



Quinolone resistance project, an update of a collaborative study

Kees Veldman, Lina M. Cavaco, Dik Mevius, Frank M. Aarestrup

Project PMQR EURL-AR

- Objectives
 - Collection of data on quinolone resistance in *Salmonella* and *E. coli* from NRL's in Europe
 - Establishment of a database on quinolone resistance
 - Retrospective screening for transferable quinolone resistance mechanisms of isolates with a PMQR phenotype



Project- methods

- Methods
 - Questionnaire
 - Data
 - Collection of data (numbers) on quinolone resistant isolates
 - Selection of PMQR-suspected isolates
 - Screening for resistance mechanisms of PMQR-suspected isolates
 - Testing: PCR, sequencing

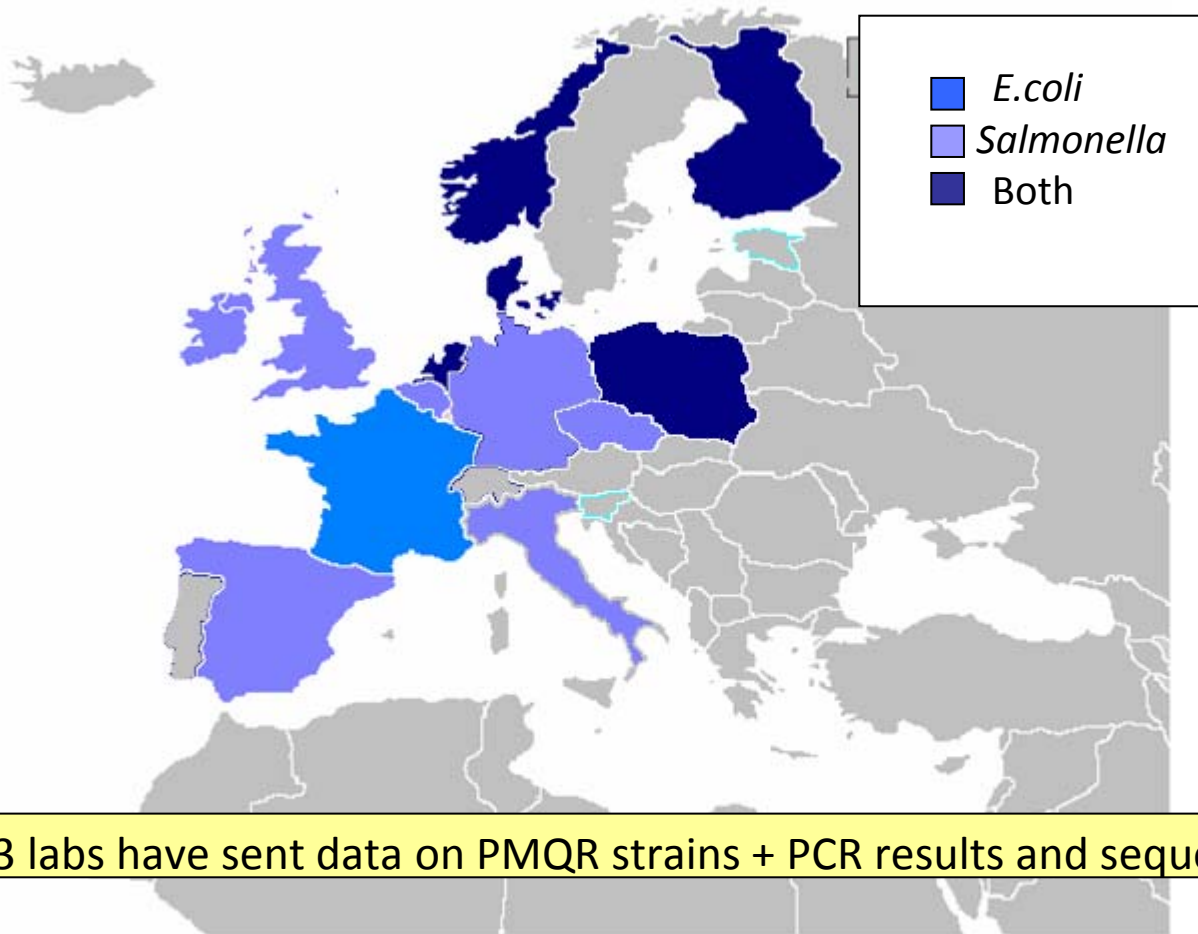


Project update

- Data collection + testing
 - 22 participant laboratories (17 countries):
 - 13 labs have sent data on PMQR-suspected isolates, including PCR results and sequence data
 - 3 labs selected PMQR-suspected isolates, but did not send any data yet
 - 6 labs have sent data on resistant strains, but did not find any PMQR suspected isolates



Tested PMQR suspected isolates



13 labs have sent data on PMQR strains + PCR results and sequence data



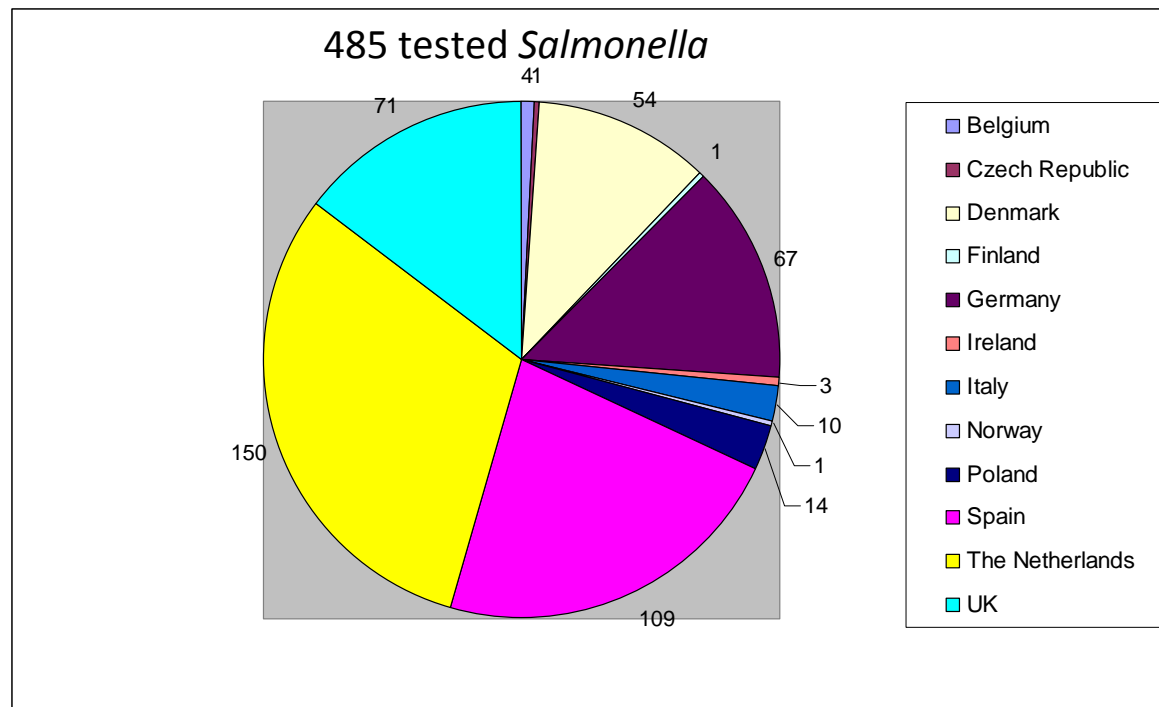
Data

- Data on resistant isolates (CIP and NAL R)
 - Large number of isolates screened
 - *Salmonella* 660.000 screened over 42.000 resistant (13%)
 - *E. coli* 33.000 screened with 2900 resistant (5%)
- PMQR-suspected isolates (after 1993)
 - *Salmonella* 660.000 screened, 1215 PMQR phenotype
 - *E. coli* 33.000 screened, 333 PMQR phenotype

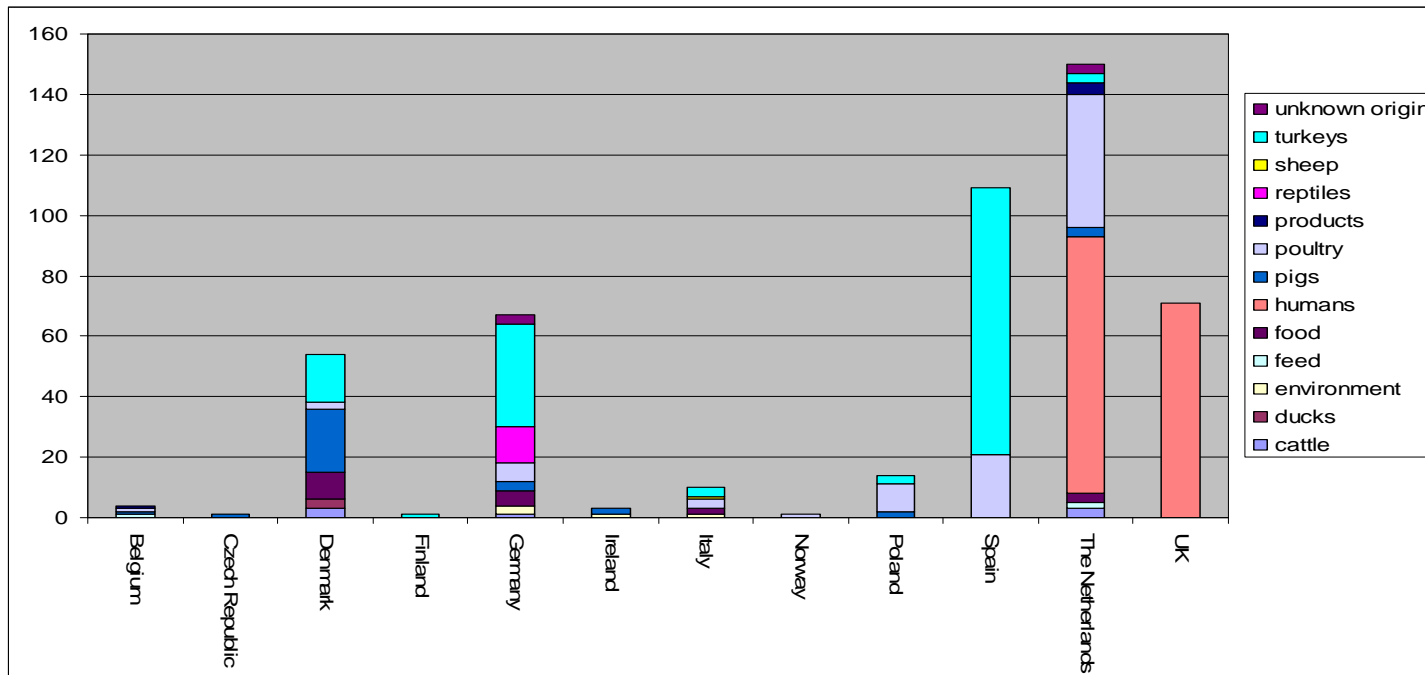


PMQR-suspected *Salmonella* isolates tested

- 1215 PMQR-suspected isolates reported
- 485 isolates tested from 12 countries



PMQR-suspected *Salmonella* from different sources



Humans: UK and the Netherlands

Turkeys: mainly from Spain, Germany and Denmark

Poultry and pigs: different countries

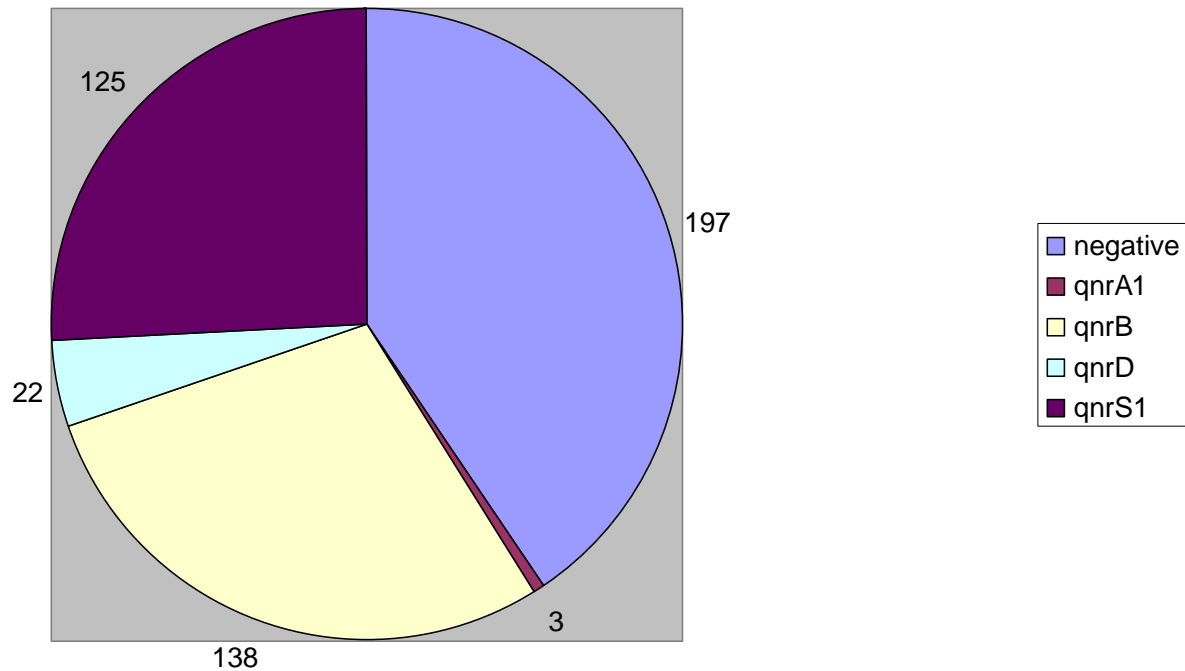
Reptiles: Germany

PMQR-suspected *Salmonella*

- Results
 - 1215 PMQR-suspected isolates reported initially
 - 485 isolates tested from 12 countries with PCR + sequencing
 - 288 PMQR-positive (59%)

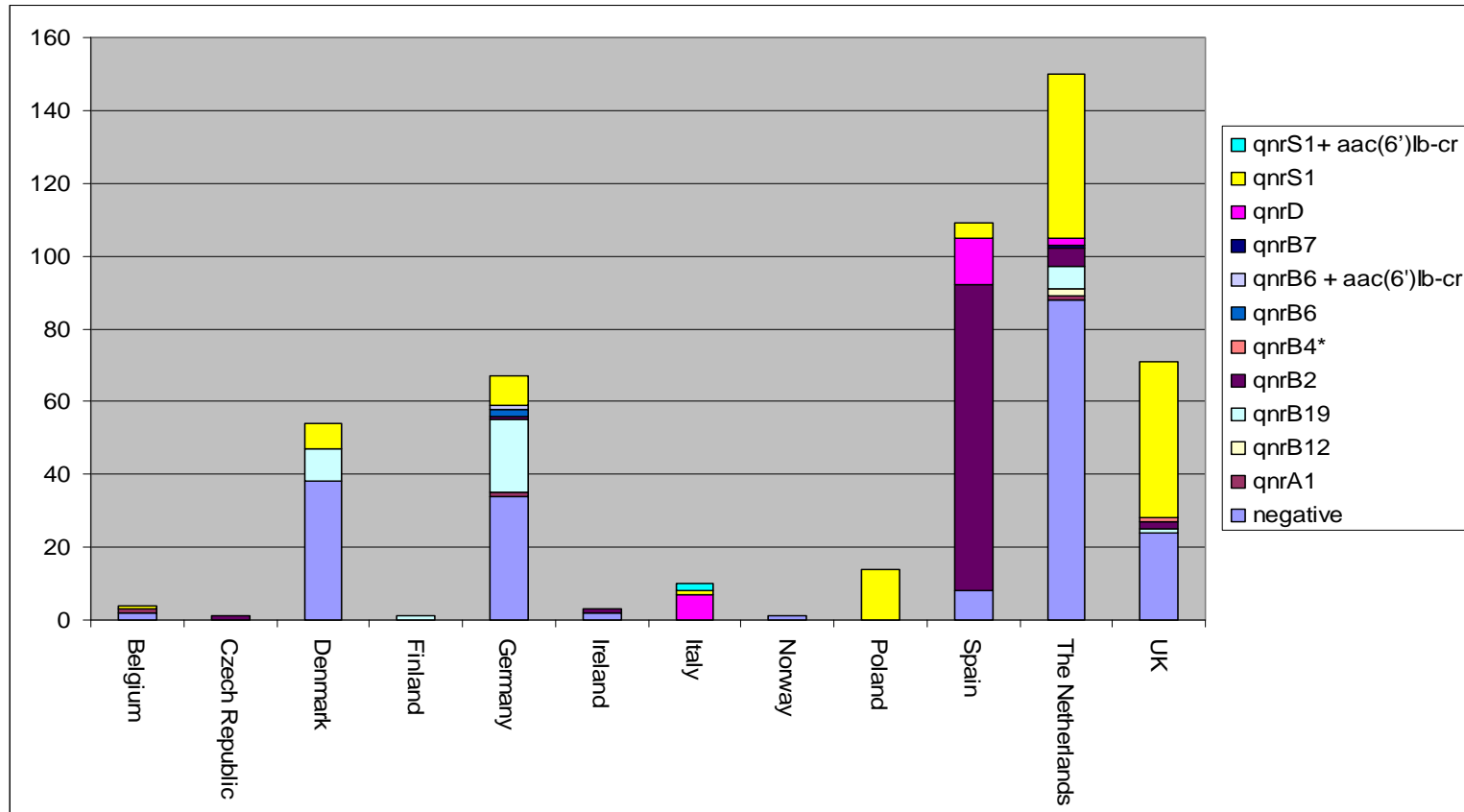


Results of PCR testing of *Salmonella* (n = 485)



qnrB and *qnrS1* were predominant

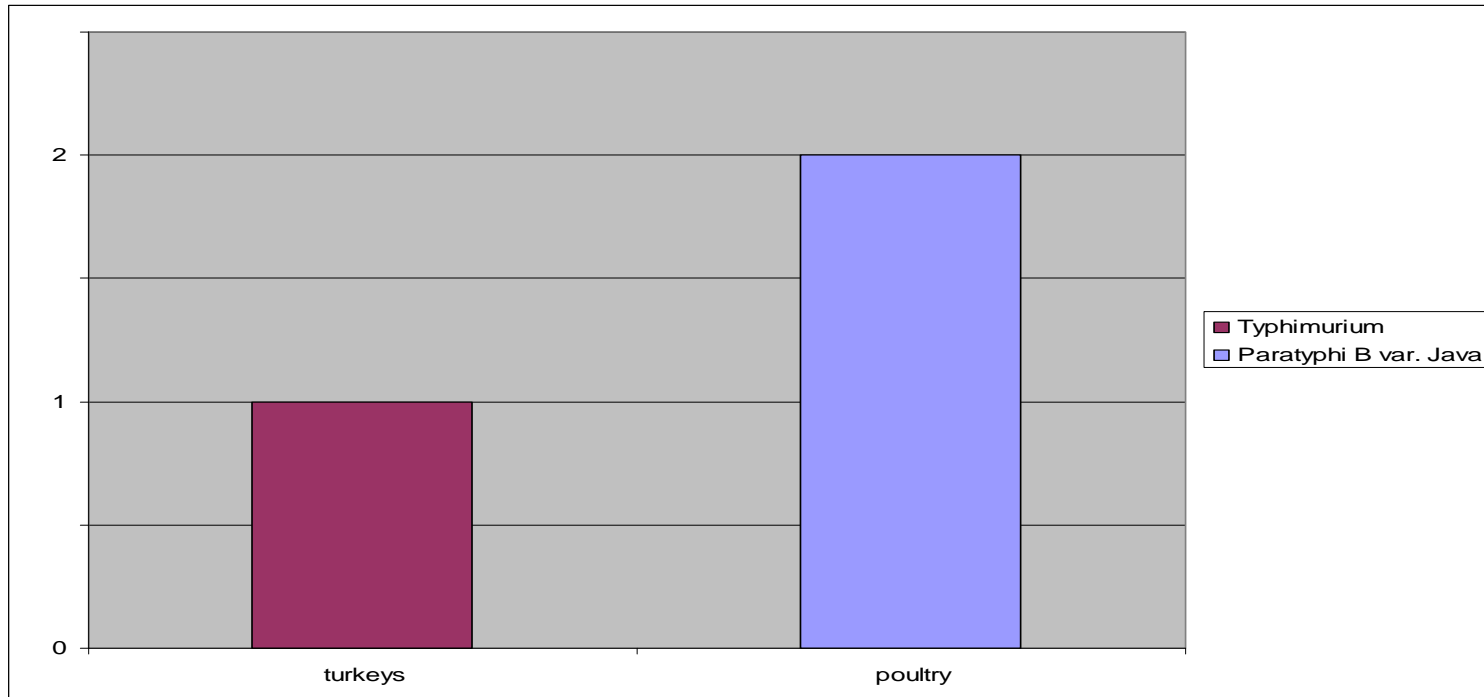
Results PMQR-suspected *Salmonella* tested (n = 485)



288 PMQR-positive out of 485 suspected isolates (= 59%)



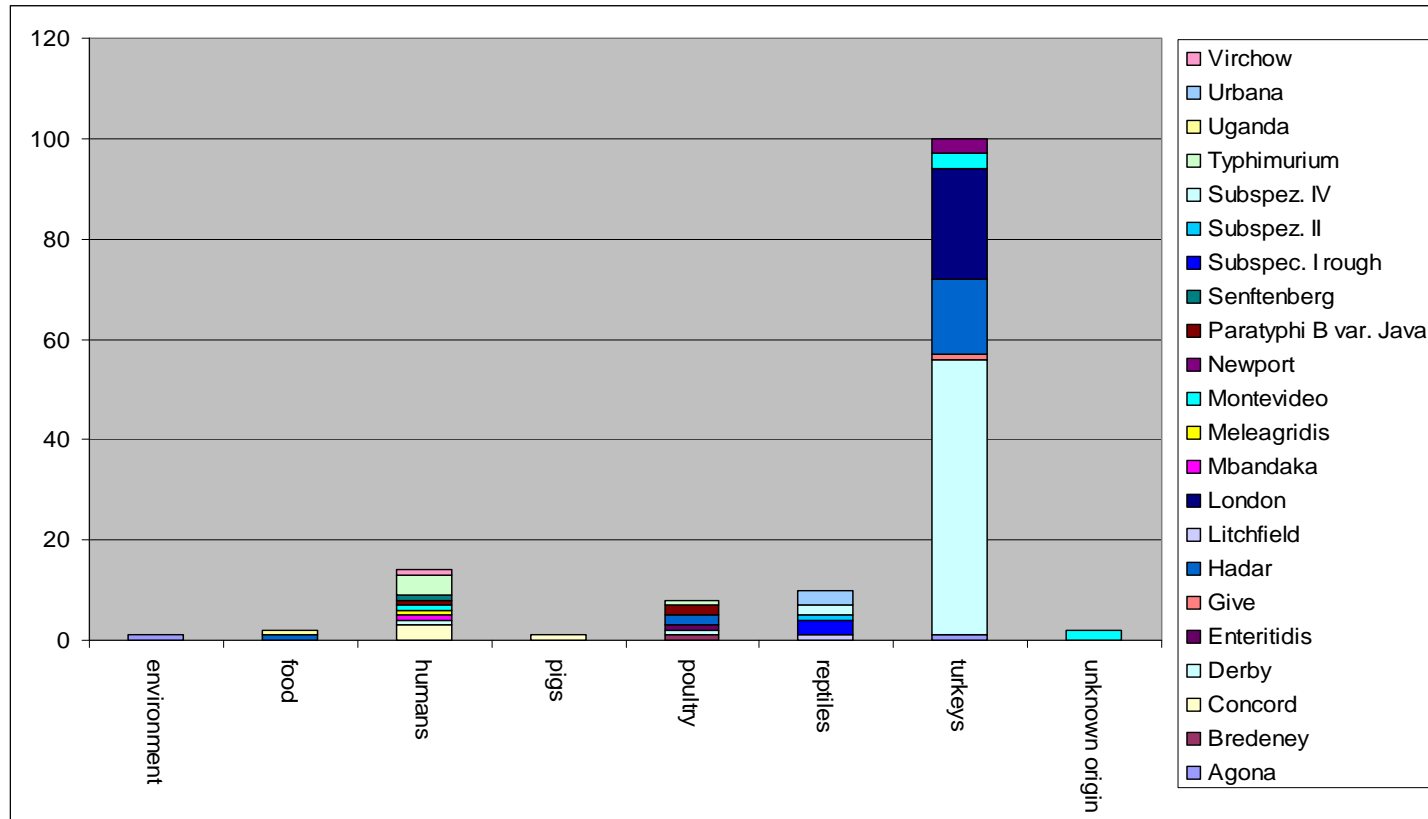
qnrA1-positive *Salmonella* isolates (n=3)



S. Paratyphi variant Java isolates from poultry meat (Belgium and the Netherlands)

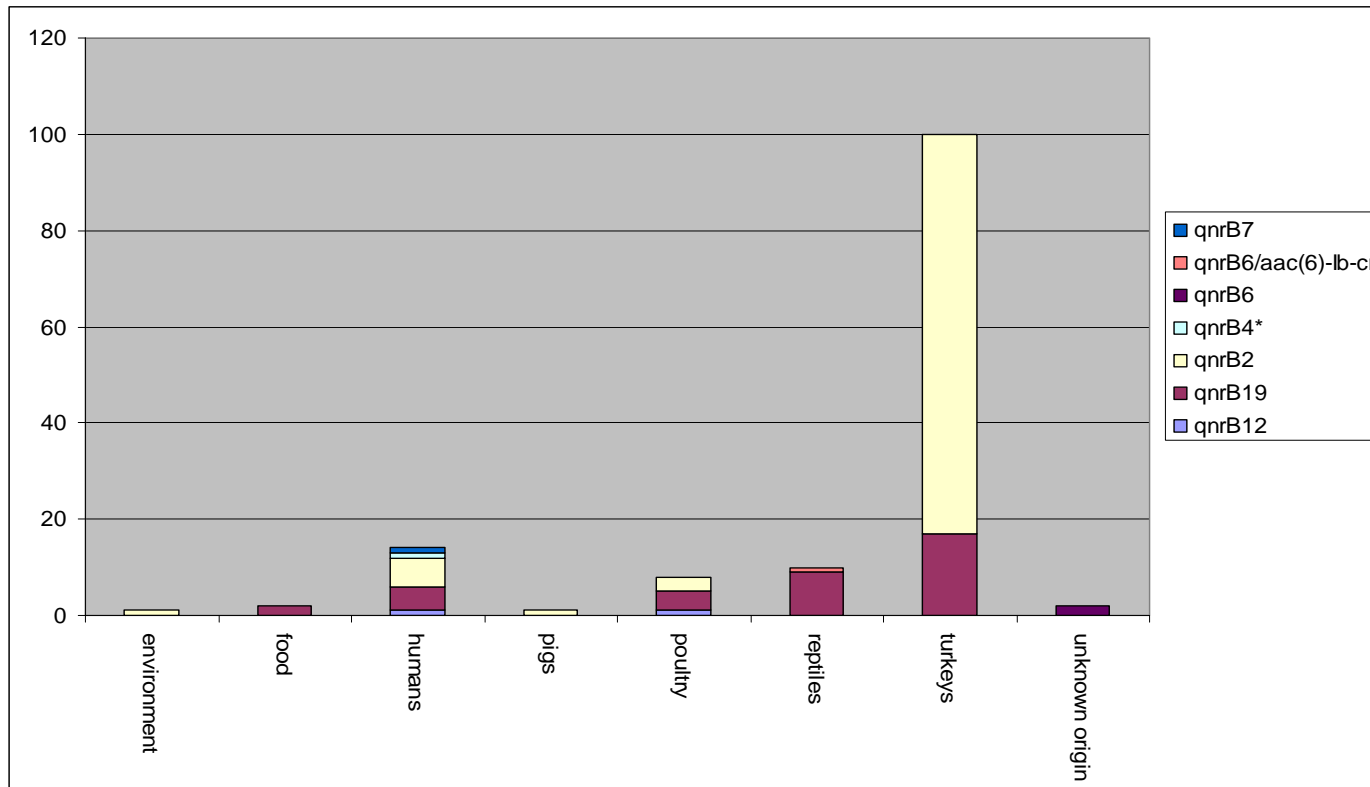
S. Typhimurium isolate from a turkey (Germany)

qnrB-positive *Salmonella* isolates (n=138)



Variants of *qnrB* are identified in 22 different *Salmonella* serotypes
72 % *qnrB*- positive isolates identified in turkeys (*S. Derby*, *Hadar*, *London*)

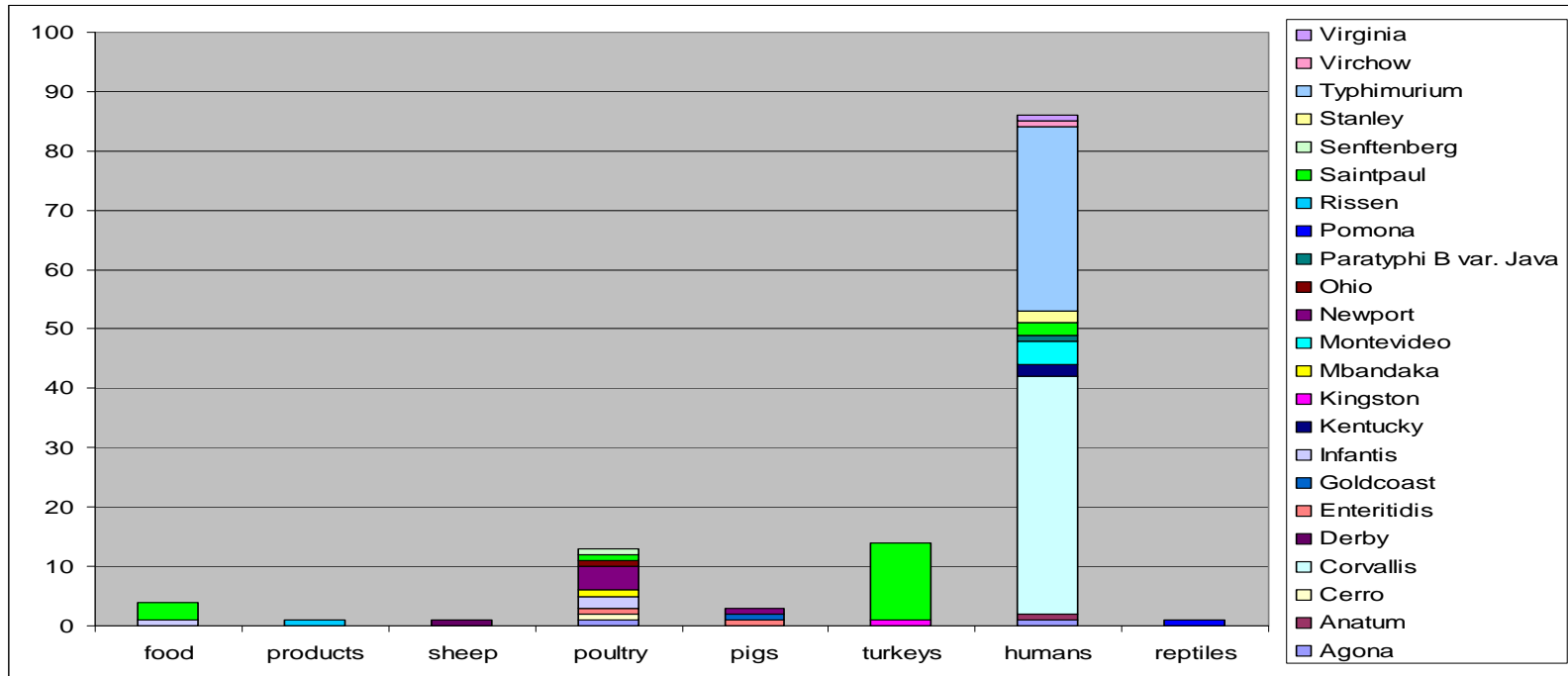
qnrB-variants in *Salmonella* per source (n = 138)



qnrB2 in turkeys

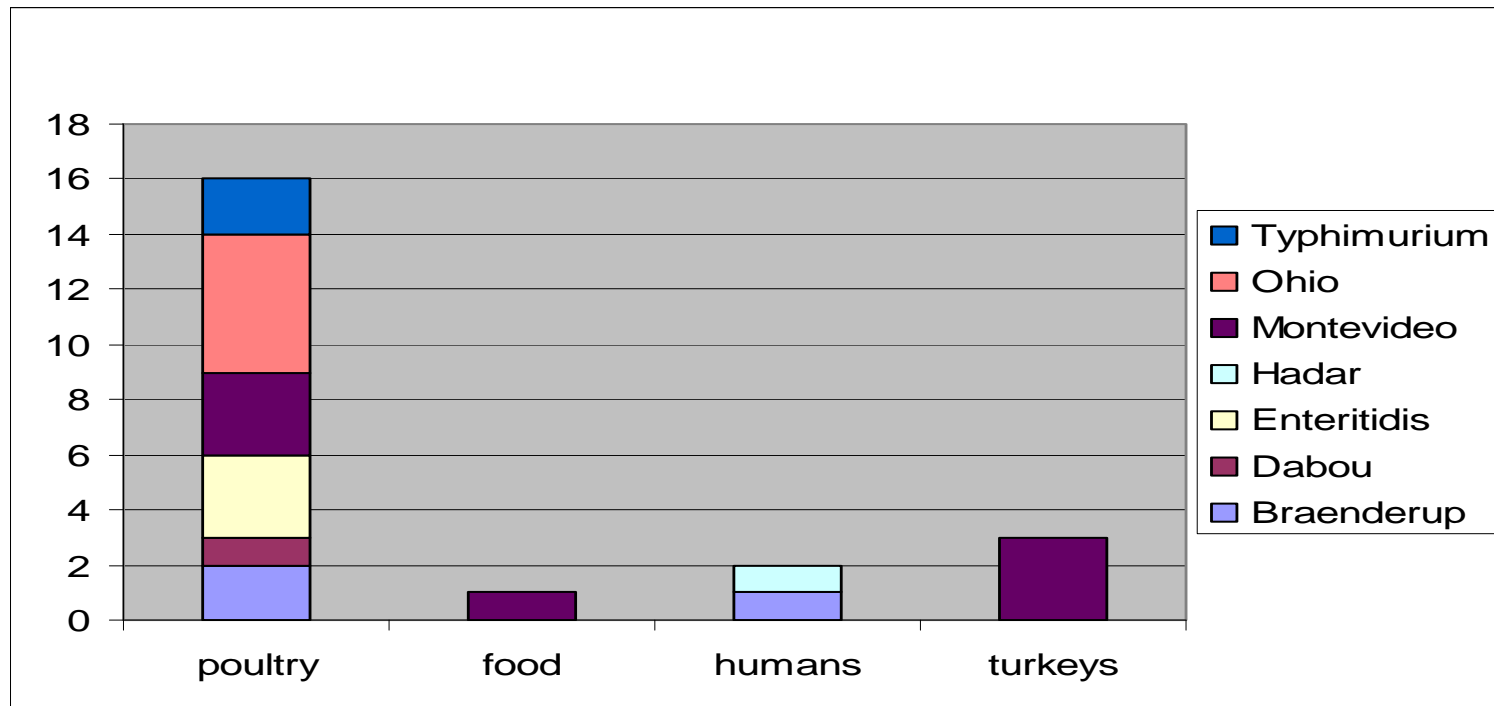
qnrB19 (or *qnrB5*) in humans, poultry, turkey and reptiles

qnrS1-positive *Salmonella* isolates (n= 125)



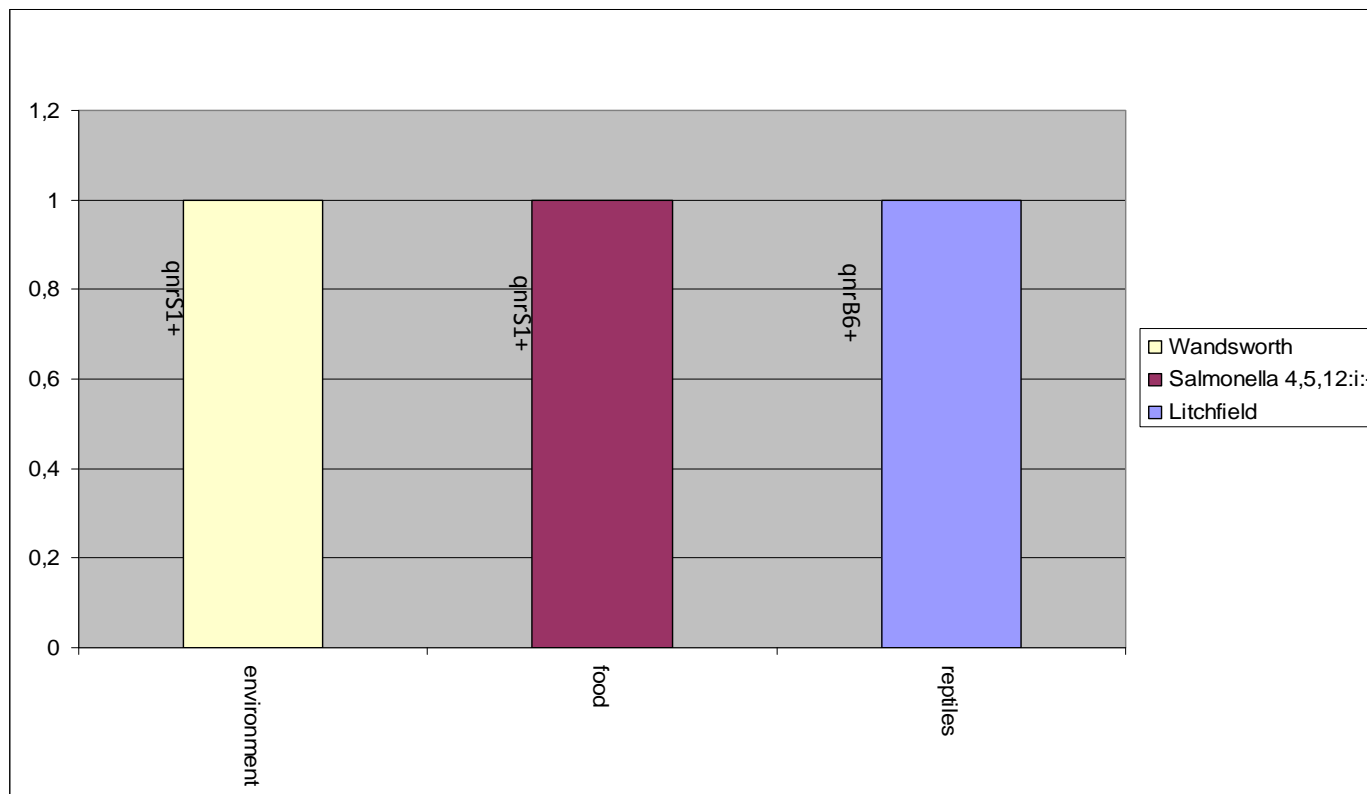
qnrS1 genes in *S. Corvallis* and *S. Typhimurium* (most humans)
qnrS1-positive *S. Saintpaul* in turkey isolates from Denmark, Poland and Germany and in human isolates from the UK and the Netherlands

qnrD-positive *Salmonella* isolates (n = 22)



22 *qnrD*-positive *Salmonella* in 7 serotypes from 3 different countries (Italy, Spain and the Netherlands)
qnrD genes in poultry (n = 16), turkeys (n = 3), humans (n = 1) and food (n = 1)

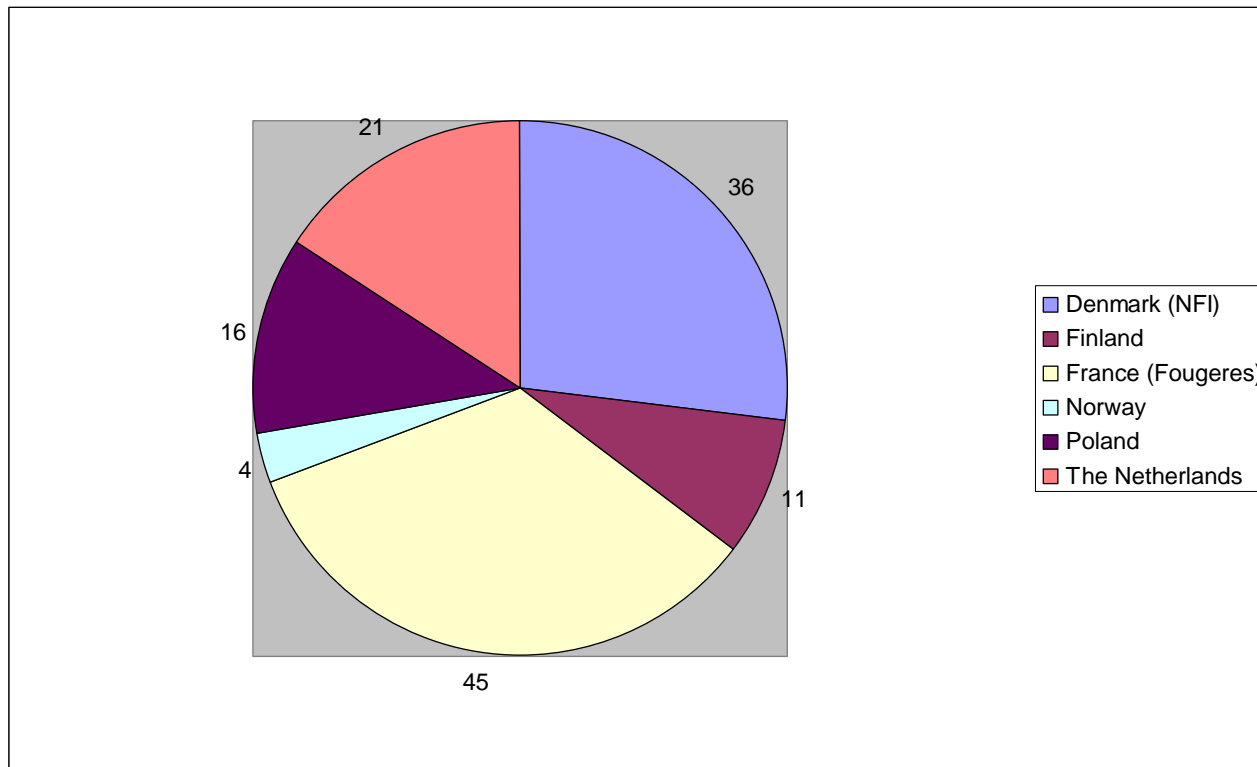
aac(6')-1*b-cr*-positive *Salmonella* isolates (n=3)



aac(6')-1*b-cr* was only detected in combination with *qnr*

PMQR-suspected *E. coli* isolates

- 333 suspected isolates reported
- 133 isolates tested from 6 different countries

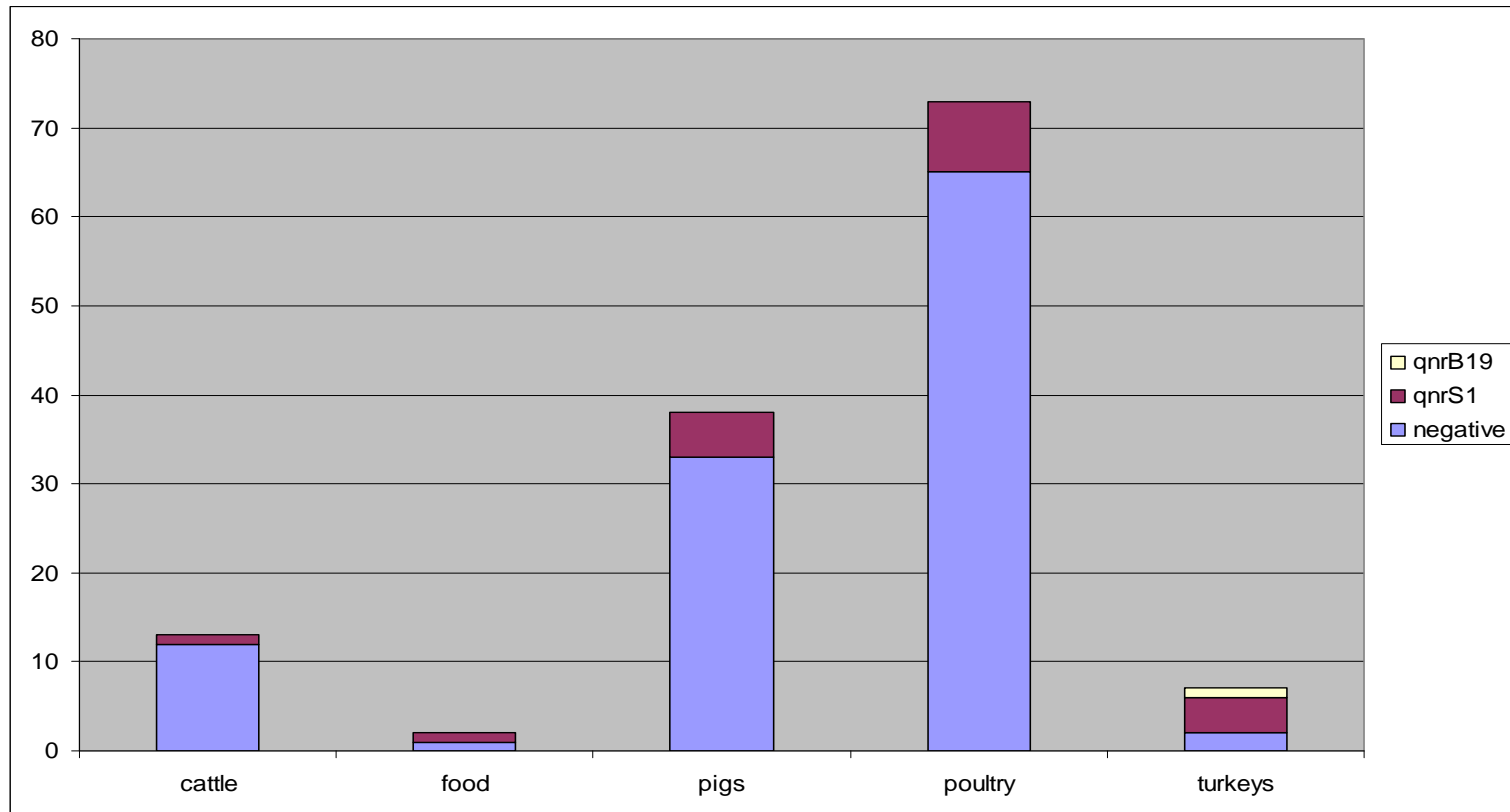


PMQR *E. coli*

- Results
 - 333 PMQR-suspected isolates reported
 - 133 isolates tested with PCR + sequencing
 - 20 isolates PMQR-positive (= 15% of the tested isolates)

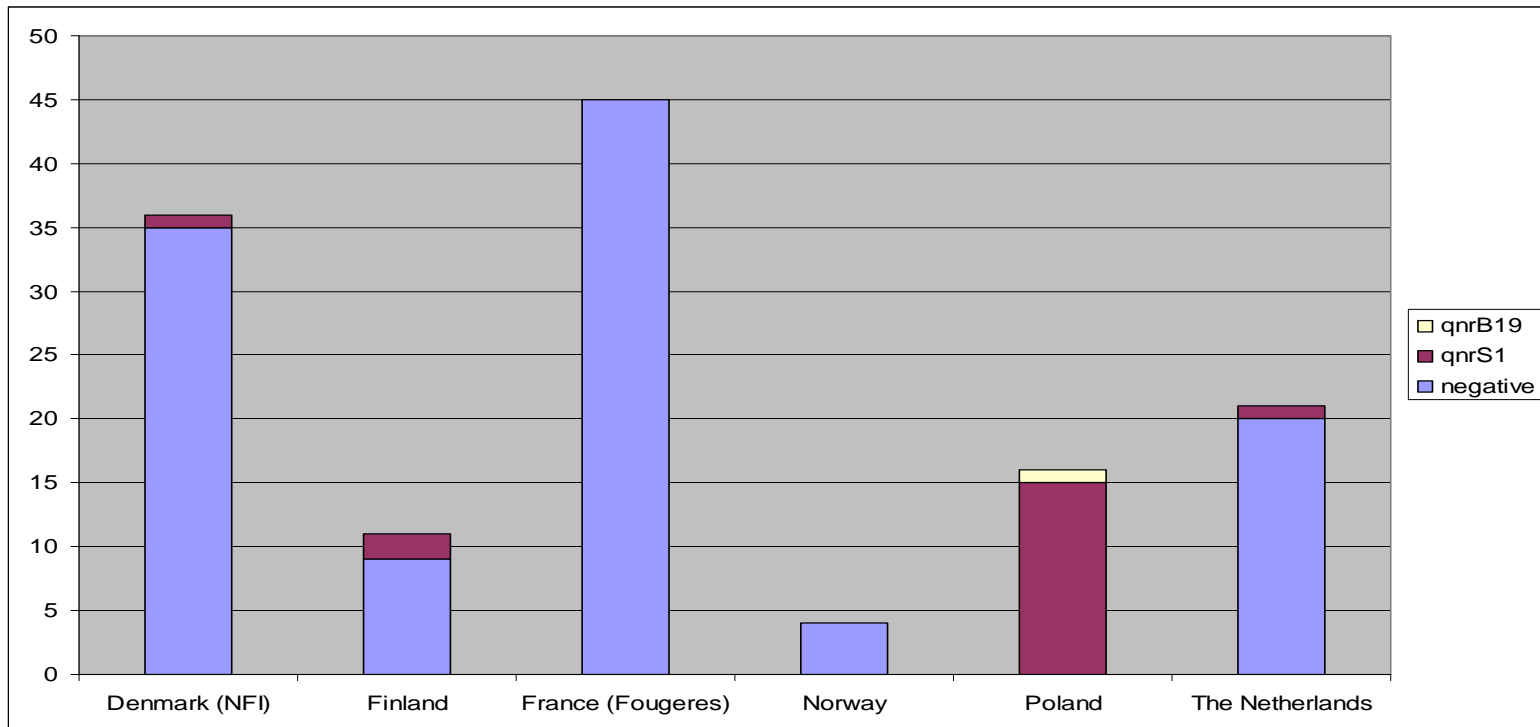


Results PMQR-suspected *E. coli* (n = 133)



Qnr-positive *E. coli* seem to be rare, but were identified from 5 different sources

Results PMQR-suspected *E. coli* (n = 133)



Qnr-positive *E. coli* identified in 4 different countries
High incidence of *qnrS1*-positive *E. coli* (n = 15) from Poland

Prevalence?

- The calculated prevalence of PMQR-positive *Salmonella* isolates is **0.04%** (288/661629)
- The calculated prevalence of PMQR-positive *E. coli* is **0.06%** (20/311132)
- These calculations underestimate the real prevalence, because:
 - Less than half of the PMQR-suspected isolates have been tested
 - *Salmonella*: $485/1215 = 40\%$
 - *E. coli*: $133/333 = 40\%$
 - NAL + CIP resistant isolates have not been tested for the presence of PMQR-genes
- The real prevalence of PMQR is probably higher than calculated, but is difficult to estimate



Summary of the results

- The prevalence of PMQR-genes in *Salmonella* and *E. coli* is low in Europe.
- PMQR-positive *Salmonella* were identified in 11 different European countries and PMQR-positive *E. coli* in 4 different European countries.
- PMQR-genes were identified in different *Salmonella* serotypes of human and animal origin, especially turkey and poultry.
- Variants of *qnrB* and *qnrS1* were predominant.
- *qnrD* was identified in 22 *Salmonella* isolates from 3 different countries.



Future perspectives

- Publication of these results
- Continuation of the collaboration within this area between laboratories in the network
- Further study on *qnrD*-positive isolates
- Plasmid analysis in a collection of isolates?
- Other additional studies?



Thank you for your collaboration!!!



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