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Risk-based meat inspection and integrated meat safety assurance

Contemporary Meat Safety Standards and the role of meat inspection

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Introduction: Bert Urlings

- Farmers-son from Maastricht
- Veterinarian
- PhD: Safety of food of animal origin
- Director Food Safety Veterinair Instituut Lelystad
- Professor Wageningen University
- Corporate Director Quality Assurance and Public Affairs Vion Food

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WAGENINGEN UR
For quality of life

Universiteit Utrecht

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Vion is a leading European producer of pork and beef

4,7
Revenue for 2021
in billion euros

ZLTO
One shareholder
Zuidelijke Land- en Tuinbouw-organisatie (ZLTO)

Employees

12,150
Average number of employees in FTEs
in 2021 (including flex workers)

Part of top 100
largest global food companies

28

Production locations
The Netherlands – Germany-Belgium

Market leadership
In the Netherlands
and Germany

Vion
100 million
people worldwide consume food produced by Vion, every day

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Vion's strategy (food business operator)

- Control the supply chain: food safety, ethics, animal welfare, healthy food, ..
- Full tracking and tracing
- Private Certification through the supply chain
- Being in the lead:
  - Corrective
  - Preventive
  - Pre-cautionary measures
- Empowered to respond to questions of:
  - Consumers
  - Authorities
  - NGO's
- Transparency

Animal welfare

Food safety

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Responsibility of FBO (supply chain)

- Design of systems (GAPs, HACCP, Pre-Requisite-Requirements)
- Development of procedures
- Monitoring and verification
- Evaluation and development of performance standards
- Realistic compliance standards

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Figure 15. Scatterplot of the global burden of foodborne disease per 100 000 population and per incident case.

Abbreviations: NoV = Norovirus; Camp = *Campylobacter* spp.; EPEC = Enteropathogenic *Escherichia coli*; ETEC = Enterotoxigenic *E. coli*; STEC = Shiga toxin-producing *E. coli*; NTS = non-typhoidal *Salmonella enterica*; Shig = *Shigella* spp.; Vchol; *Vibrio cholerae*; Ehist = *Entamoeba histolytica*; Cryp = *Cryptosporidium* spp.; Giar = *Giardia* spp.; HAV = Hepatitis A virus; Bruc = *Brucella* spp.; Lmono = *Listeria monocytogenes*; Mbov = *Mycobacterium bovis*; SPara = *Salmonella* Paratyphi A; STyph = *Salmonella* Typhi; Toxo = *Toxoplasma gondii*; Egran = *Echinococcus granulosus*; Emult = *E. multilocularis*; Tsol = *Taenia solium*; Asc = *Ascaris* spp.; Trich = *Trichinella* spp.; Clon = *Clonorchis sinensis*; Fasc = *Fasciola* spp.; Flukes = Intestinal flukes; Opis = *Opisthorchis* spp.; Parag = *Paragonimus* spp.; Diox = Dioxin; Afla = Aflatoxin

Foodborne Disease

WHO

FERG report

2015

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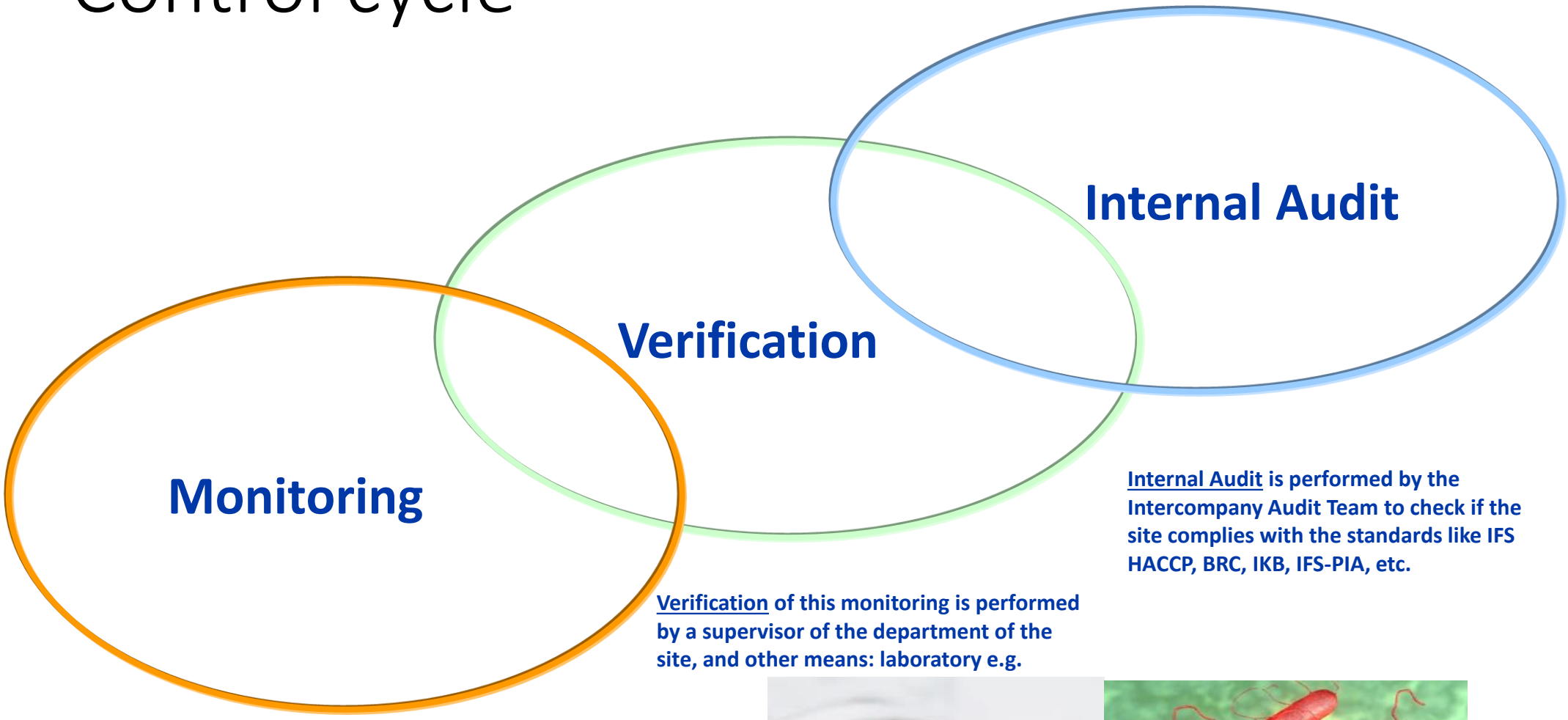
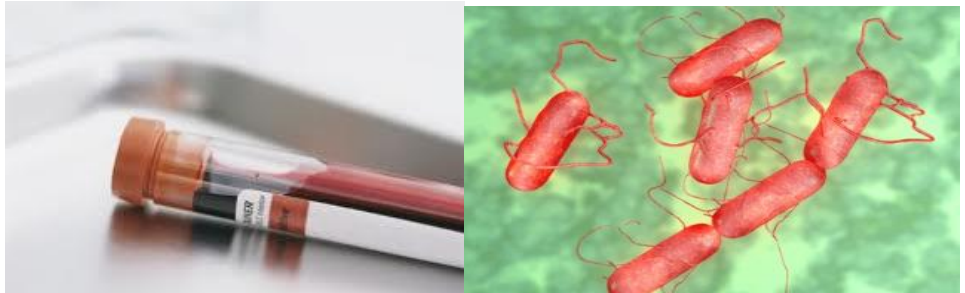
Control cycle



Internal Audit is performed by the Intercompany Audit Team to check if the site complies with the standards like IFS HACCP, BRC, IKB, IFS-PIA, etc.

Verification of this monitoring is performed by a supervisor of the department of the site, and other means: laboratory e.g.



Monitoring of processes within the department is performed by the department itself.

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Control of Microbiology I: ALARA principle

ALARA: as low as reasonably achievable initial contamination

- CPs e.g.:
  - Supply of "clean" animals
  - Rodding, special cutting of skin, sternum, way of cutting / desinfection of knifes
  - Personal hygiene, daily R&D of whole production area.

- CCP contamination with digestive content
  - Hygienic slaughtering
  - Marking contaminated carcasses
  - Steam-clean: front- and hind-quarter of beef at slaughter
  - 100% check entrance of cutting room and dispatch
  - Monitoring: each day 4 x 5 front- and hind-quarter / pigs each hour during slaughter
  - Verification: visual checks daily / microbiological sampling daily.

  - **Whole head slaughtering in pigs** (prevent cutting of lnn)

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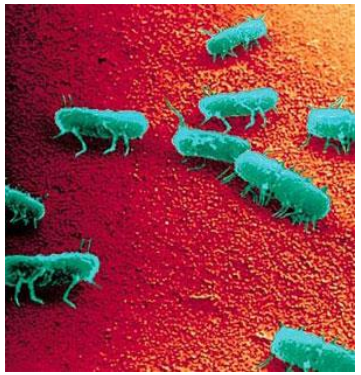
Control of Microbiology: prevent microbiological multiplication

Keep hands off until it is cold



- Start meat cutting after core temperature is <7 °C
- Keep cold also during processing
- No big volumes in processing area's
- CCP temperature: before dispatch <7 °C or 3 °C for organs

- Verification through structured sampling of technical cuts and trimmings: performance no substantial multiplication (prevent Enterobacteriacea to multiply)

- Check in all samples also salmonella, Estec and listeria…

  (VHEI: Vion Harmonized Epidemiological indicators)

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Control of chemical contamination

Not part of meat inspection, but of private HACCP standard

(meat inspection can decide to delay the decision and to check for residues independent of private monitoring programme)

- Risk based sampling on residues of antibiotics on the basis of recent slaughter history of animals
- Regular monitoring programme on heavy metals
- Risk based monitoring on xenobiotics such as dioxines.

- Private programme: continuous improvement
- Evaluate on the basis of GFL / not part of official meat inspection

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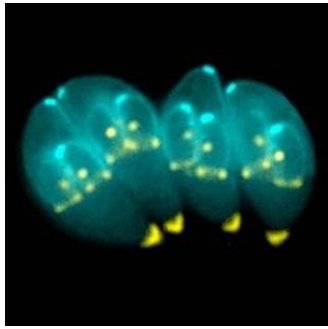
Current and future meat safety control?

Further development of Food Safety control:

- Well known hazards: improve control of performance within HACCP plan
- New / re-occurring hazard: improve your HACCP plan
  - Genes monitoring for antibiotic resistance
  - Antibodies monitoring for toxoplasma



All new development through HACCP plan / science based

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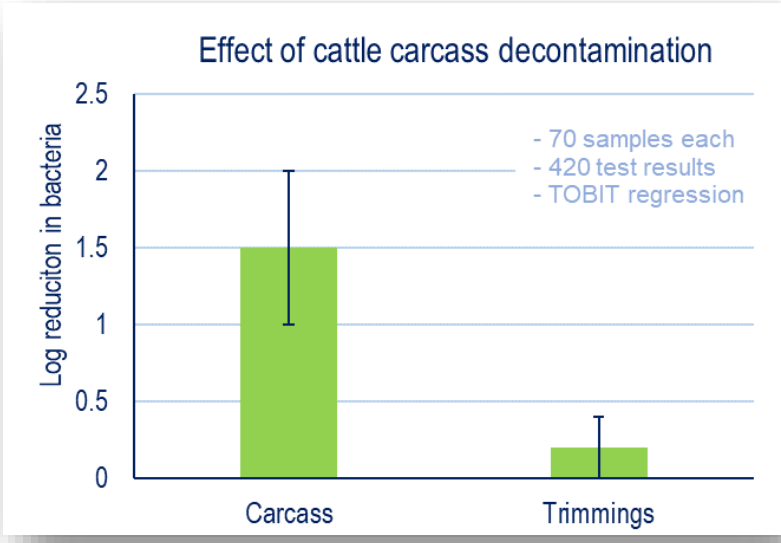
Carcass decontamination of beef carcasses?

US – CDC figures show:

- It works for campylobacter in poultry
- No real improvement in human cases of salmonella / Stec during past 25 yrs as a result of carcass decontamination
- New isolates detected



Own data / literature suggest:

- Carcass decontamination has a direct reduction of 1 to 2 log bacterial count
- On trimmings the effect is not detectable anymore after 2 days in bacterial counts.

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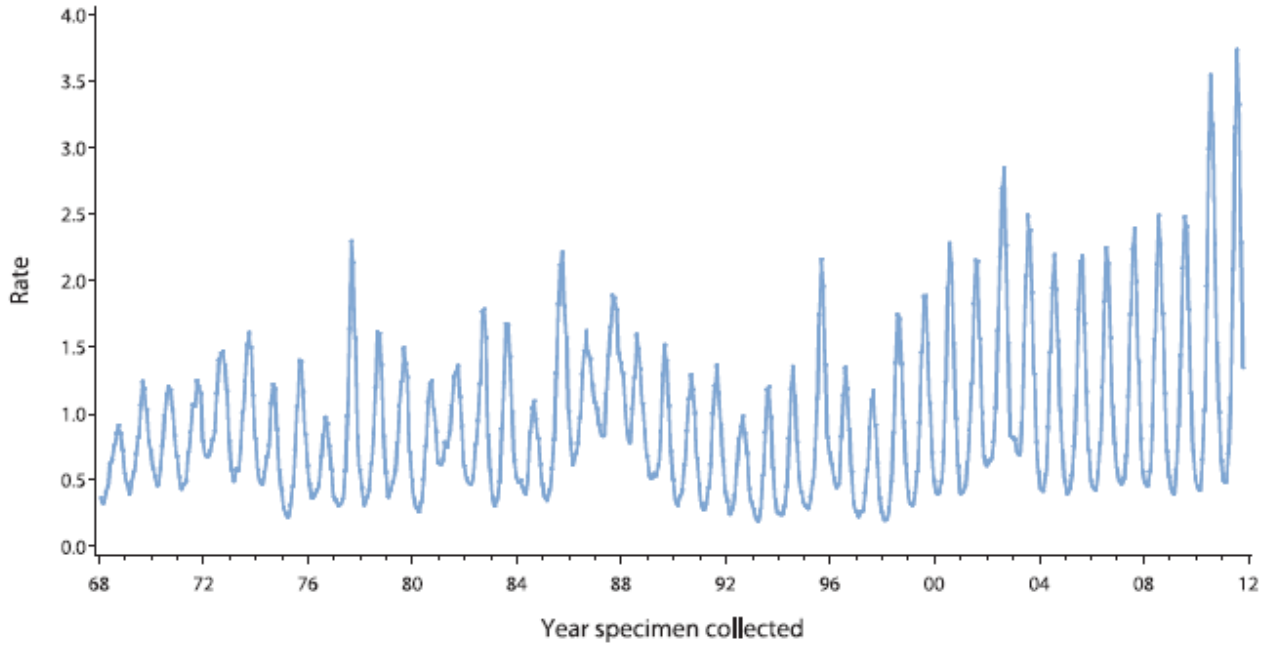
Atlas of Salmonella (Centers for Disease Control and Prevention (CDC))

Salmonella serotype Newport

Figure 1 - Rate of reported isolates per 100,000 population, 3-month moving average, by month and year, 1968-2011

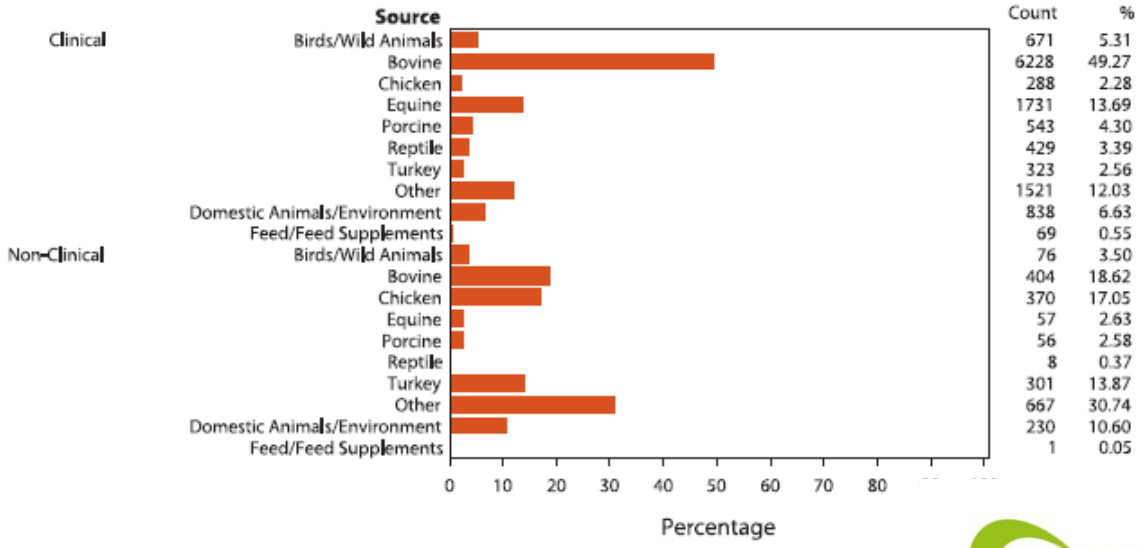
N=109,629



Isolate from human case

Figure 8 - Percentage of non-human isolates, by type and source, reported by the National Veterinary Services Laboratories, USDA-FSIS, 1968-2011

N=14,811



Isolate from food / animal

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Atlas of Salmonella (Centers for Disease Control and Prevention (CDC))

Salmonella serotype I 4,[5],12:i:-

Figure 1 - Rate of reported isolates per 100,000 population, 3-month moving average, by month and year, 1968-2011

N=10,652

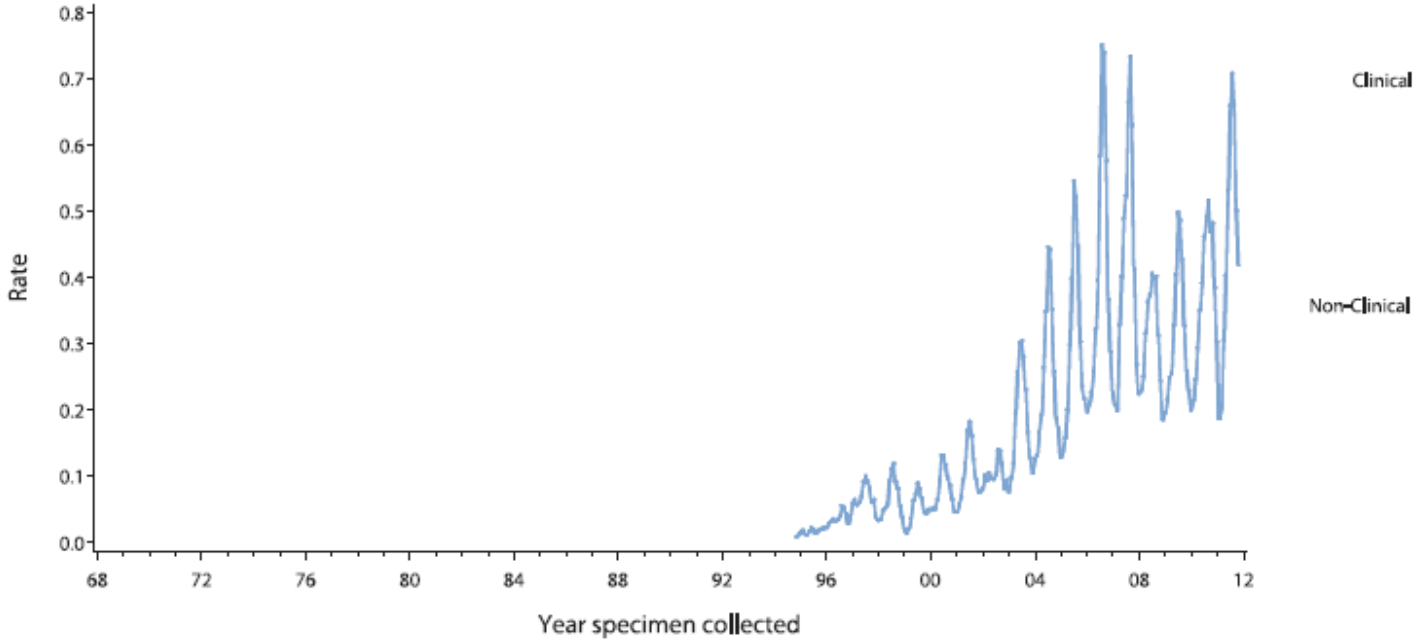
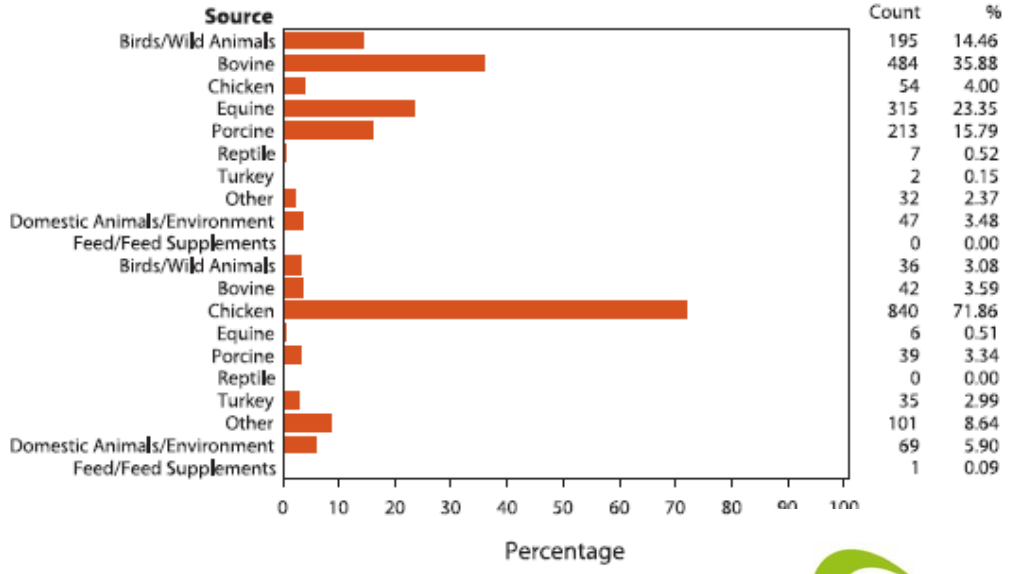


Figure 8 - Percentage of non-human isolates, by type and source, reported by the National Veterinary Services Laboratories, USDA-FSIS, 1968-2011

N=2,518



Isolate from human case

Isolate from food / animal

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Carcass decontamination of beef carcasses?

What is the **possible** background mechanism:

- Carcass decontamination results also in muscle cell lysis:
  - More substrate for microbiological multiplication
  - Less effect of reduction of bacteria as a result of lower a_w of the carcass after cooling
- Keep natural structure of tissue to prevent microbiological attachment and multiplication

Own strategy:

- No carcass nor technical quarter decontamination
- Intensive whole supply chain monitoring on Stec and salmonella. From carcass to consumer product.
- Negative release strategy for beef products that are consumed raw (partial raw)

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Manage your sources of variation I

Example of salmonella in pork, where is the variation:

- At farm
- Transport / lairage at slaughterhouse
- Black slaughterline
- Clean slaughterline

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Manage your sources of variation II

Farm:

- Sampling for salmonella:
  - Serology:
    - Blood
    - Meat juice
  - Culturing feacal samples

- Do everything perfect at farm, take many samples: the value that you predict a farm positive is < 70% of the real positive farms (resulting in many false negative farms).

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Manage your sources of variation III

Lairage:

- How do you get the lairage clean and disinfected:
  - After regular cleaning and disinfection: 100% of environment samples salmonella positive
  - After an additional cleaning and disinfection: 10% of environment samples salmonella positive
  - After third cleaning and disinfection in a row: 1% of environment samples salmonella positive
- We sampled the skin of pigs after exsanguination: > 100 cfu salmonella / cm^2
- No difference measured between salmonella positive farms and negative farms after exsanguination

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Manage your sources of variation IV

Black slaughterline:

- Scalding:
  - Right temperature / right time
  - Whole carcass
- Singing and flaming / even better, repeatedly

- Microbiological sampling of carcass immediate after black line:
  - Swab method
  - Incision method
- VHEI: Enterobacteriacea < 0.5 in log(cm^2), with incision method

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Manage your sources of variation V

Clean slaughterline:

- Keep the carcass clean (ALARA):
  - Evisceration
  - 100% pre-inspection on carcass contamination by FBO
    - Only identify carcass, register carcass and contain when needed (no removal of contamination)
- Monitor and verify zero tolerance
- Microbiological sampling of carcass after slaughter (incision method):
  - Steer on counts of Enterobacteriaceae and total count (VHEI)
  - Salmonella: and when needed genotype isolates:
    - Predominant isolate when there are elevated levels / biofilm formation in the clean slaughterline.

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Quo Vadis: meat inspection?

- New hazards and re-occurring hazards should be controlled through HACCP
- Based on risk assessment certain parts of meat inspection can be simplified:
  - Stop cutting of lnn

  Based on:
  - Animal species
  - Type of animal (e.g. beef cow / old dairy cow)
  - Origin of animal including epidemiological status in this area
  - Status and performance of the slaughterhouse

- New / re-occurring hazard: improve your HACCP plan
  - Genes monitoring for antibiotic resistance
  - Antibodies monitoring for toxoplasma

All new development through HACCP plan / science based

Before 2006

After 2006

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Thank you for your attention