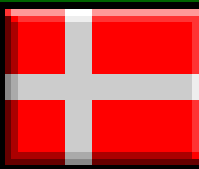


# Integrated Surveillance of Foodborne Diseases in Denmark

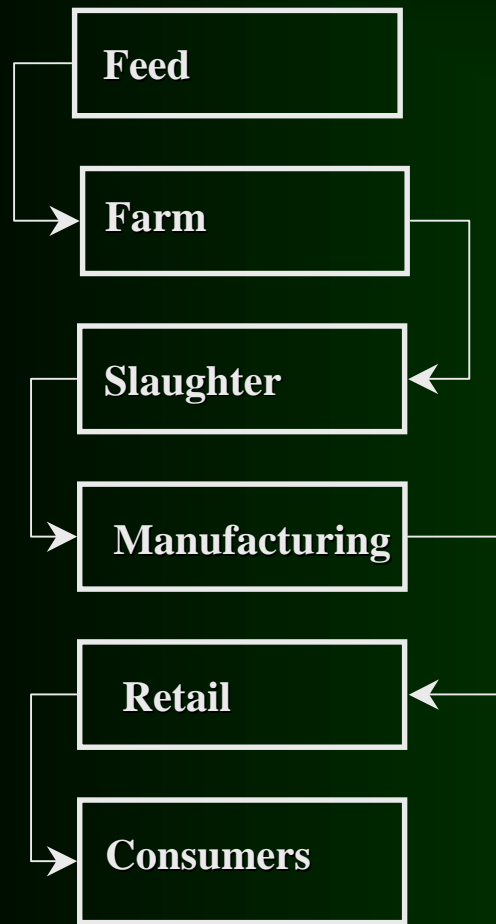


## - Control Through Collaboration

Henrik C. Wegener  
Danish Zoonosis Centre



# Need for an integrated approach



- Numerous possible routes for introduction and transmission of pathogens
- Coordinated multi-disciplinary and multi-sector response necessary
- Levels of collaboration/coordination:
  - Microbiology - epidemiology
  - Veterinary - food hygiene - medical
  - Government - industry - research - NGO

# **A National Zoonosis Surveillance Unit – Danish Zoonosis Centre**

## **Aims of The Danish Zoonosis Centre:**

- To systematically collect, analyse and interpret data on food borne disease in humans and food borne pathogens in the food production chain
- Conduct epidemiological research
- Provide information and advice to private and government sector and to the general public
- Facilitate coordination and collaboration

# A National Coordinating Body

## Coordination group

- Statens Serum Institut (Inst. of Public Health)
- Danish Veterinary and Food Administration
- Danish Plant Directorate
- Danish Veterinary Institute
- National Board of Health
- Danish Environmental Protection Agency
- Royal Veterinary and Agricultural University

## Producer contact group

- Poultry producers org.
- Livestock and meat board
- Pig & pork producers org.
- Danish Dairy Federation
- Egg producers

## Danish Zoonosis Centre

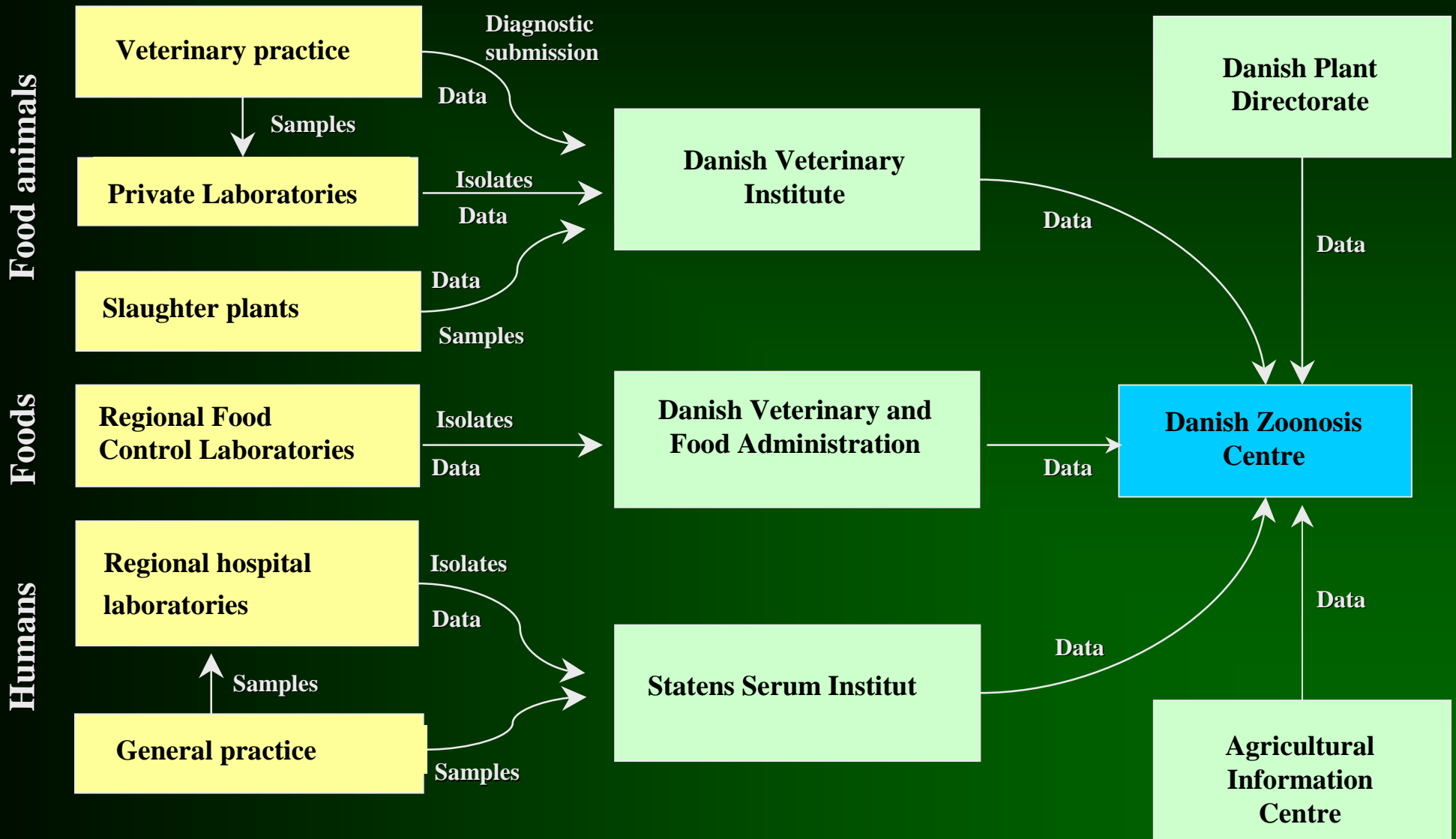
## NGO Contact group

- The Consumers Council
- Retailers Association
- Danish Industry Board
- Danish Agricultural Board
- Central Labour Organisation

# Danish Integrated Surveillance Programs

- Danish Integrated Zoonoses Surveillance Programme (DANIZO)
- Danish Integrated Antimicrobial Resistance and Antimicrobial Consumption Monitoring Programme (DANMAP)

# DANIZO/DANMAP - logistics



# Elements in DANIZO

- Feed
- Food animals
- Slaughter houses
- Whole Sale and Retail
- Monitoring of imported foods
- Human Disease

Active surveillance of *Salmonella*

Clinical disease notifiable

Active surveillance of *Salmonella*

Active monitoring of *Trichinella*,

More than 3 million *Salmonella*,

samples tested for *Salmonella*, *Yersinia*

specific pathogens

each year!

Systematic surveillance of

Centralised laboratory based and epidemiological surveillance of foodborne diseases

# Elements in DANMAP

- Monitoring of antimicrobial resistance
- Monitoring of antimicrobial consumption
- Coordination
- Communication

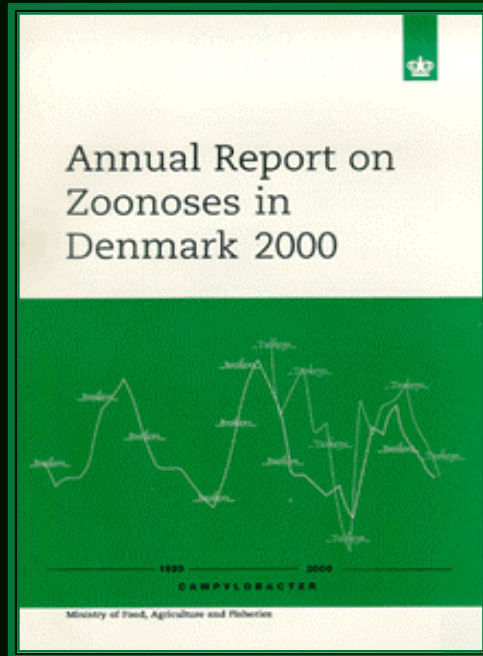
Specific human pathogens  
Specific animal pathogens  
Zoonotic bacteria  
Indicator bacteria

Antimicrobials for therapy and prophylaxis in animals (VETSTAT)  
Antimicrobials for therapy and prophylaxis in humans

Steering committee  
DANMAP report  
Scientific publications  
Open annual meetings



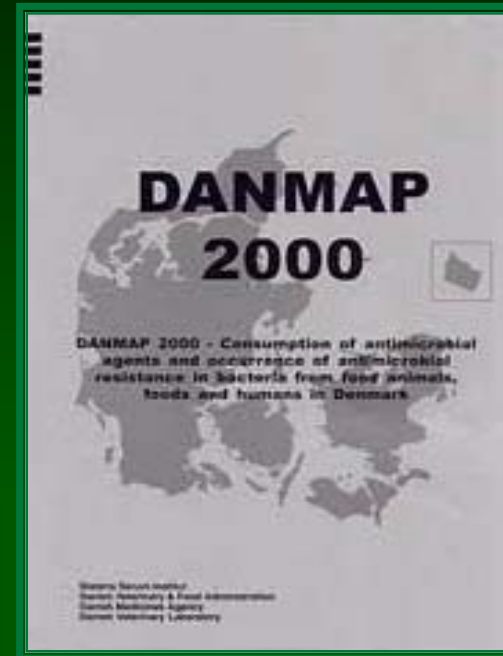
# Integrated Surveillance Reports



Annual  
Report

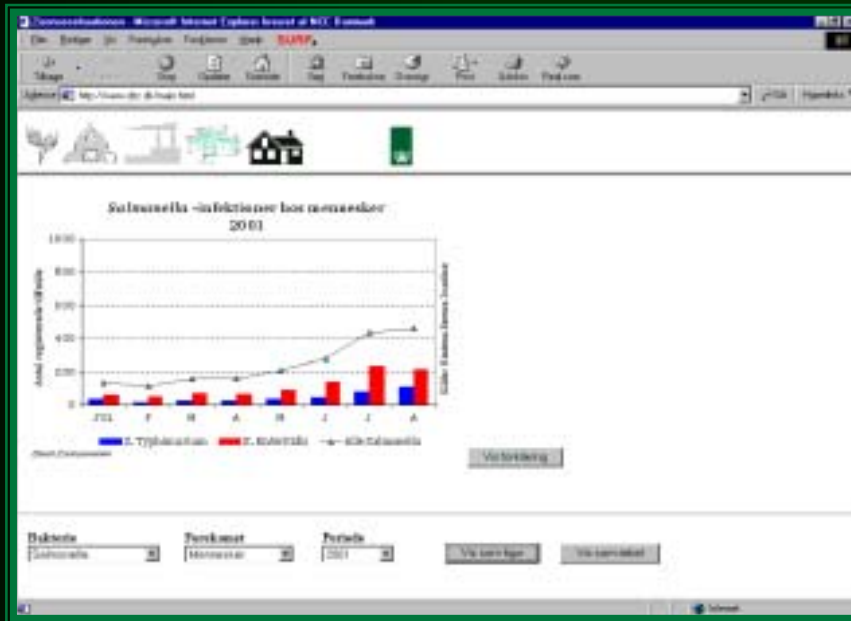


Zoonoses  
News

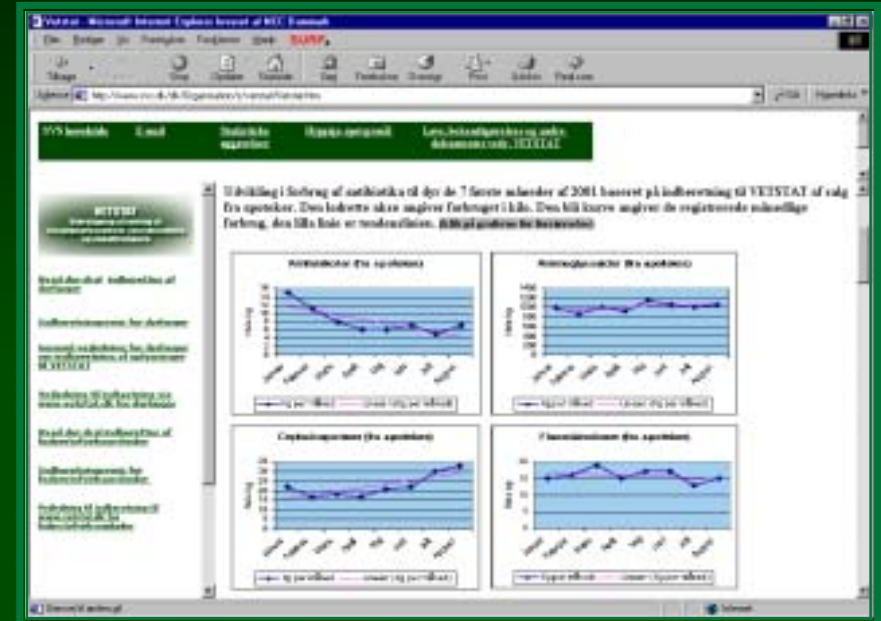


DANMAP  
Report

# Integrated Internet Information



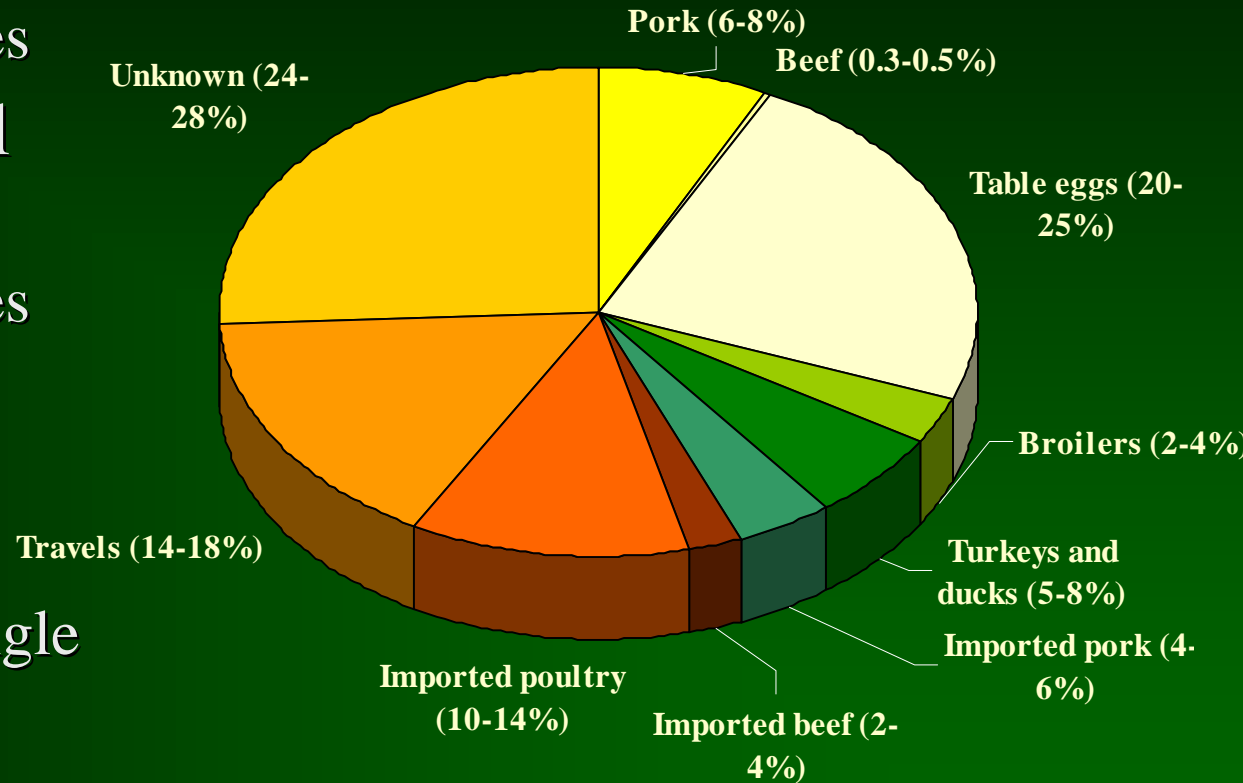
Zoonoses  
Homepage



VETSTAT  
Homepage

# Salmonella Source Account

- Registered human cases
  - Sero-, phage- & DNA types
- Prevalence in food animal reservoirs
  - Sero-, phage- & DNA types
- Comparison of types isolated
  - certain types almost exclusive isolated from single sources
  - Other types ascribed to source proportionally to indicative types



*Salmonella* sources 2000

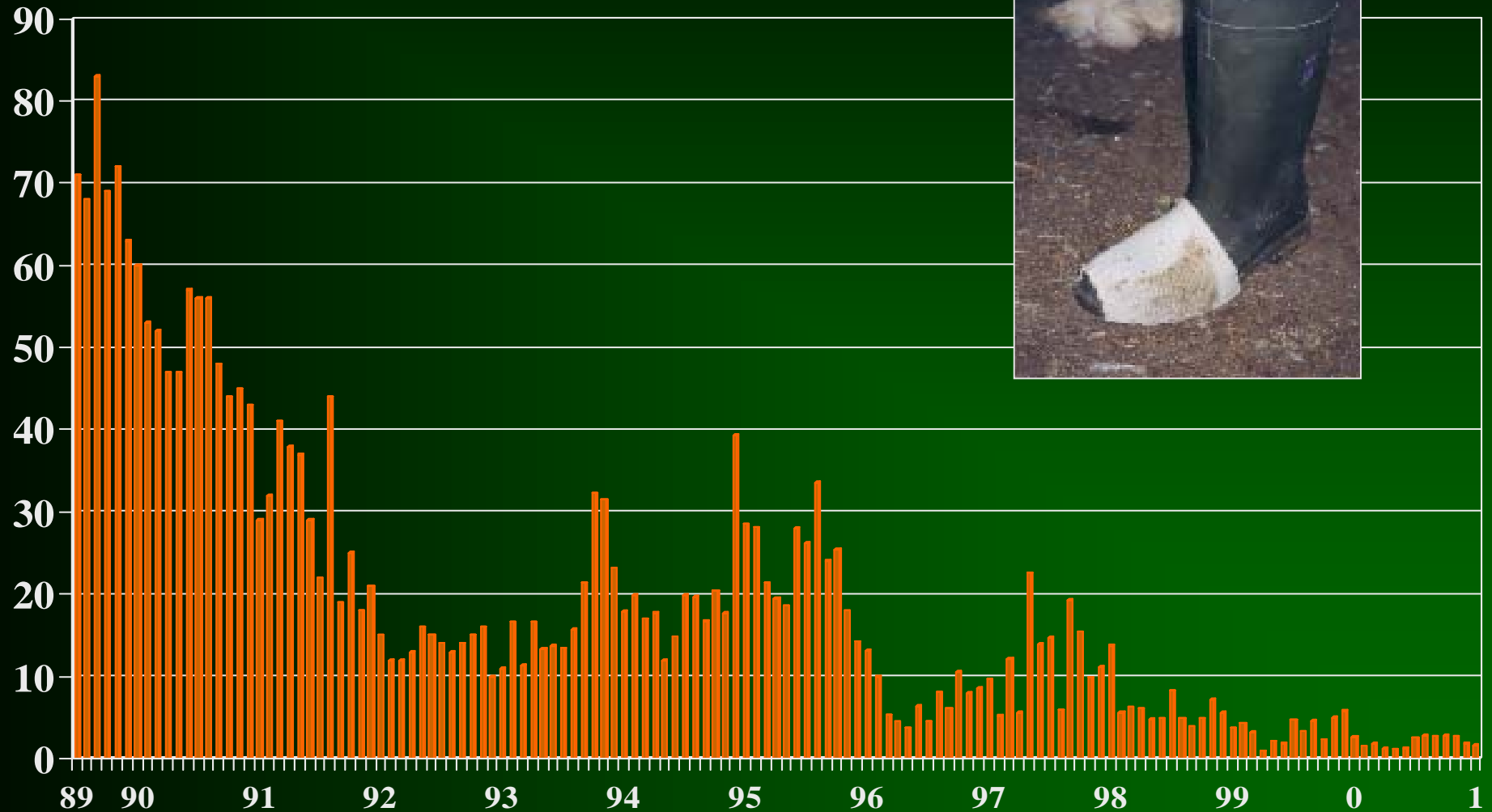
# Salmonella Control Programs and Public Health Impact (I)

## Broiler chicken and table egg production

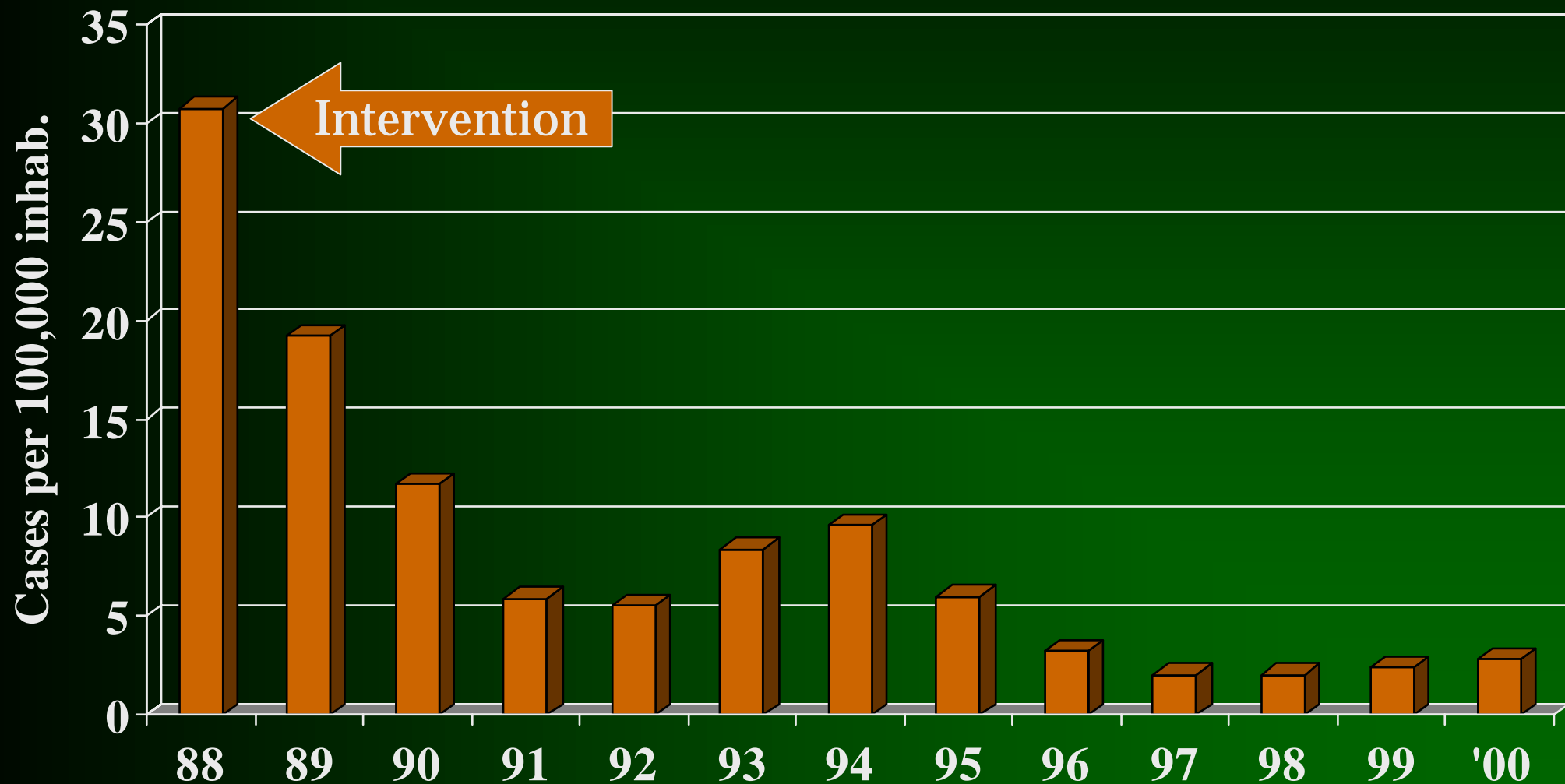
- Top down eradication programme
- Test and destroy in breeding flocks
- Test and decontaminate broiler/table egg industry
- All commercial producers involved
- All serotypes, but special emphasis on *S. Typhimurium* and *S. Enteritidis*

Objective: Eradicate *Salmonella* from broiler chicken and table egg production

# Prevalence of *Salmonella* infected Danish broiler flocks



# Incidence of human salmonellosis attributable to broilers in Denmark



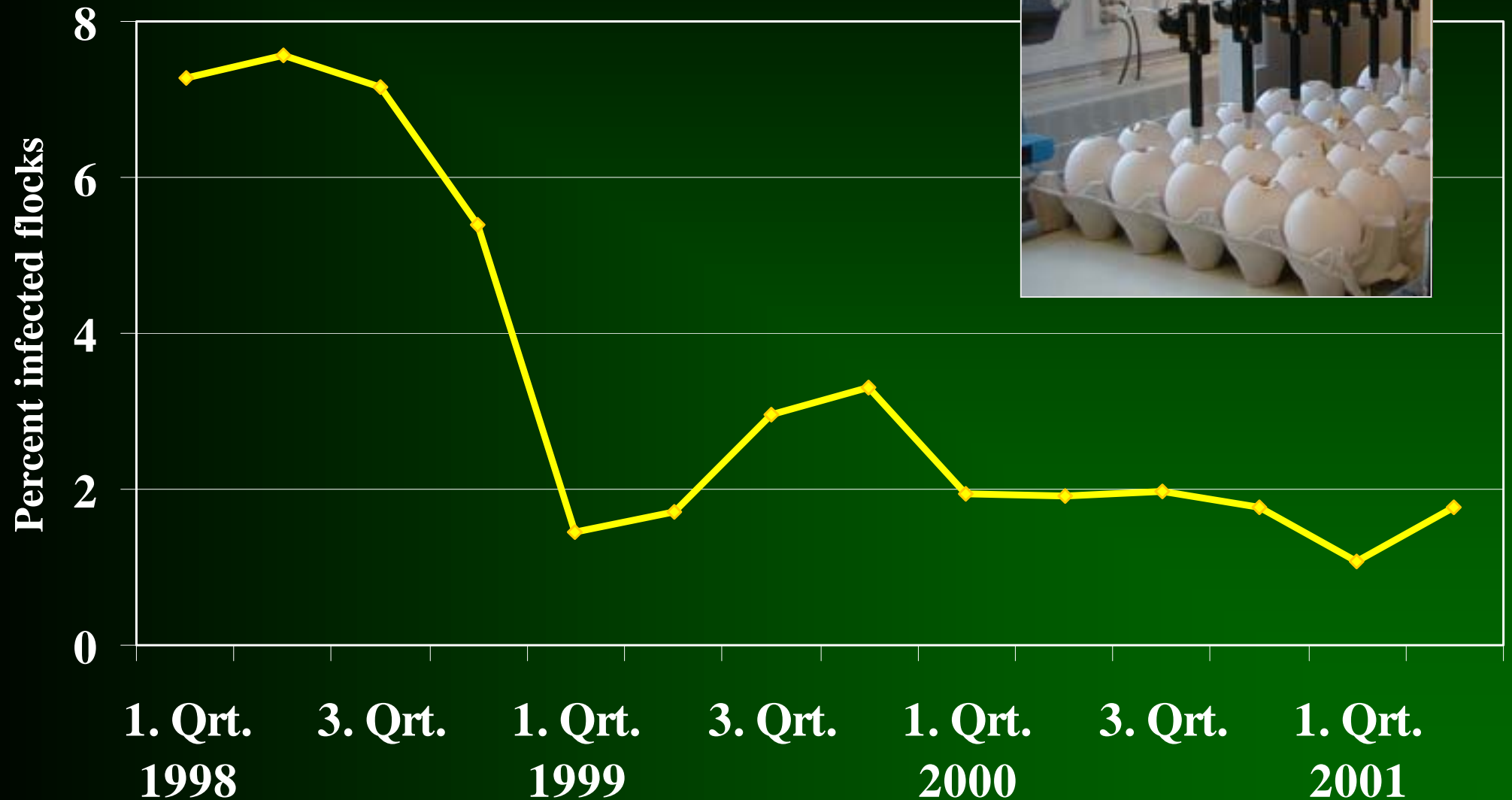
# Salmonella Control Program in Table Egg Production

60 eggs from every commercial table egg producing flock tested every 9 weeks

Consequences in seropositive flocks:

- Intensive bacteriological sampling
- Eggs are diverted to heat-treatment (pasteurisation)

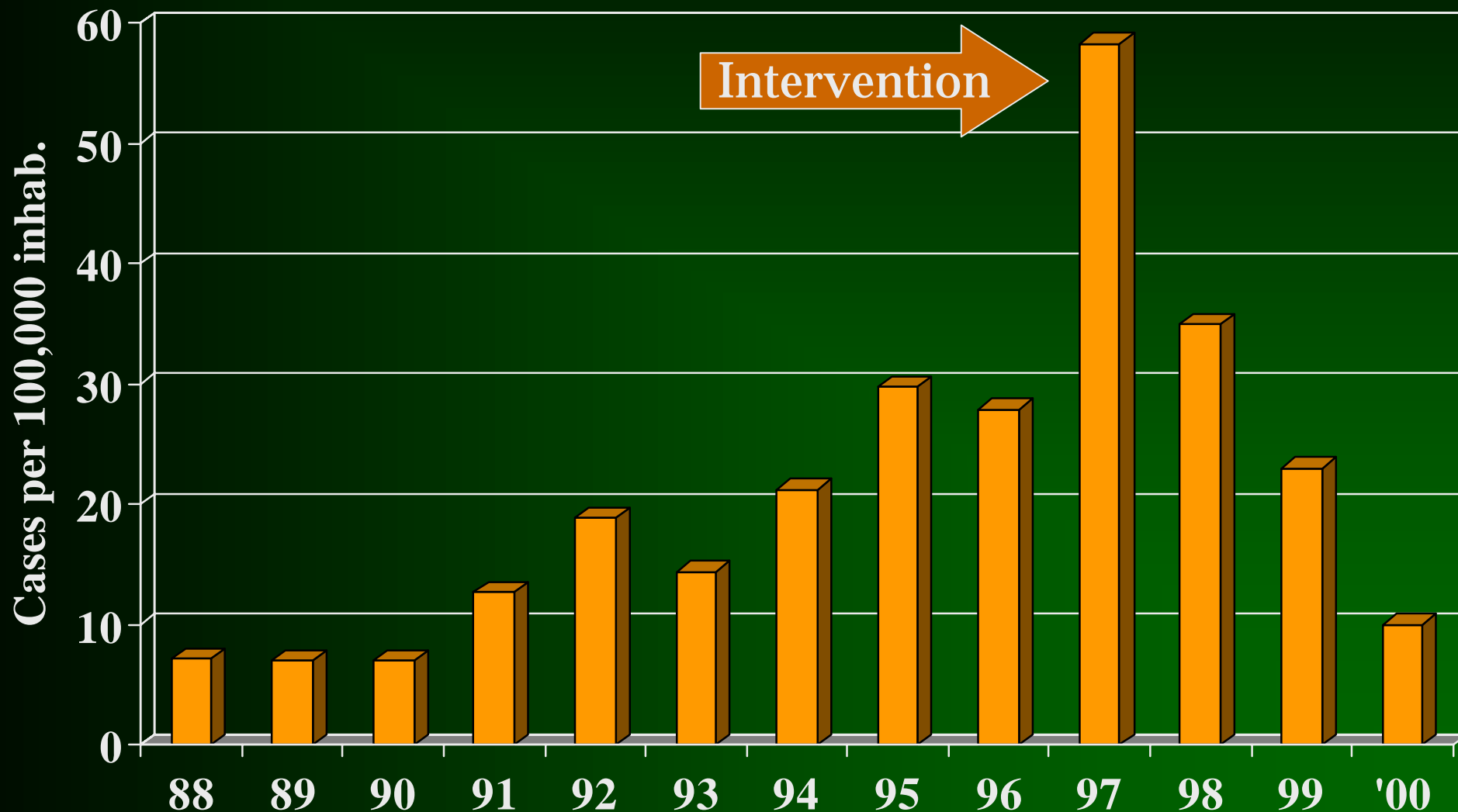
# Salmonella in table egg production



Data: Danish Veterinary and Food Adm.



# Egg associated human salmonellosis in Denmark



# Salmonella Control Programs and Public Health Impact (II)

## Integrated *Salmonella* control program of swine and pork:

- Testing of all breeding and multiplying herds
- Continuous testing of all herds producing more than 200 finishers for slaughter per year
- Herds are ranked by number of salmonella positive animals:
  - Level 1 - no reaction
  - Level 2 - intervention at herd level (hygiene, feeding, sectioning, a.o.)
  - Level 3 - intervention at herd level and special hygienic slaughter

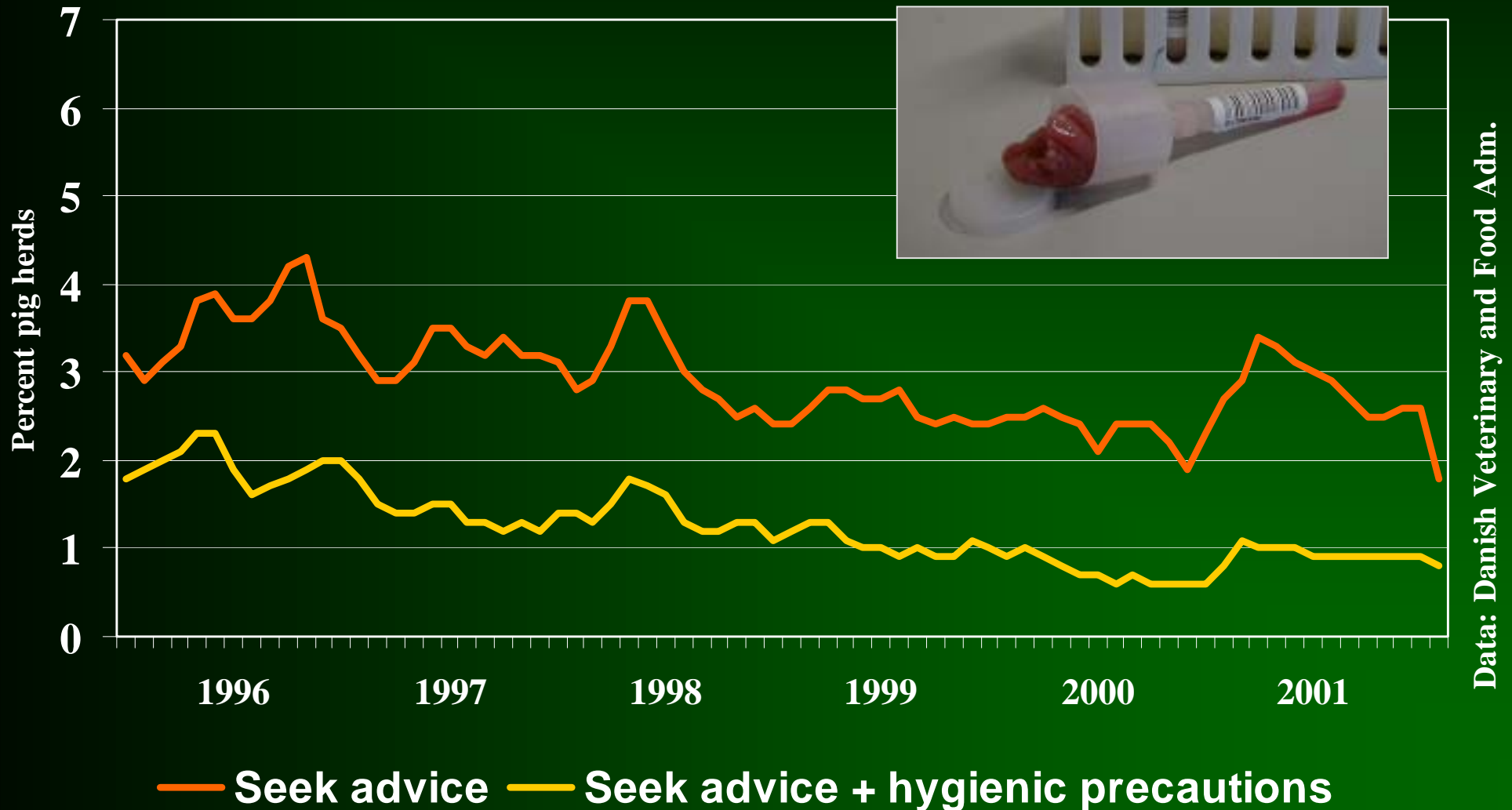
Objective: Reduce *Salmonella* in pork

# Salmonella Control Program in Swine

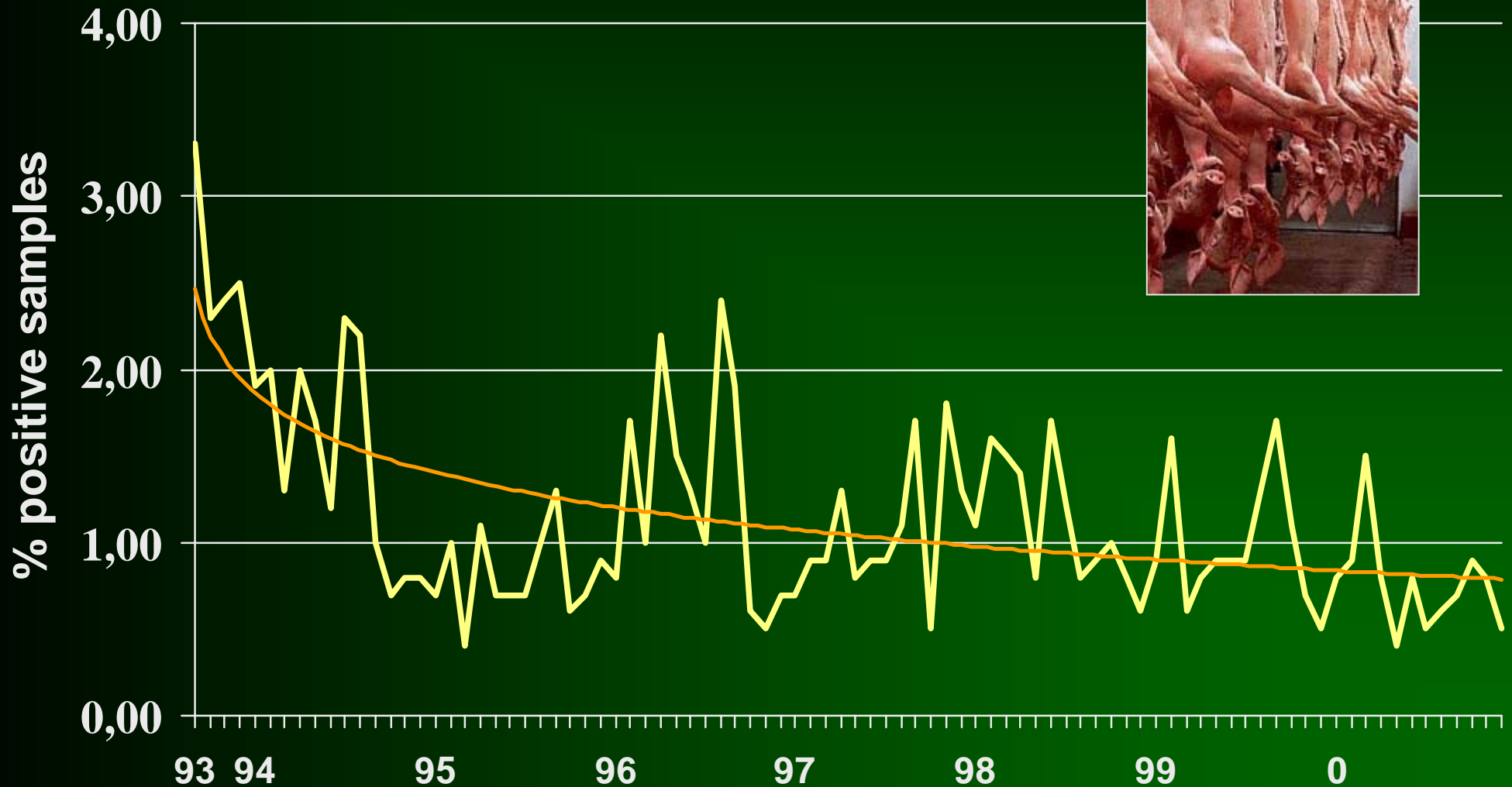
Serological examination of “meat juice” samples by  
an ELISA technique (LPS antigens - O:1,4,5,6,7,12)



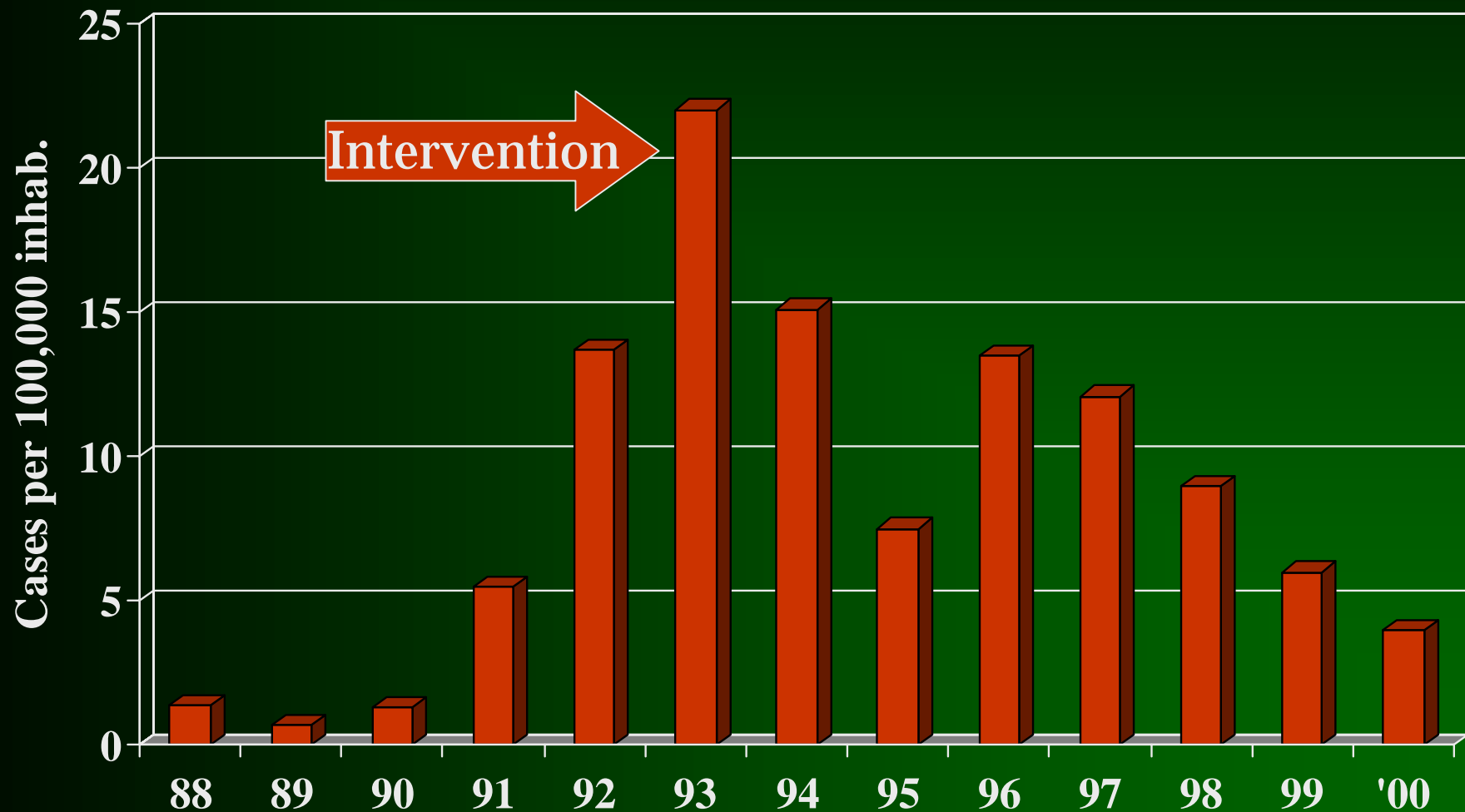
# Serological surveillance of *Salmonella* in Danish pig herds 1995-2001



# *Salmonella* prevalence in fresh pork, 1993-2000



# Pork associated human salmonellosis in Denmark, 1988 - 2000



# *Salmonella* Typhimurium DT104

## - a cause for extra concern

- Multi-resistant: Treatment failures reported
- Pathogenicity: Increased morbidity and mortality reported
- Epidemicity: Spreading rapidly within and between all types of food animal production systems
- Rapid global spread
- Concern: Could potentially compromise the Danish *Salmonella* control strategies in food animals

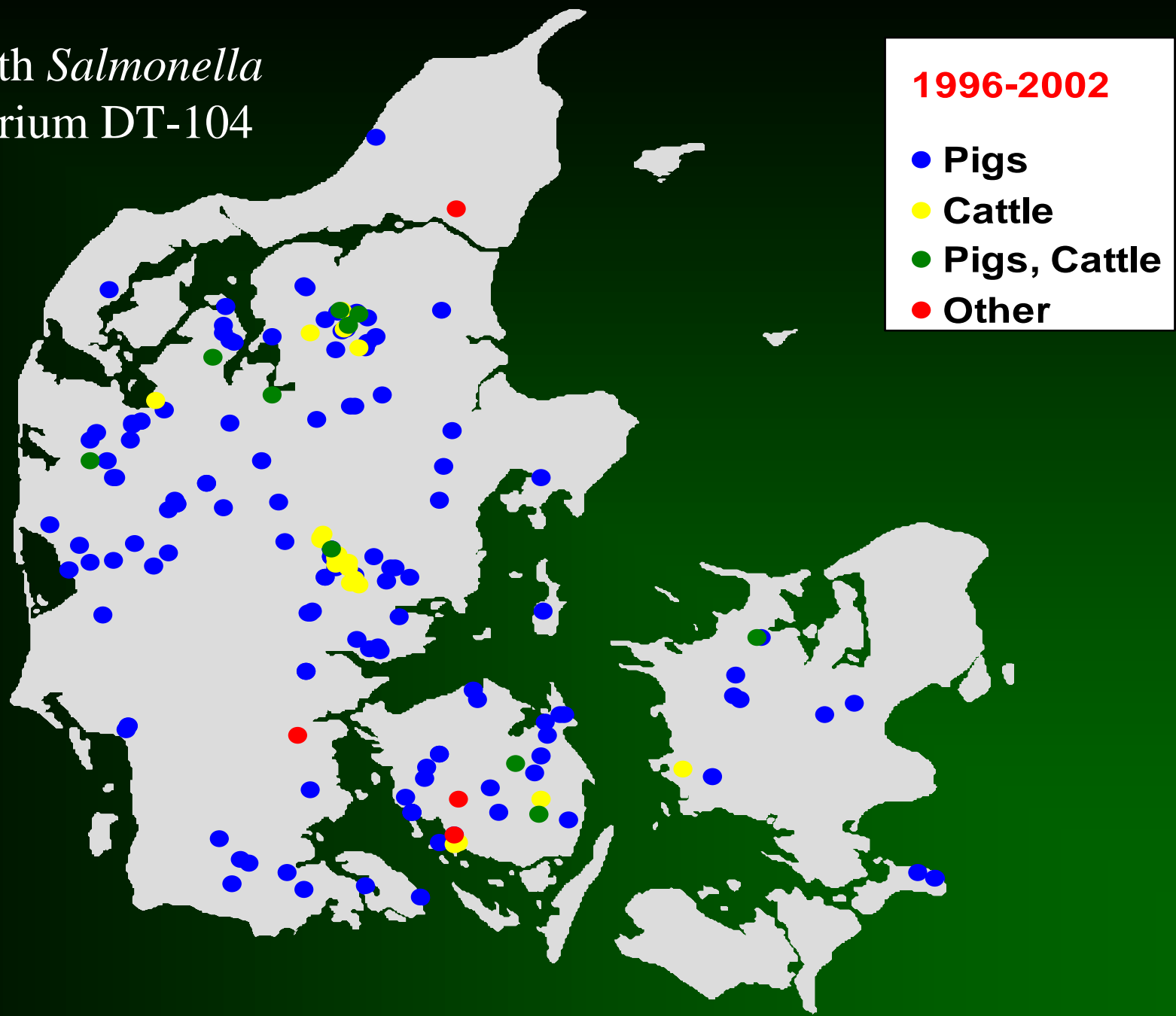
Objective: Eradicate DT104 from food animal herds to prevent spread and secure absence in food

# Eradication of *Salmonella* Typhimurium DT104



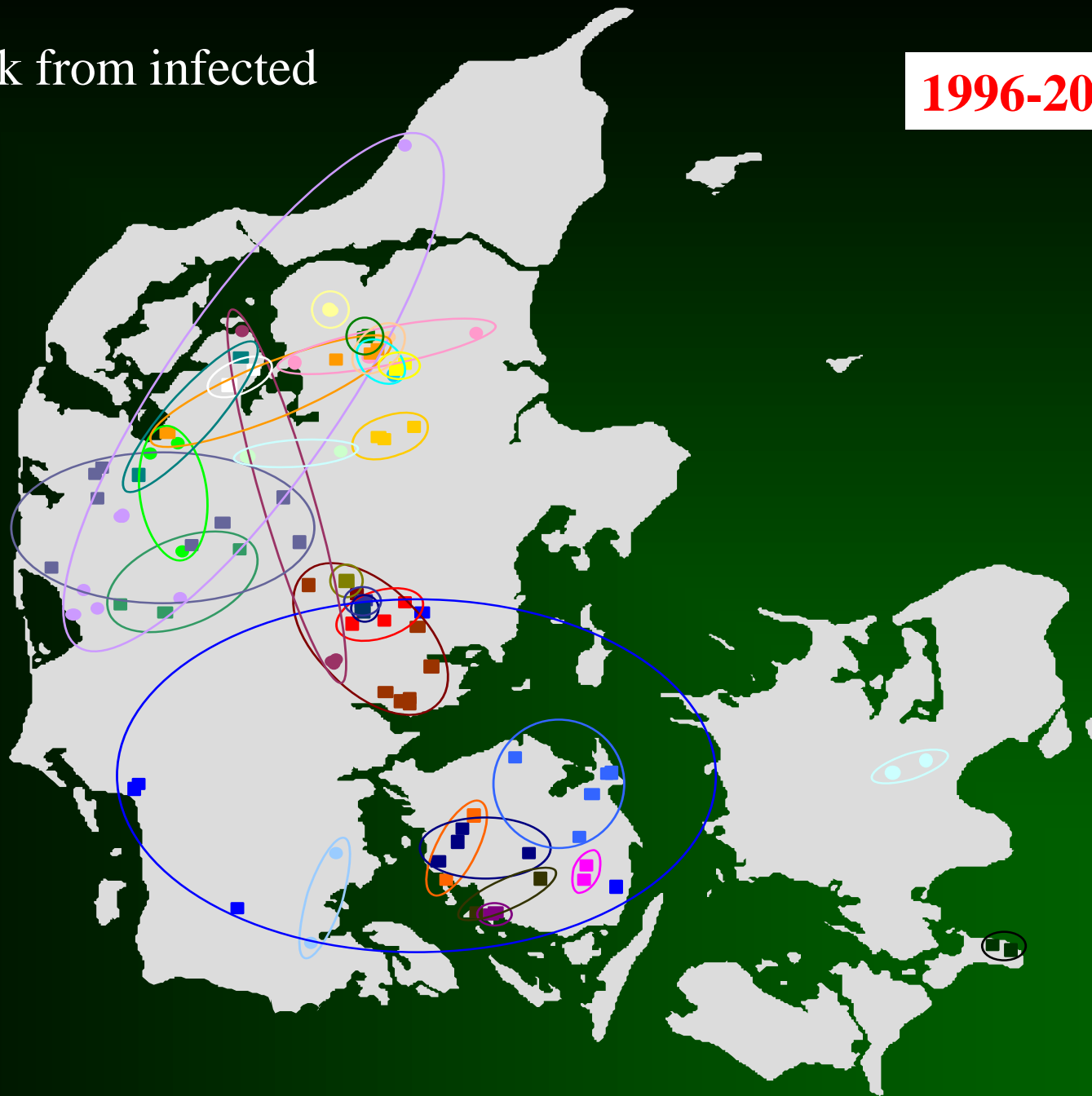


Herds with *Salmonella*  
Typhimurium DT-104

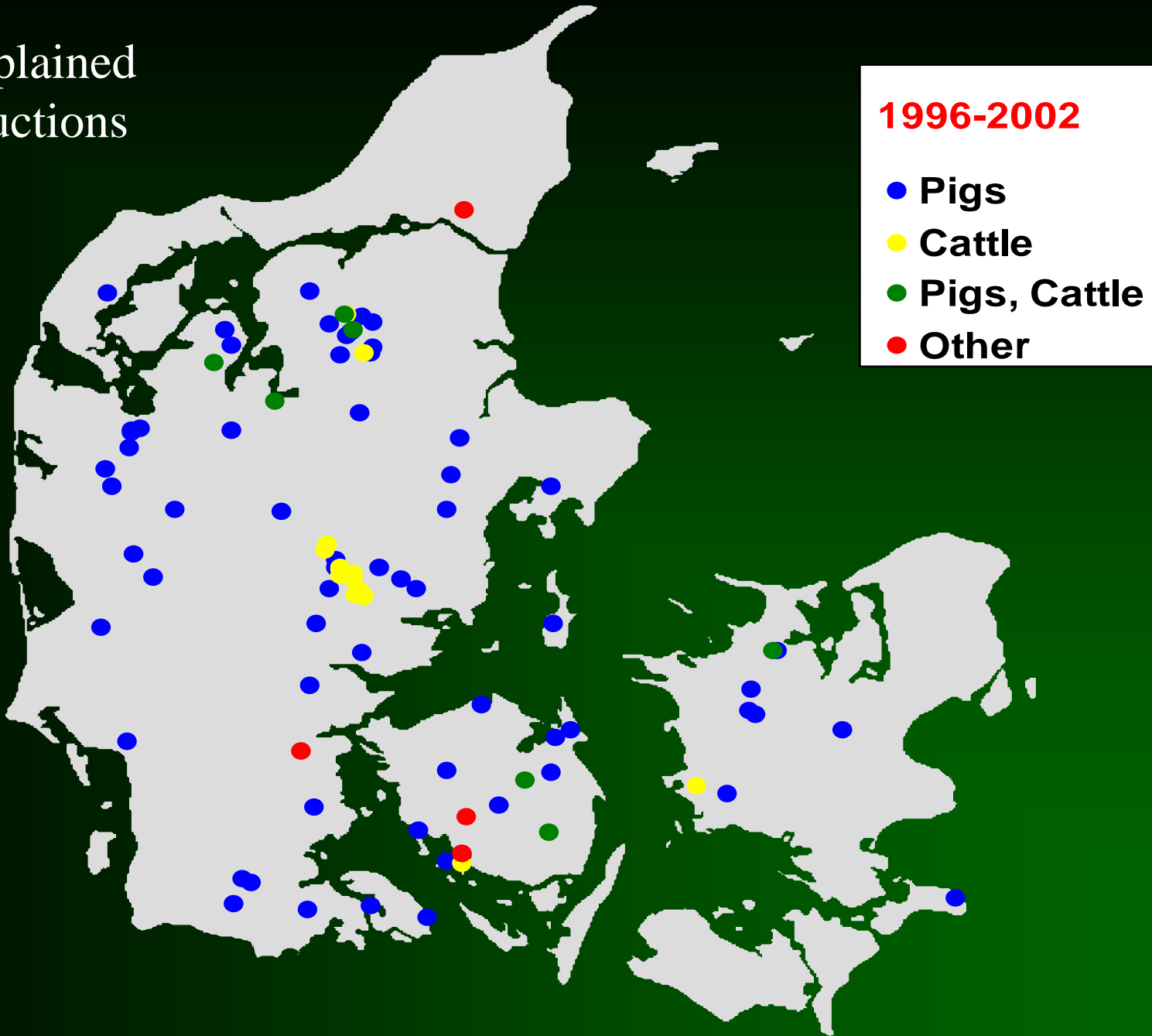


Traceback from infected  
herds

**1996-2002**



# Un-explained introductions

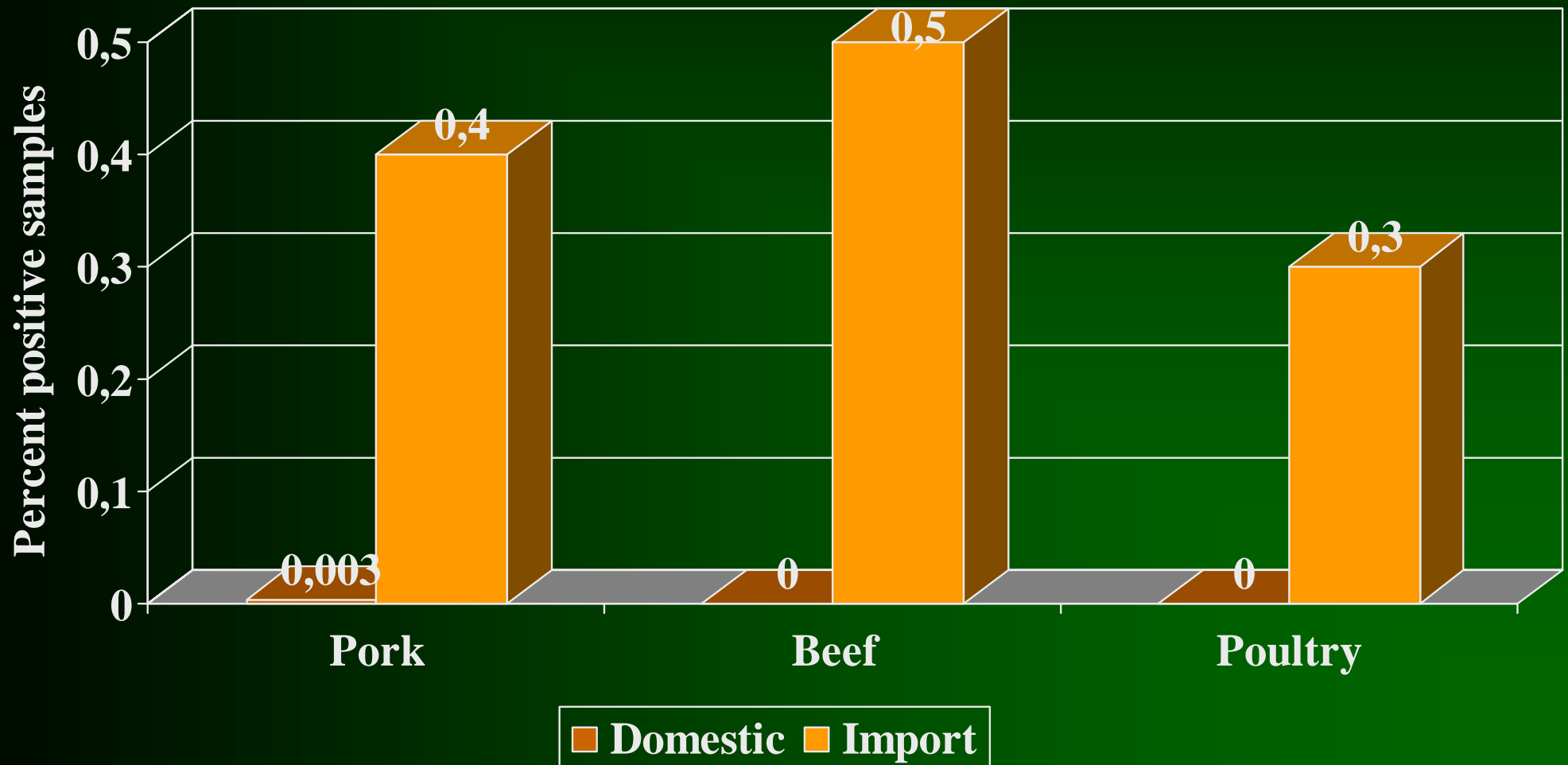


# DT104 control program - revised

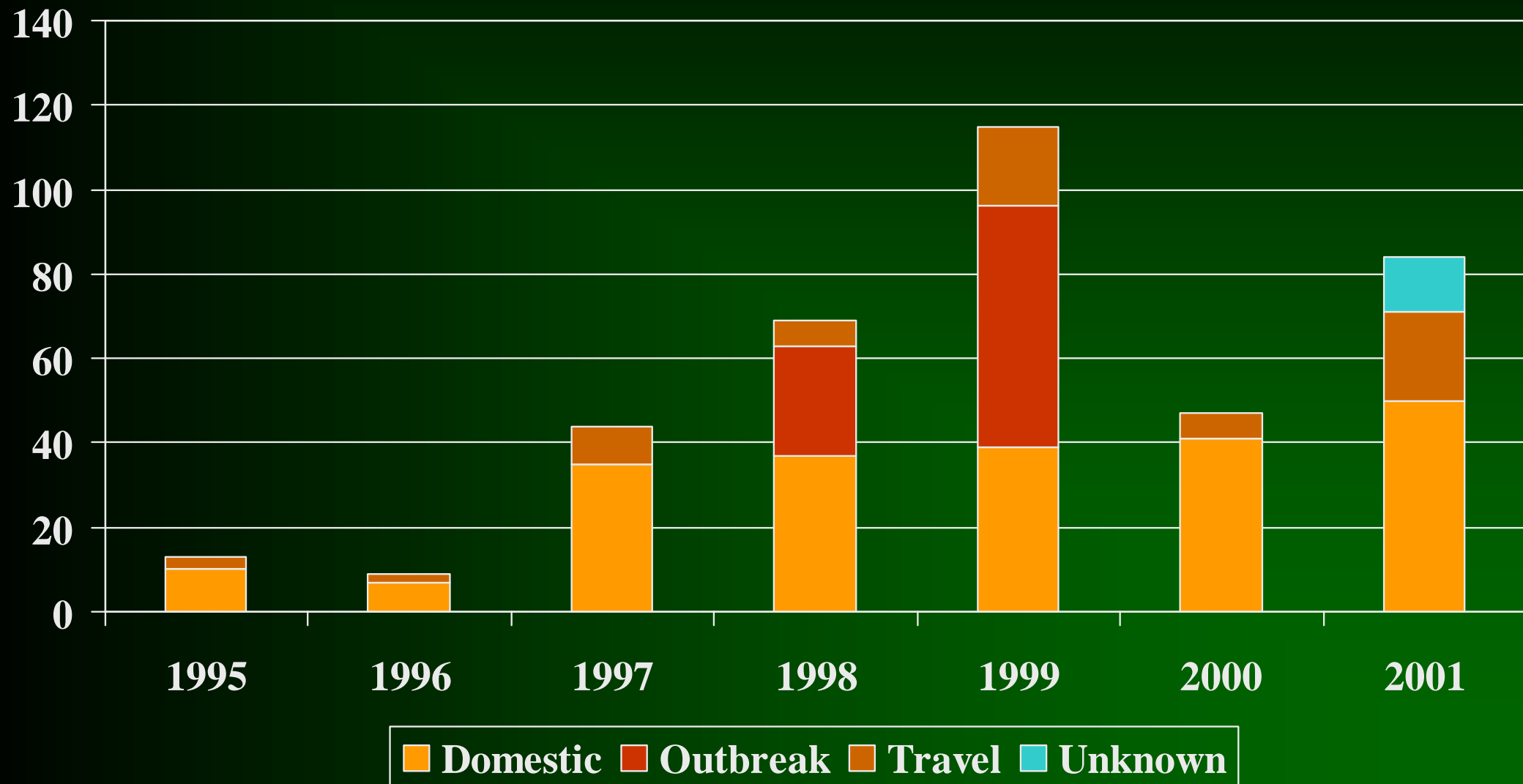
- Herd with DT104 put under District Veterinary Officers supervision
- No movement of animals
- Cleaning, disinfection, partial eradication, etc.
- Special hygienic slaughter
- All products decontaminated
- Sanctions lifted when herd tested negative twice

Objective: O-tolerance in food; barrier between herd and consumer (decontamination)

# DT104 in meat end-product samples 1996-2001 (N=130,000)



# Prevalence of human DT104 infections



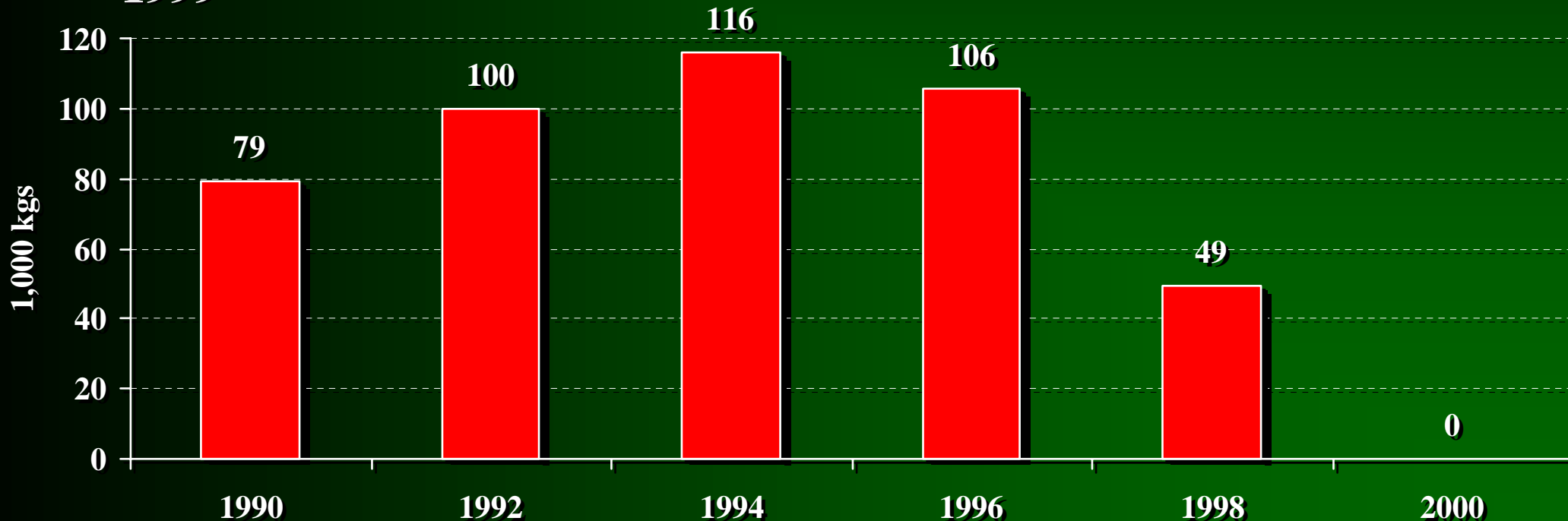
# Containment of antimicrobial resistance in food animals – the case of the antimicrobial growth promoters

- Special concerns:
  - Vancomycin-resistant *Enterococcus faecium* (VRE)
  - Streptogramin-resistant *Enterococcus faecium* (SRE)
- Growth promoting antimicrobials belonging to the same classes of drugs used in food animals for decades
- Selection of resistant enterococci in animals and transmission to humans through the food production chain

Objective: Reduce animal carriage of VRE and SRE

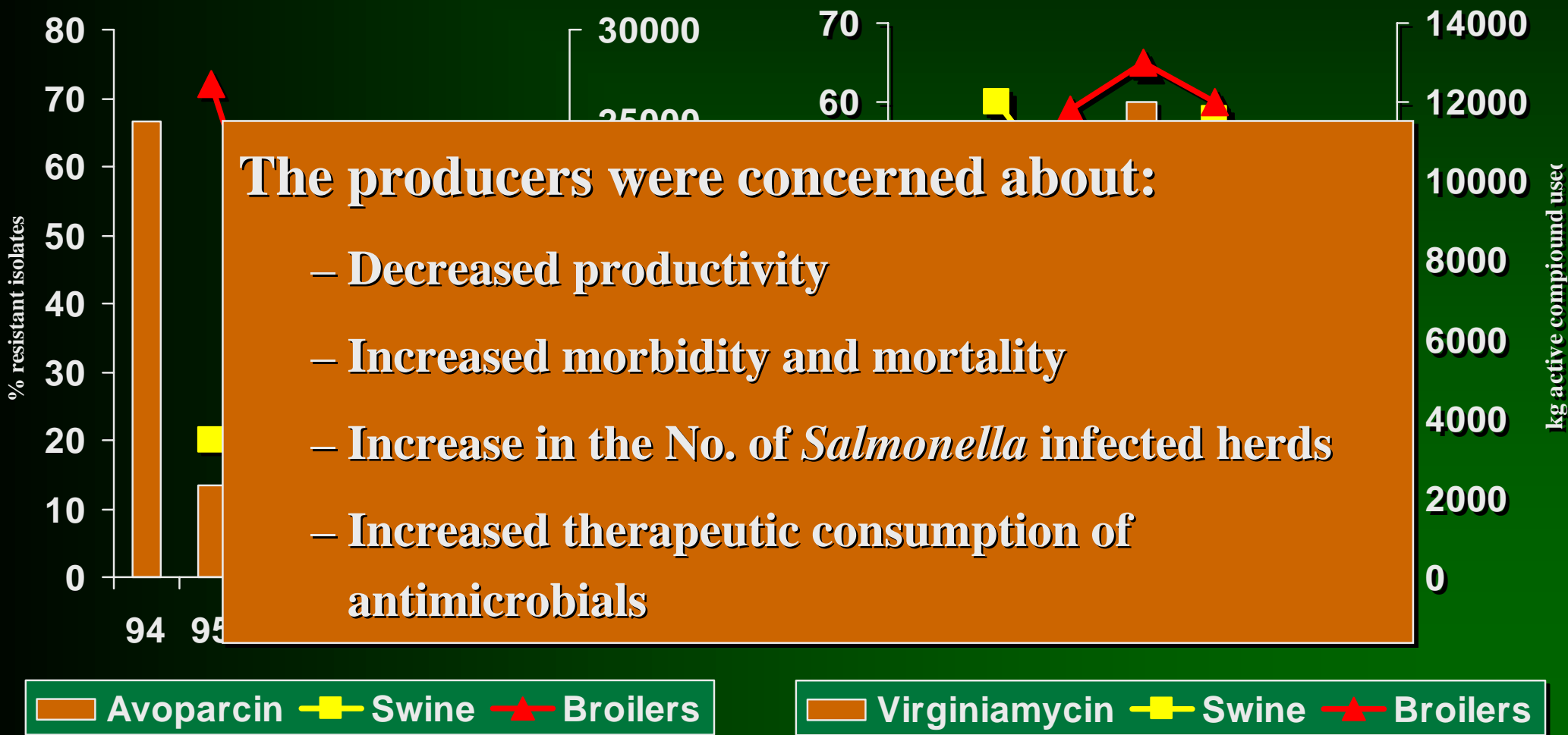
# Voluntary stop of all use of AGP in Denmark

- Early 1998, the Danish cattle and broiler industries reacted to consumer concerns and stopped all use of AGP's
- The pig industry withdrew the use of all AGP's in pigs over 35 kg
- The remaining use of AGP's in Danish pigs was phased out during 1999

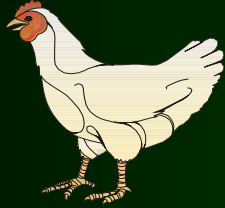




# Trends in the occurrence of resistance to Vancomycin and Synercid<sup>®</sup> in *E. faecium* from broilers and swine and the consumption of Avoparcin and Virginiamycin in Denmark



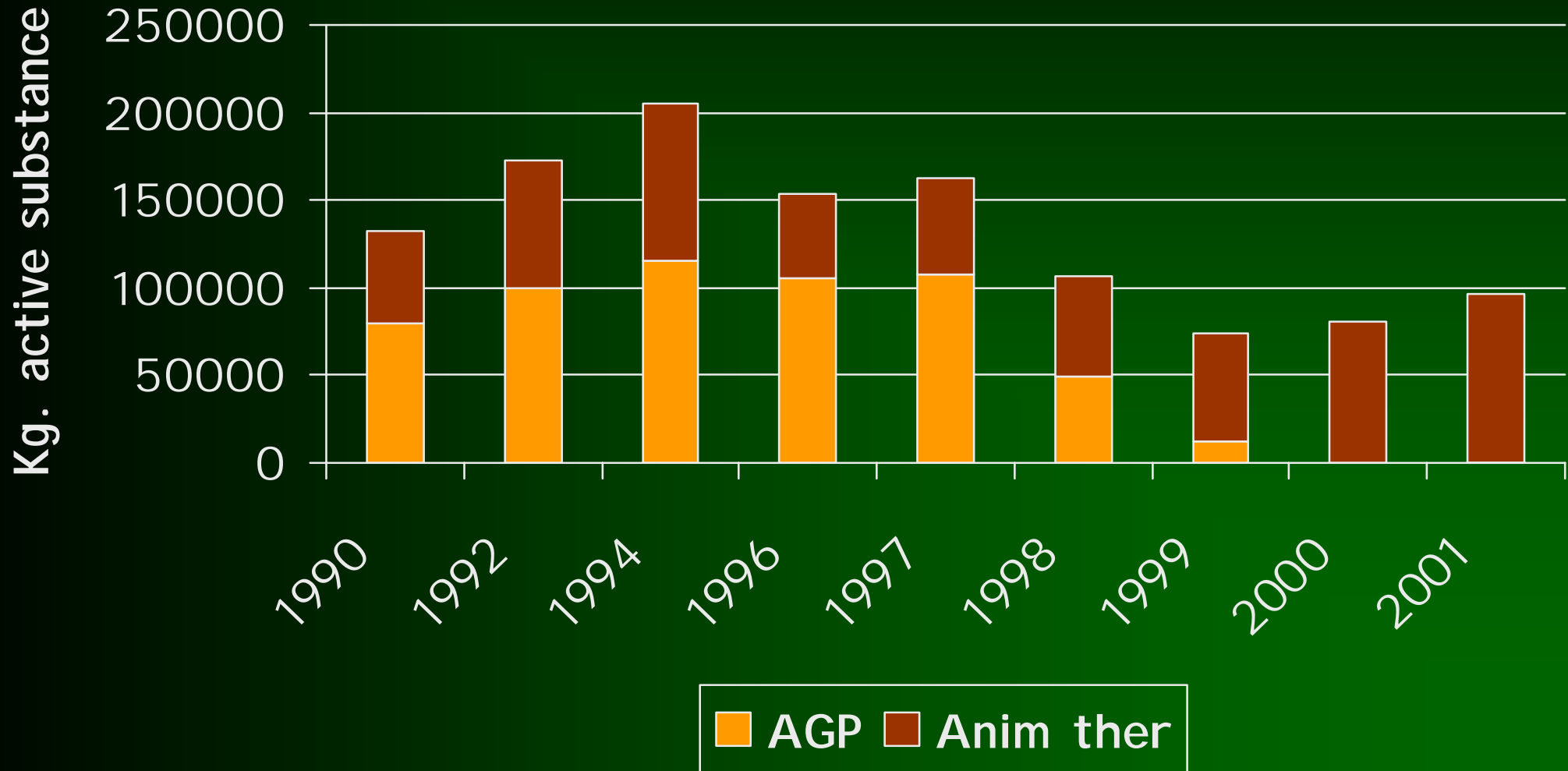
# Experiences with broiler and pig productivity



- Kg broilers produced per m<sup>2</sup> and mortality were not affected by the withdrawal of AGP's
- The feed conversion ratio increased only marginally with 0.016 kg feed/kg broiler
- Cost of feed increase equivalent to costs saved on AGP
- Finishers and growers (>30 kg): No or a very limited effect of the withdrawal of AGP's
- Weaned pigs (<30 kg): In 11% of herds problems with post weaning diarrhea; decrease in daily weight gain; and increase in post weaning mortality

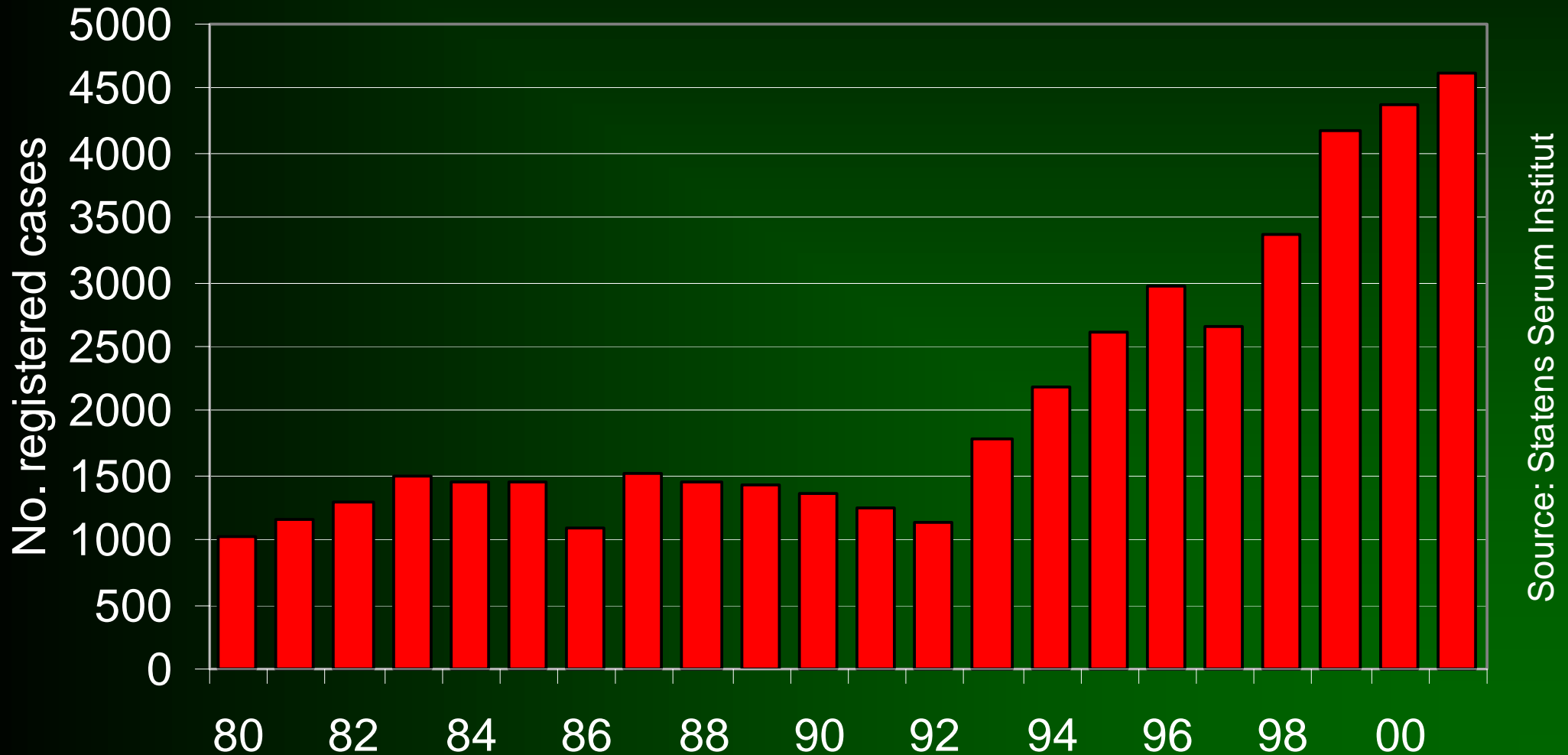
**Retail prizes of broiler meat and pork has not increased**

# Total consumption of antimicrobials for food animals in Denmark 1990-2000

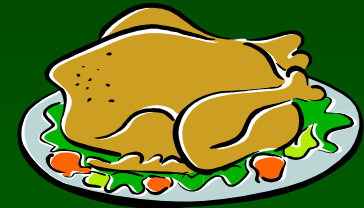
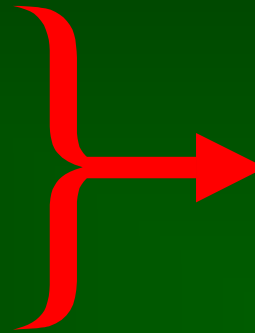
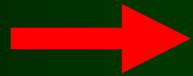
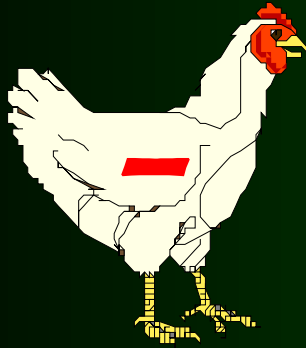


# New Challenges

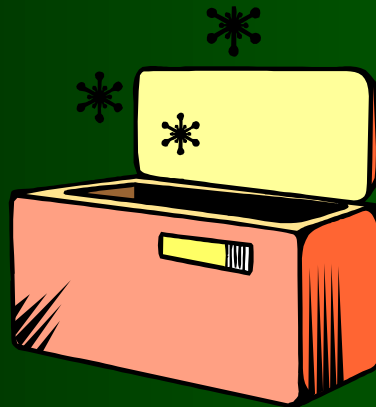
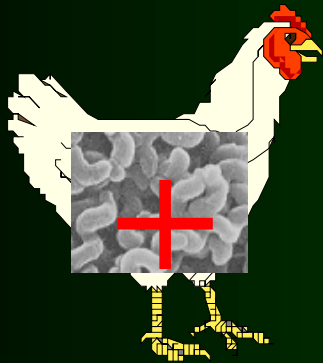
## - Campylobacteriosis an increasing problem



# Danish *Campylobacter* action plan – starting 2002



PCR test 3 days  
prior to slaughter



”Free from campylo what did you say?”

Adding value to the *Salmonella* free Danish chicken raised without the use of antibiotic growth promoters

Fri for campylohvadfor noget..?



Campylobacter er ligesom Salmonella bakterier, der giver anledning til sygdom, hvis de overføres fra inficerede madvarer. Salmonella og Campylobacter er de to absolut største kilder til fødevarerbårne infektioner hos mennesker i Danmark.

I 1993 introducerede FDB som de første i Danmark Salmonellafri kyllinger. Og

nu kan vi som de første i verden tilbyde kyllinger, som er fri for både Salmonella og Campylobacter.

Den nye kylling har også en spisekvalitet, der er helt på niveau med ferske kyllingers. En skøn spiseoplevelse med sprødt skind og mørt, saftigt kød efter stegningen.

 Kvickly, SuperBrugsen, Dagli'Brugsen, LokalBrugsen og ØB&S

# Food safety starts at the farm!

- Foodborne pathogens must be controlled at all stages in the food production chain – including at the farm
- Integrated surveillance of foodborne pathogens in all stages of the food production chain provides a powerful and cost efficient tool to prevent contamination of food and consequently foodborne diseases
- The use of antimicrobial growth promoters in food animals can and should be terminated to reduce the selection and spread of resistant bacteria in the food chain
- Formation of a formal coordinating body can facilitate communication and coordination, and ensure consistency in the response to emerging food safety threats

# Safe Food for All



**Thank you for your attention!**

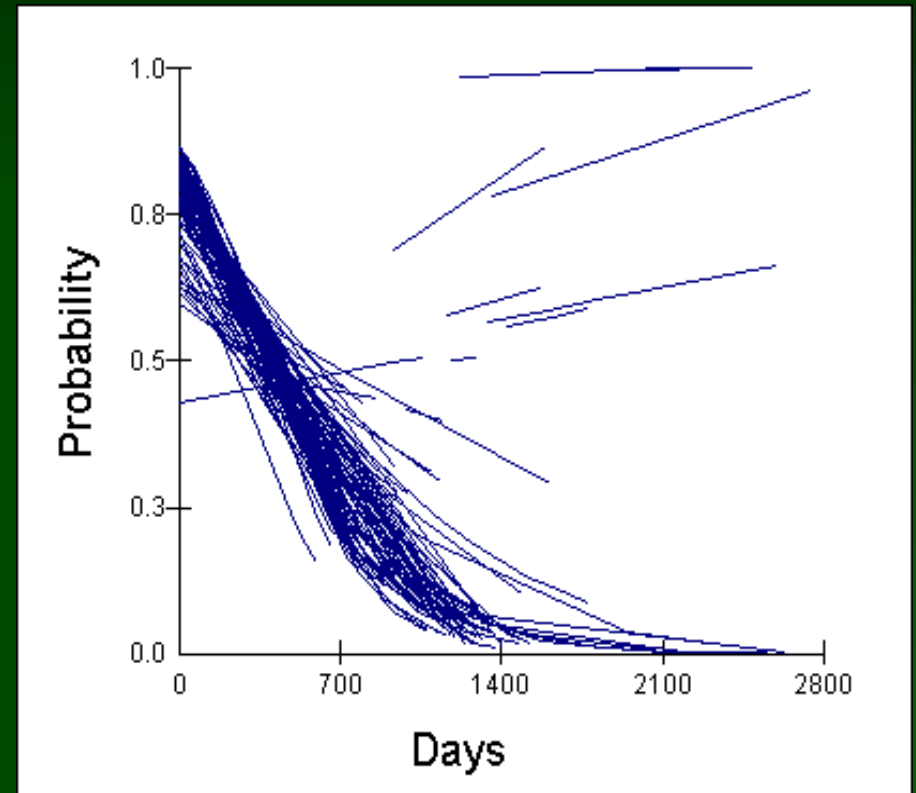
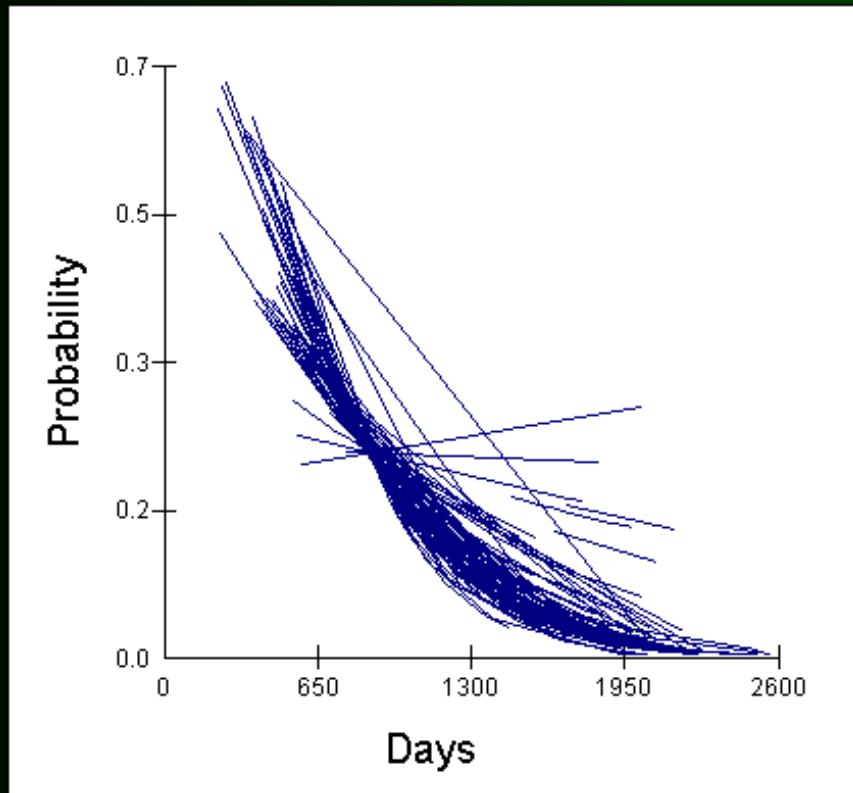


# Resistance in *E. faecium* at flock

## level - broilers

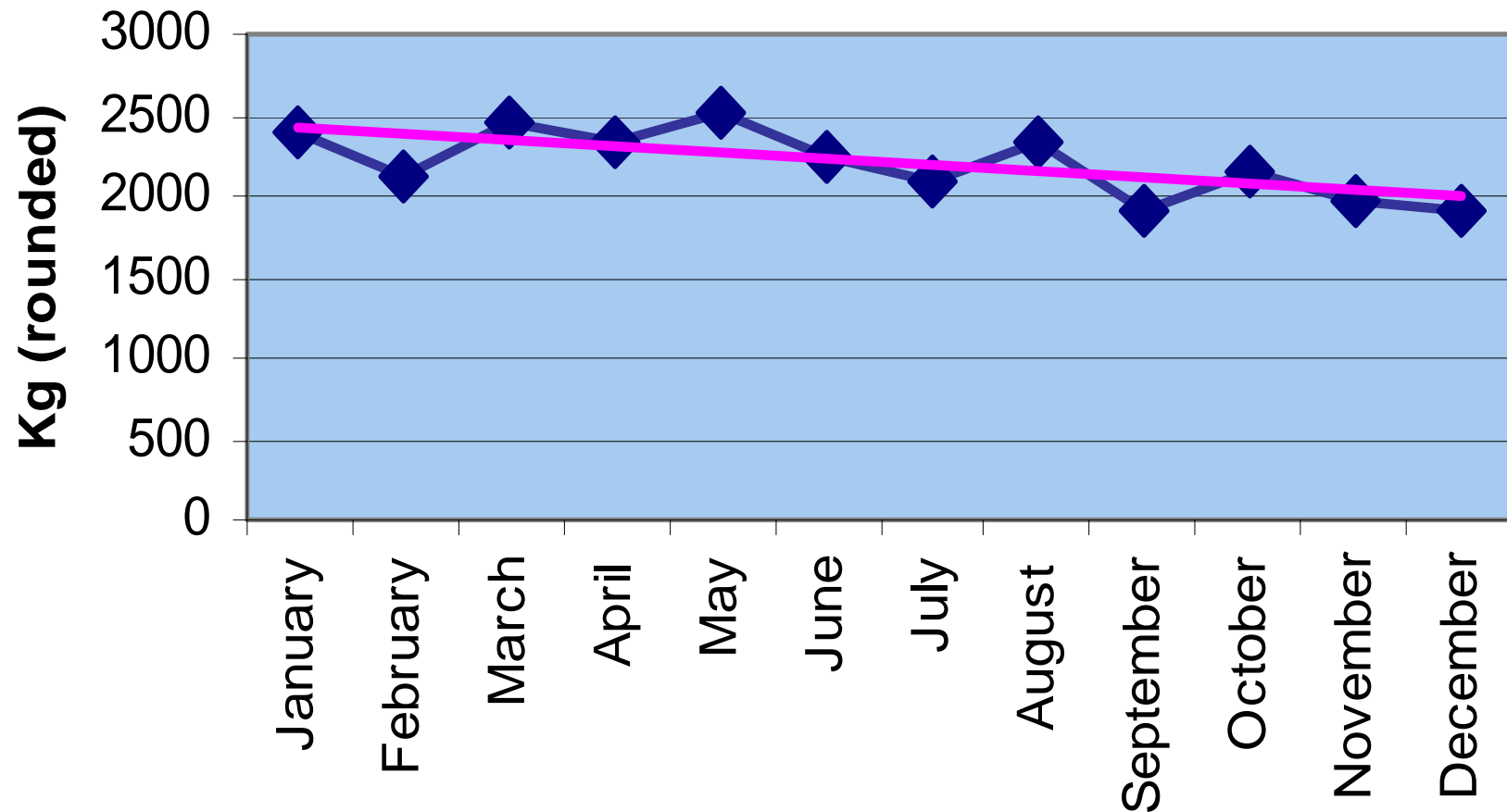
### Avoparcin (Vancomycin)

### Avilamycin (Ziracin)



# VETSTAT output - example

## Tetracyclines (pharmacies, 2001)



# Consumption of fluoroquinolones in food animals and occurrence of fluoroquinolone resistance in animal-pathogenic *Escherichia coli* in Denmark (DANMAP 2000)

