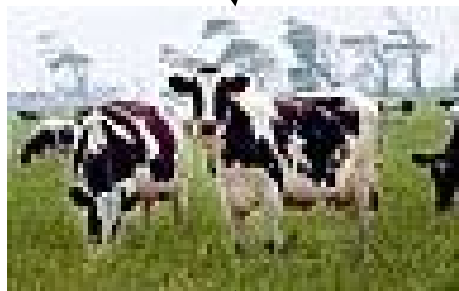


# The foodchain

Farm environment,  
animal feed, produce



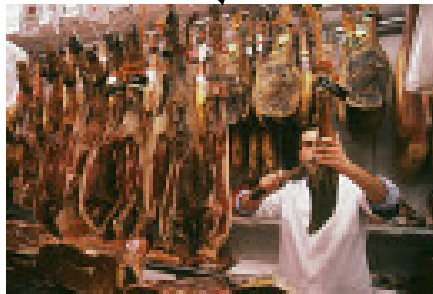
Food  
preparation



Animals

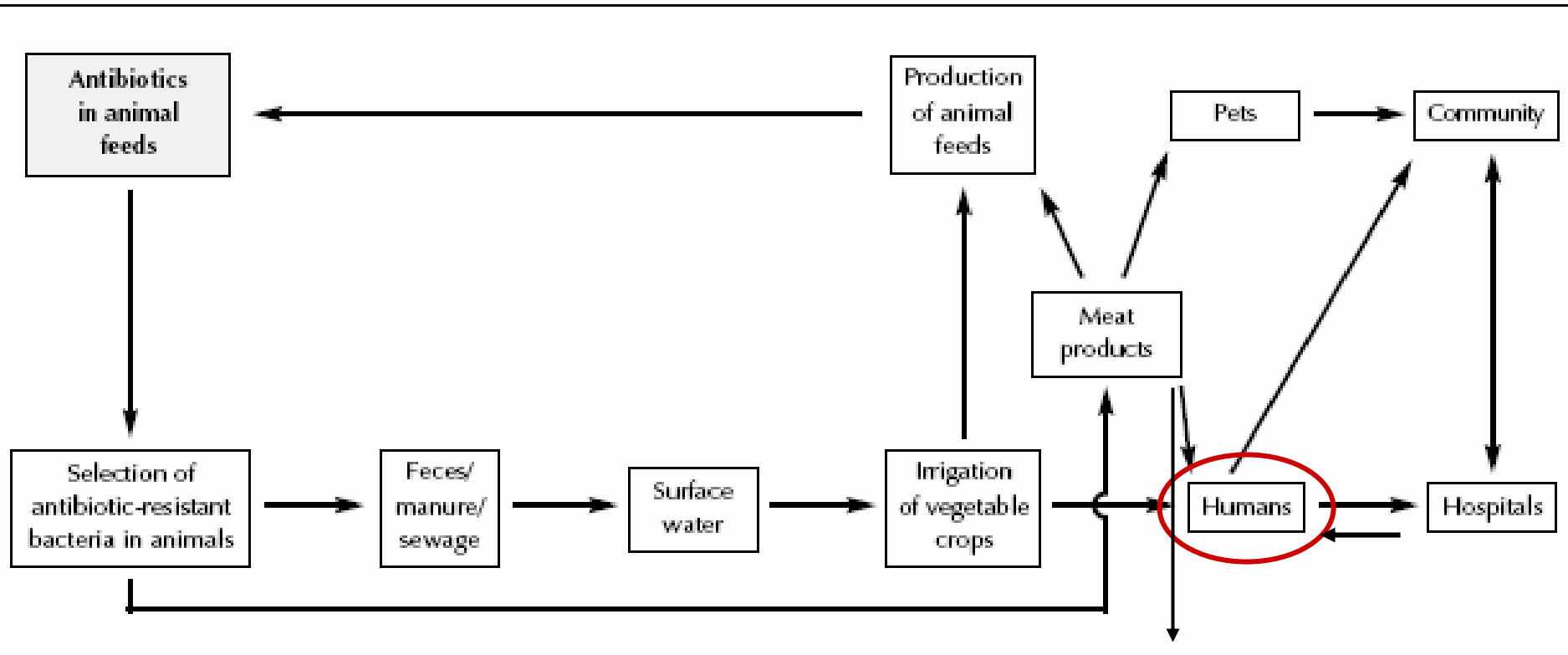
Food

Human



Slaughterhouse/  
processor

# Antimicrobial resistance in foodchain



# Reasons for integrated surveillance

Ability to trace food and animal sources of illness in humans

- To prioritize, design and evaluate food safety interventions
- To identify and control outbreaks of foodborne diseases



# Integrated surveillance in Denmark

- Surveillance of **foodborne pathogens** in humans, food and animals
- Surveillance **antimicrobial resistance** in bacteria from animals, food, humans
- Integration and analysis of data in central agency
- Control programs at the farm level



# Data flow

## Pathogens

Feed

Feed manufacturers

Farms

Animals

Slaughter plant

Foods

Retail

Humans

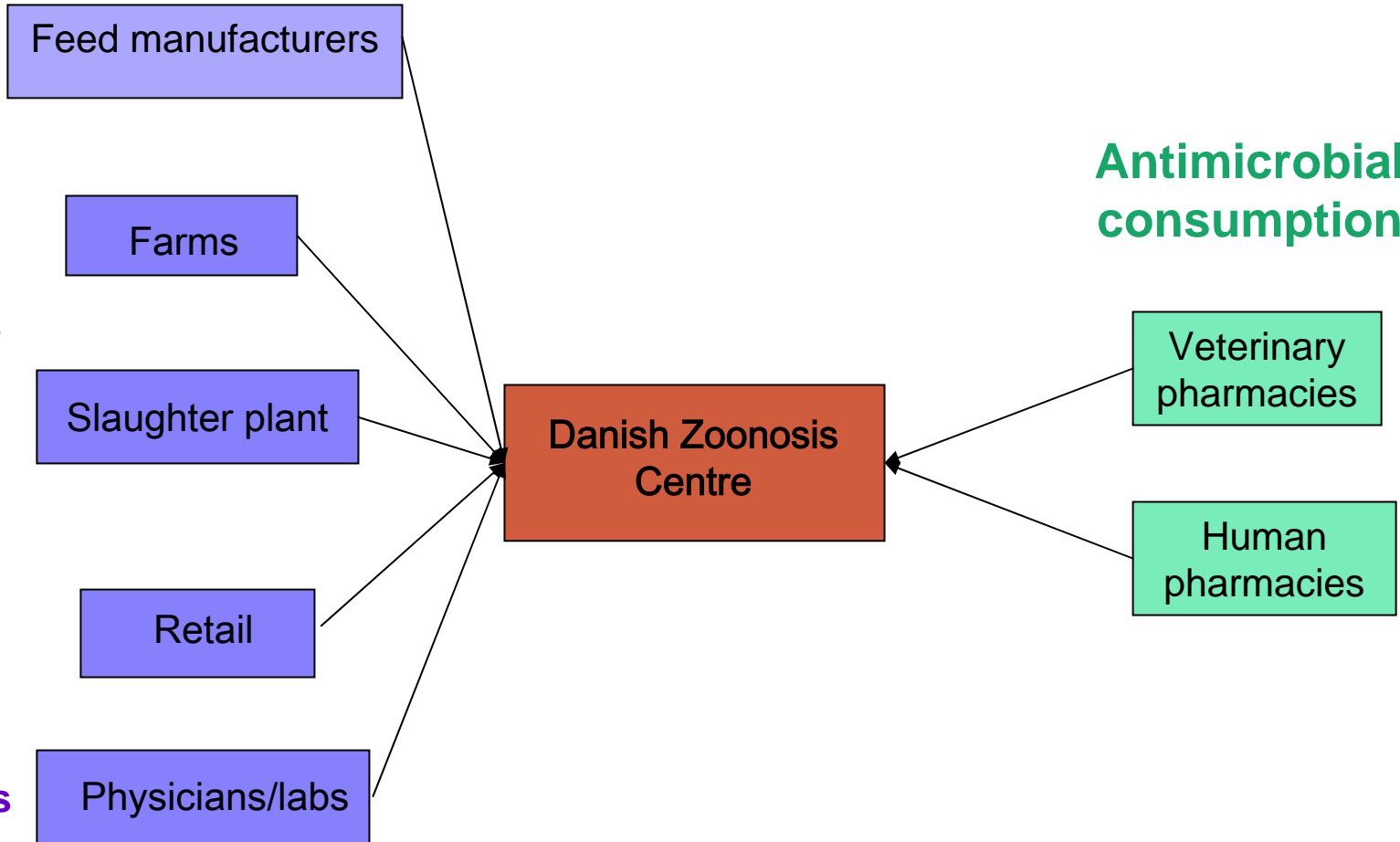
Physicians/labs

Danish Zoonosis  
Centre

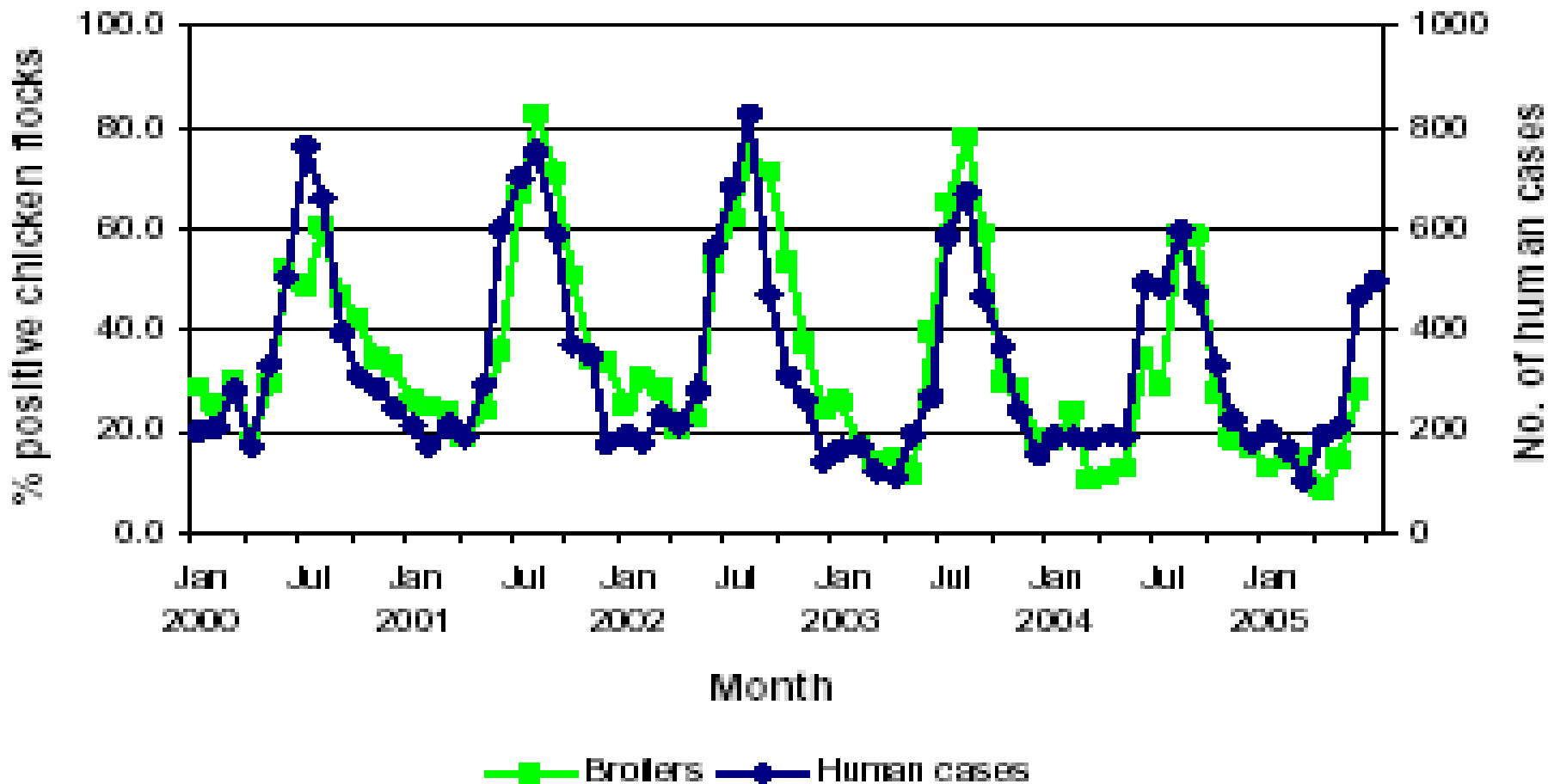
Antimicrobial  
consumption

Veterinary  
pharmacies

Human  
pharmacies



# *Campylobacter* in broilers and humans, Denmark, 2000-05

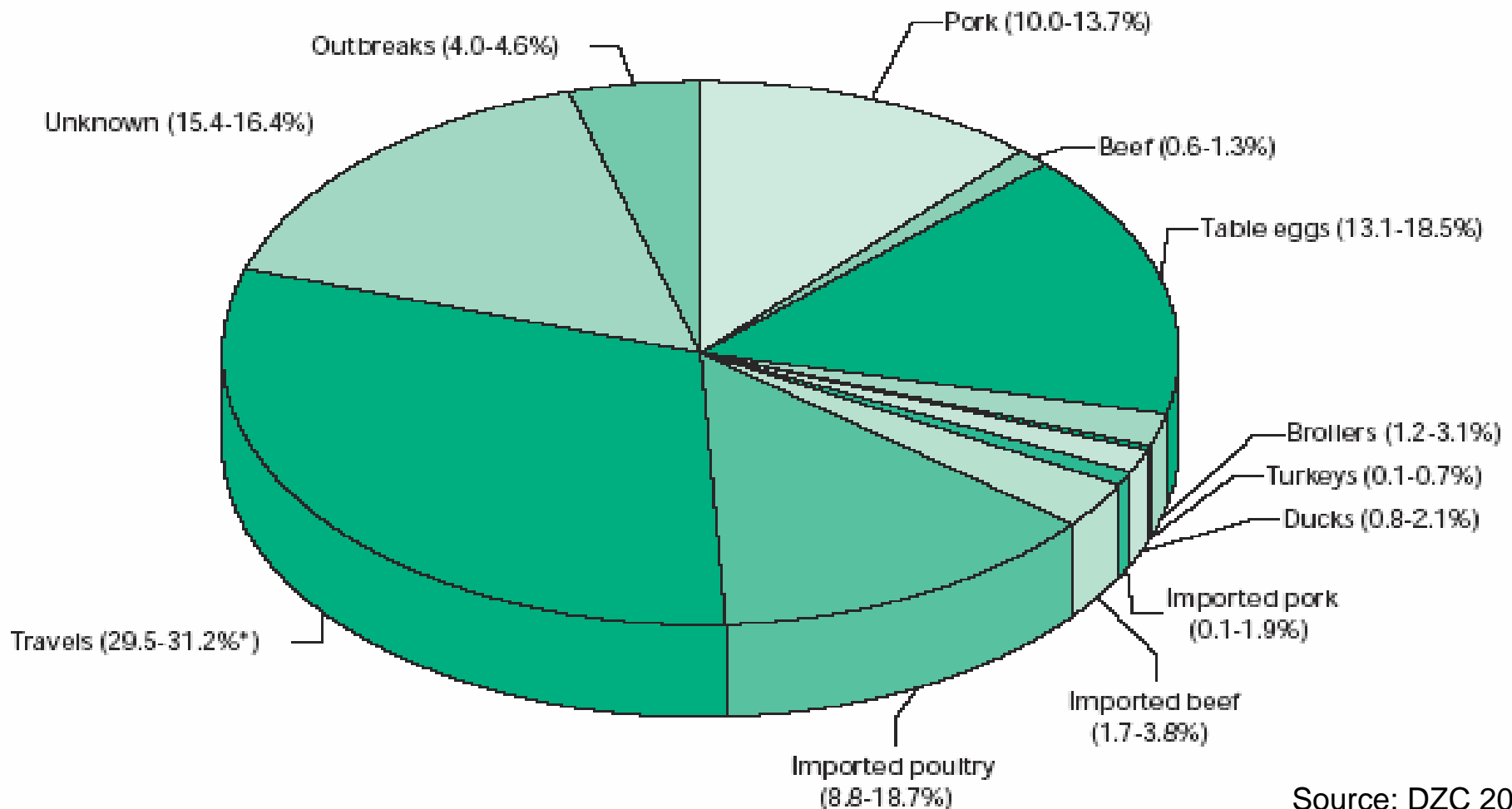


# Data analysis

## (Danish *Salmonella* source account)

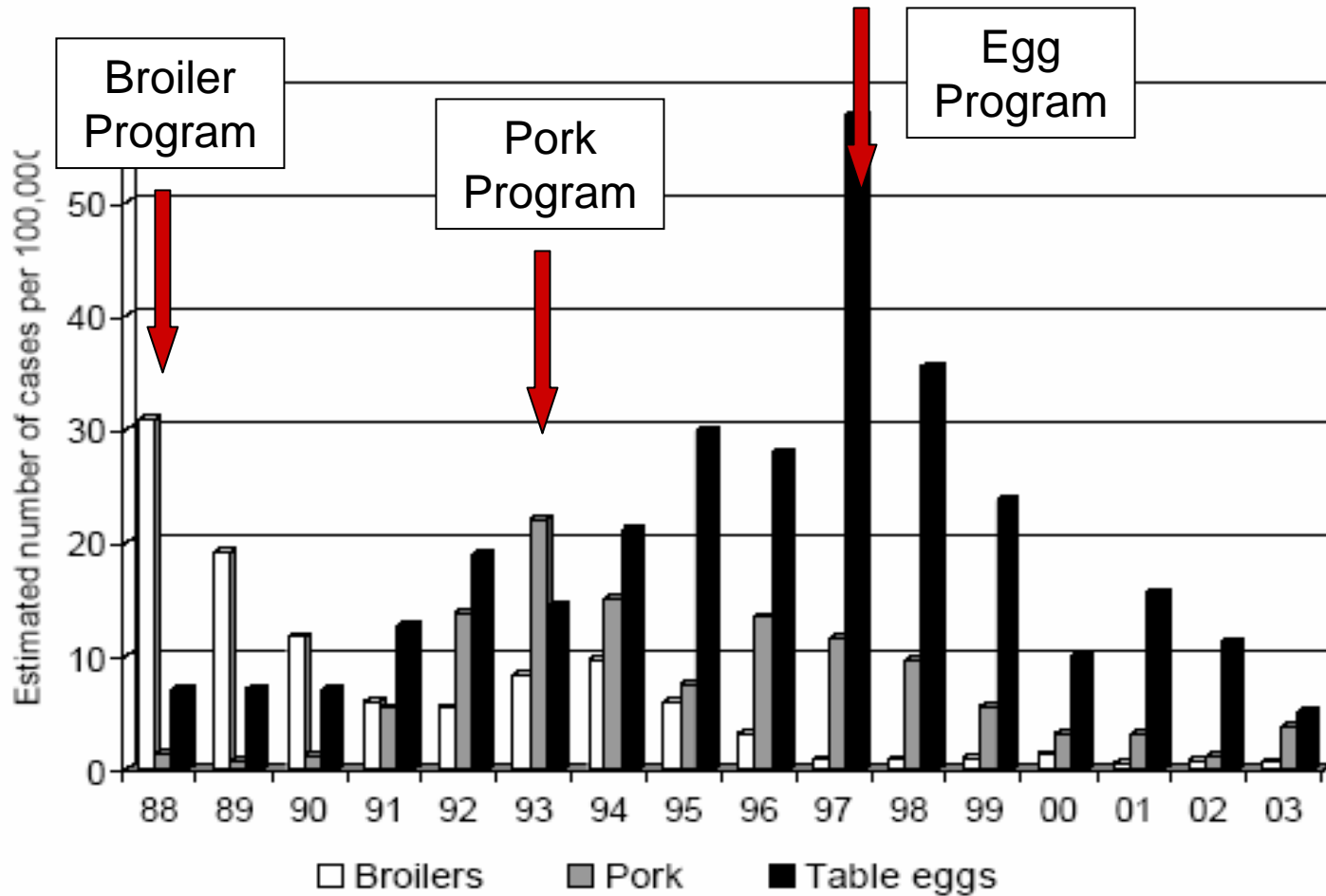
- Comparison of human pathogens to animal sources
  - Subtypes unique to an animal source: all human cases are attributed to this source
    - *S. Typhimurium* DTU288: pork
  - Subtypes occurring in several animal sources: human cases are attributed proportionally to the distribution in sources
    - *S. Infantis*: poultry and pork
- Weighted by food consumption

# Estimated sources of human salmonellosis in Denmark, 2003



Source: DZC 2004

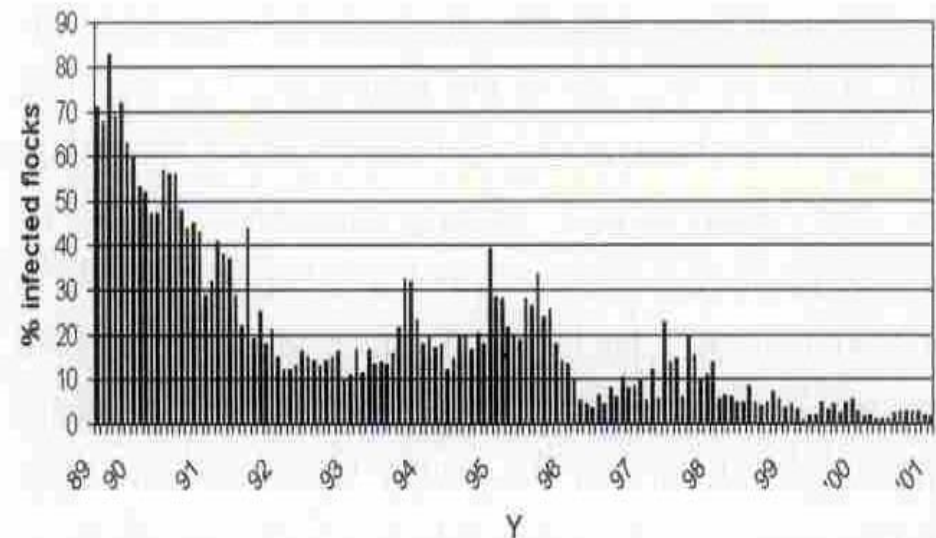
# Salmonella rate in humans caused by various food sources, Denmark, 1988-2003



# *Salmonella* control program in broiler chicken in Denmark (1988)

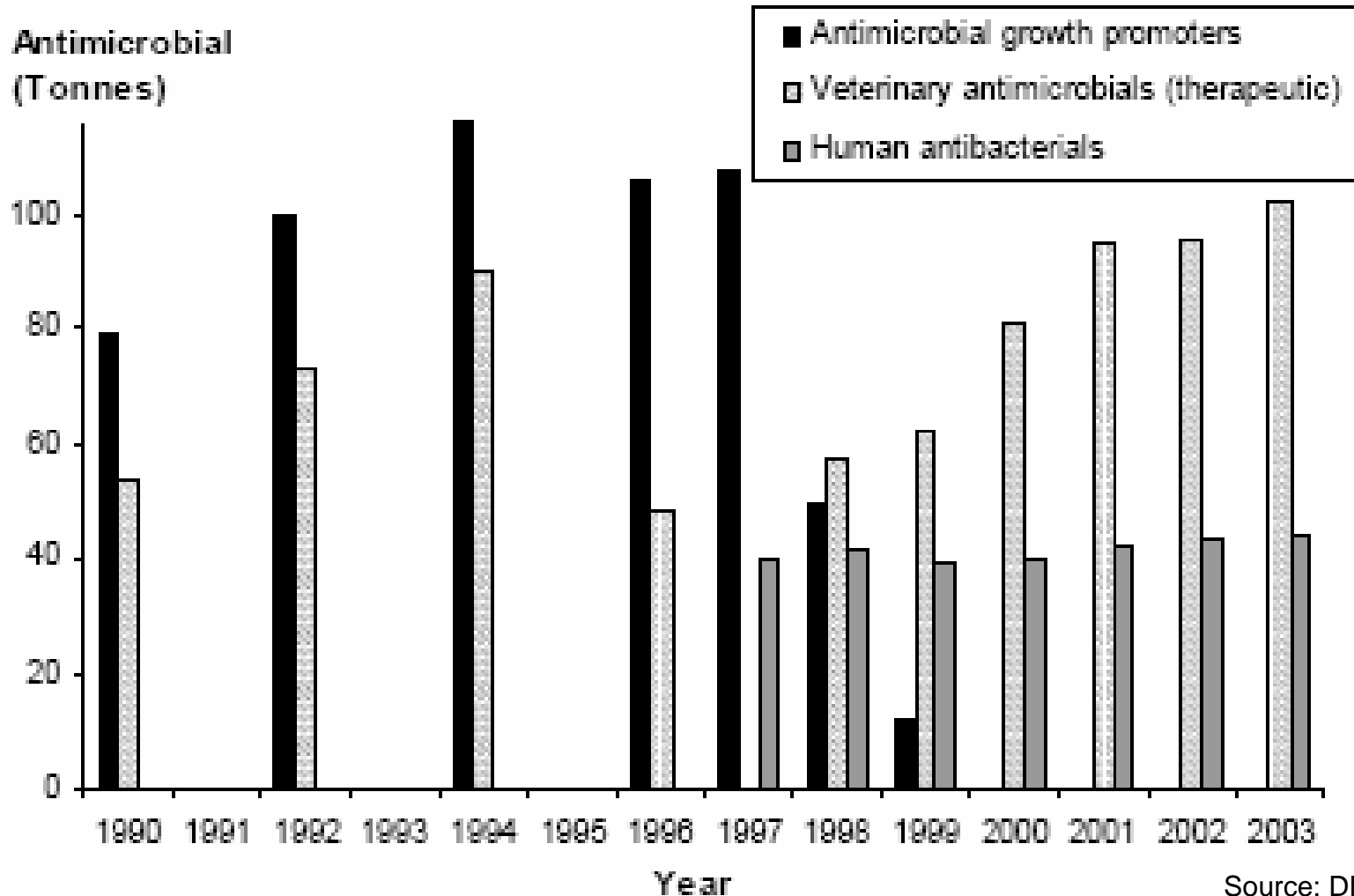
- Regular sampling of meat, feces, environment
- Infected breeding flocks destroyed (compensation)
- Disinfection of farms
- Infected broilers slaughtered on separate lines at end of day
- Farmers get better price for *Salmonella*-free flocks
- *Salmonella*-free labeling
- Now run by industry

Proportion of broiler flock infected with *Salmonella*, Denmark, 1989-2001

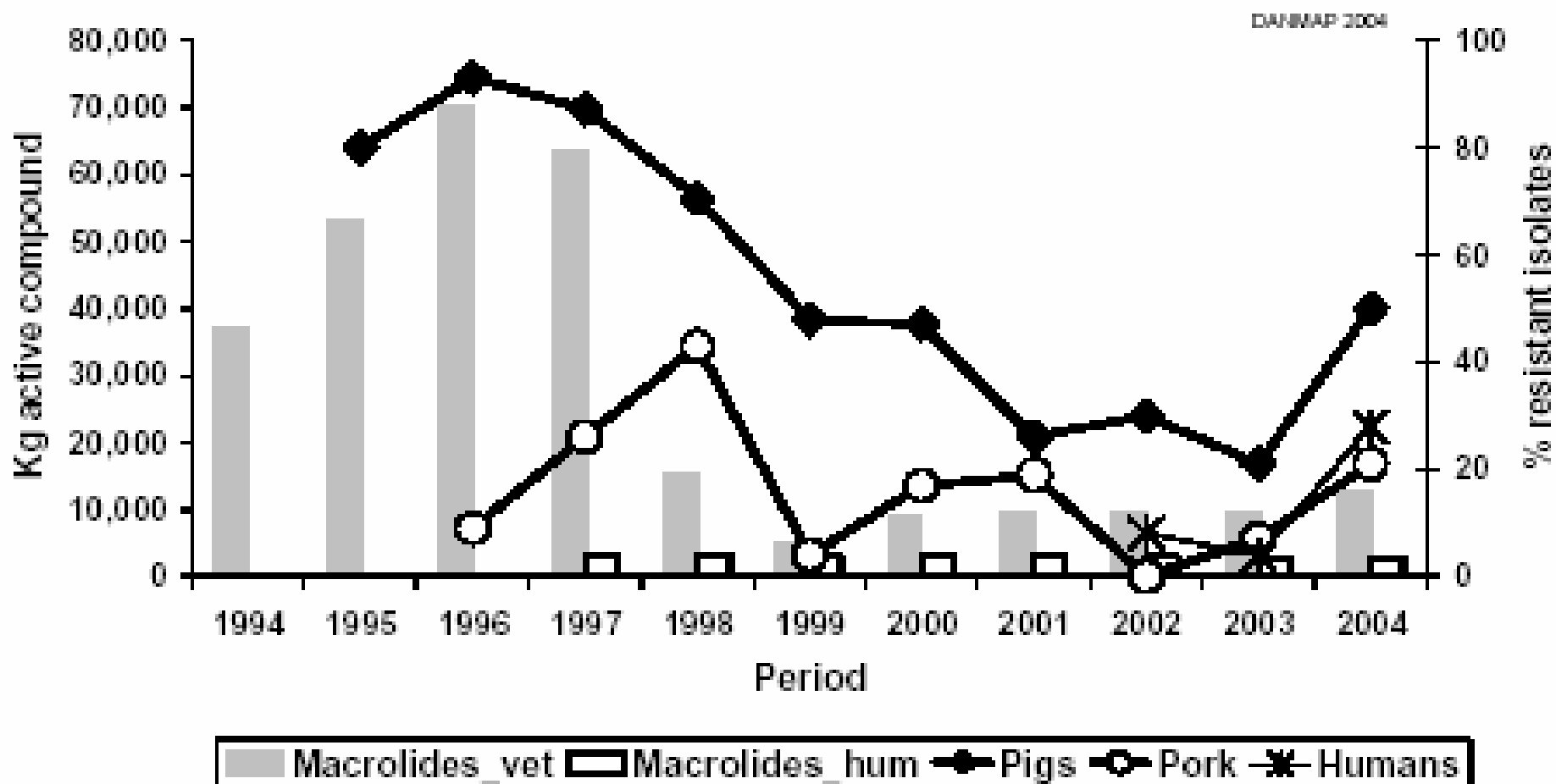


Source: DFVF 2002

# Antimicrobial use in animals and humans, Denmark, 1990-2003



# Consumption of macrolides and erythromycin resistance in *E. faecium* Denmark, 1994-2004



# Outbreak investigation using surveillance data in Denmark

- Joint investigative team
  - Public health epi and lab
  - Animal and food epi and lab
  - Food regulators
- Meet on weekly basis to review lab data from human, food and animal
- If increase in human cases: compare serotype, PT, PFGE and AMR pattern to food and animal sources



# Outbreak *S. Manhattan* in Denmark, 1998

- Increase of cases of *S. Manhattan* with same PFGE pattern (N=12)
- PFGE compared to animal and food patterns
  - Matched *S. Manhattan* isolates from imported pork
  - Different from Danish pork & broilers, imported poultry
- Case control study
  - 10/16 cases had eaten salted & smoked fillet of pork
  - 4/45 matched controls had eaten the pork
  - OR=17,  $p < 0.0001$
- Pork traced back to a slicing plant and recalled



# Integrated surveillance in Canada

- Integrated surveillance in sentinel sites
- Pilot in Ontario health unit since June 05
  - Enhanced surveillance of human cases
  - Testing and subtyping (*Salmonella*, *Campy*, *E. coli*)
    - Human stool samples
    - Retail meat (ground beef, chicken, pork chops)
    - Pigs (later: poultry, dairy cows)
    - Water
- Analysis: food attribution
- Evaluation in 2008: expansion?



# Integrated surveillance in BC

## Integrated surveillance province-wide

- Human data: BCCDC
- Food data: CFIA, BCCDC, private labs
- Animal data: MAL
- Integration? meeting planned for Dec 05



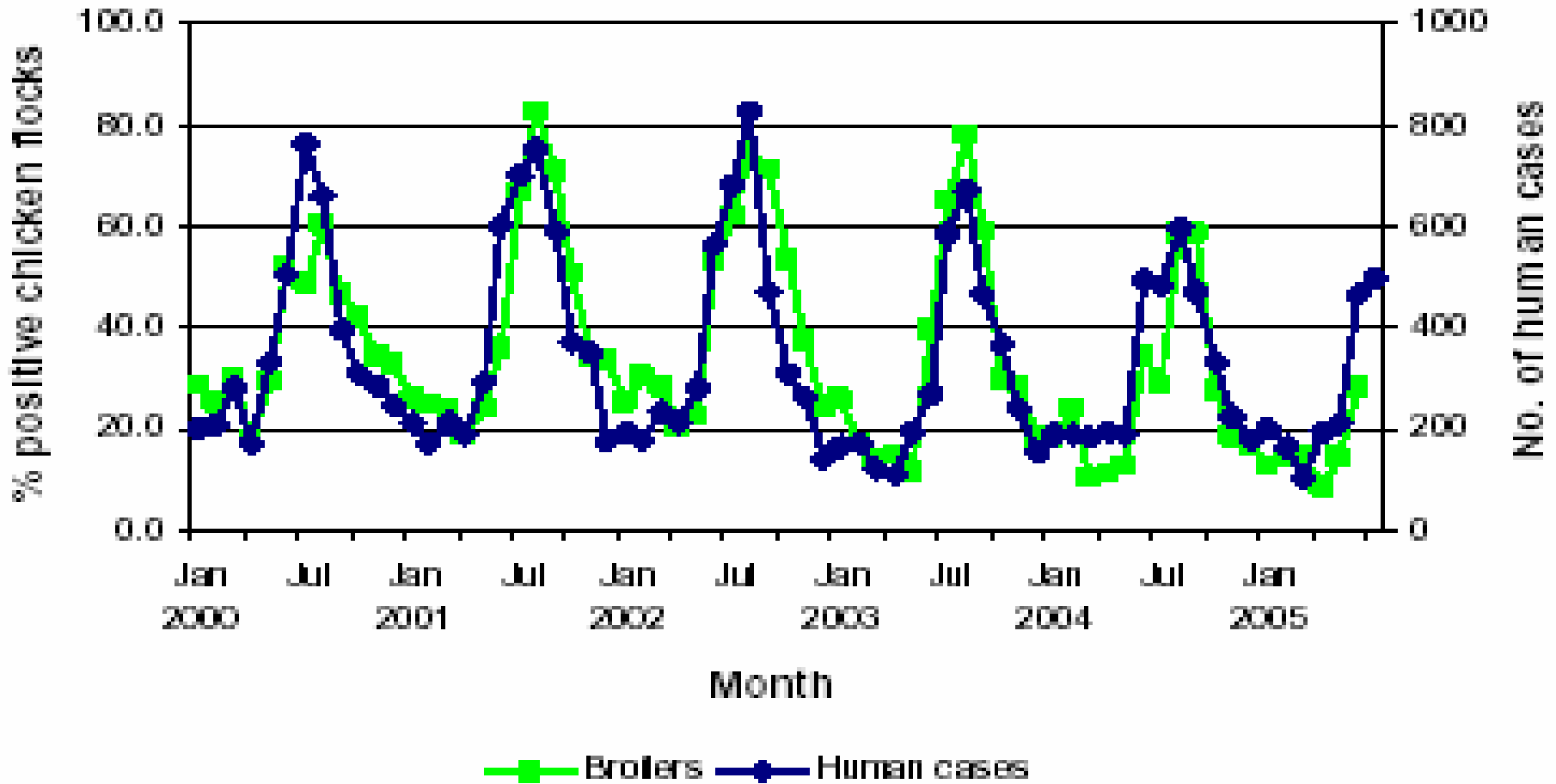
# What can we do to facilitate integrated surveillance?

- Being committed to food protection and public health
- Building links
  - Between government and industry
  - Between human health and animal health
- Collaborating
  - Identifying common goals
  - Participating in joint ventures
  - Sharing info and data
  - Sharing responsibility



# *Campylobacter* in broilers and humans, British Columbia, 2000-05

British Columbia, 2000-05



Source: DFVF and SSI 2005



# Acknowledgements

- Danish Institute for Food and Veterinary Research
- Dr. Frank Pollari, Public Health Agency of Canada

