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Antibiotic resistance in the Swiss food chain and assessment of the related resistance transfer risk: a systematic review

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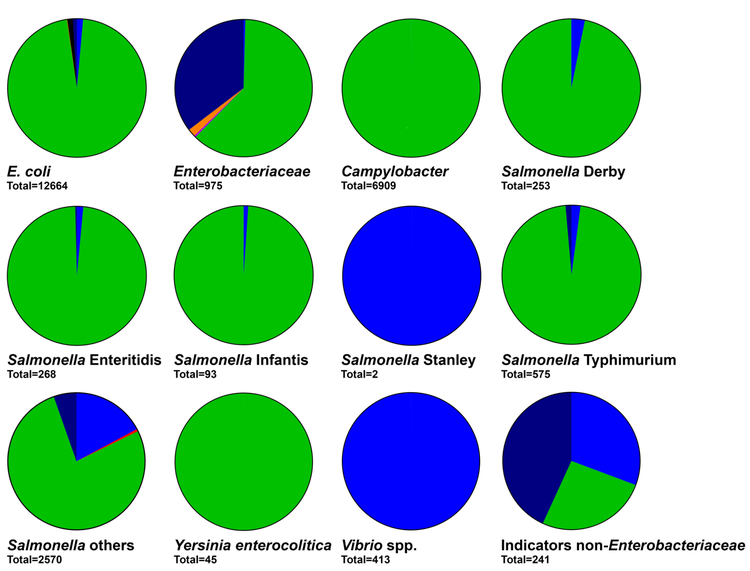
Objective

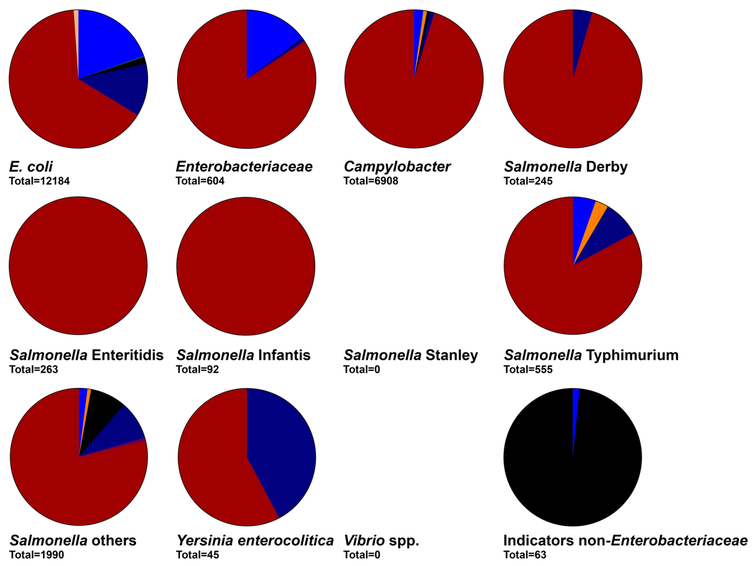
❖ The aim of this study was to evaluate the prevalence of phenotypic and genotypic AMR bacteria (AMRB) in food at retail produced in Switzerland or imported from key trading partners and therefore to estimate the potential exposure of Swiss consumers to AMRB in food.

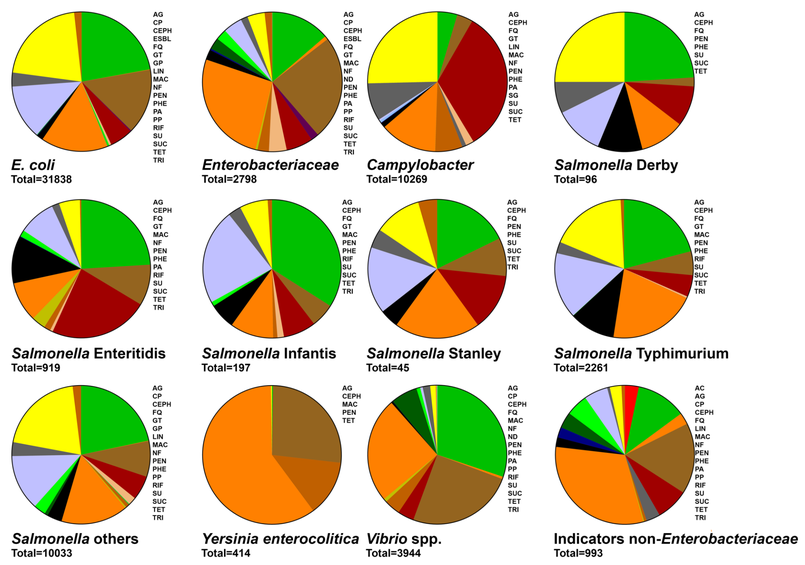
Background

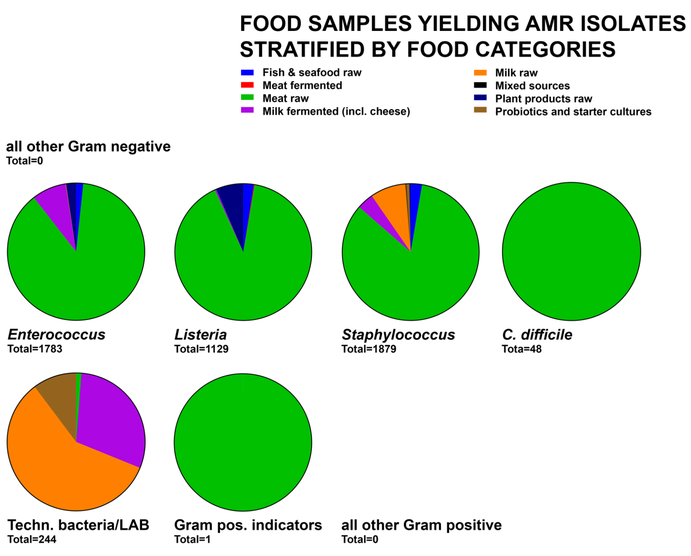
❖ Antimicrobial resistance (AMR) in bacteria is an increasing health concern. The food chain contributes to the transmission of AMRB between animals, environment and humans. The extent of human exposure via food is only poorly understood leaving an important gap for One Health-based mitigation strategies.

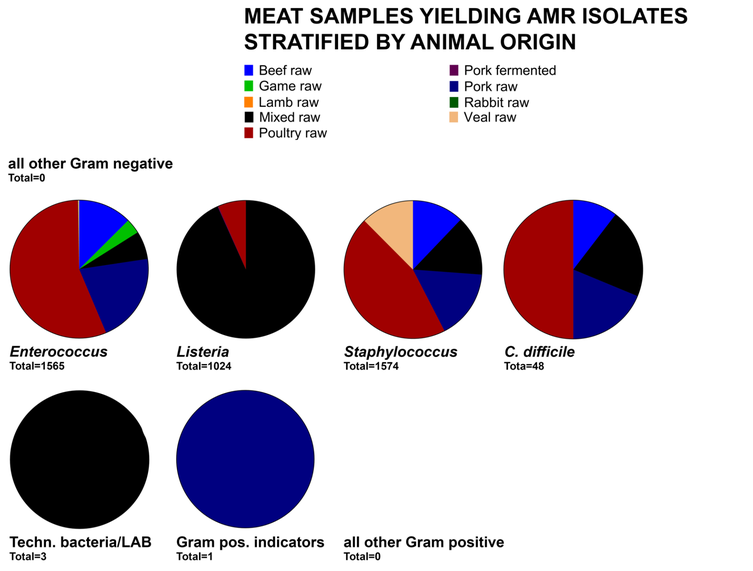
Results

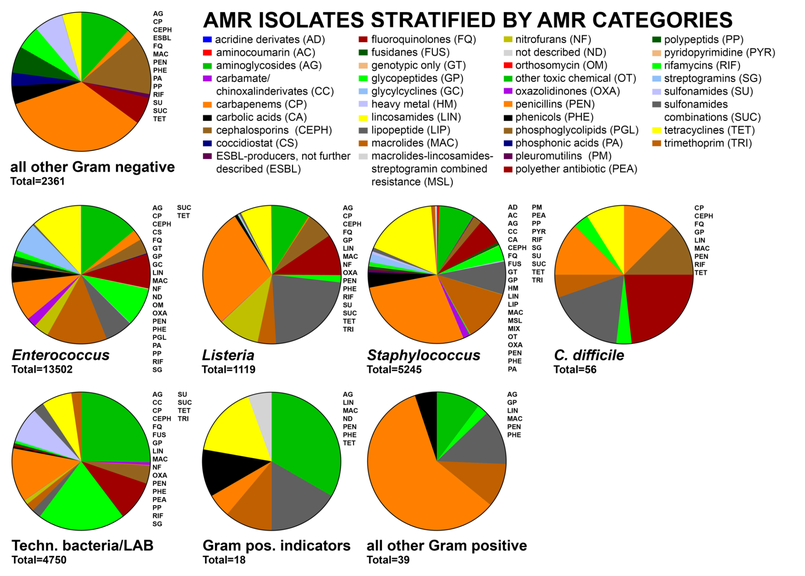












❖ Data from 314 out of 9'473 collected studies were extracted yielding 122'488 food samples and 38'371 bacteria isolates of which 30'092 samples and 8'800 isolates were AMR positive.

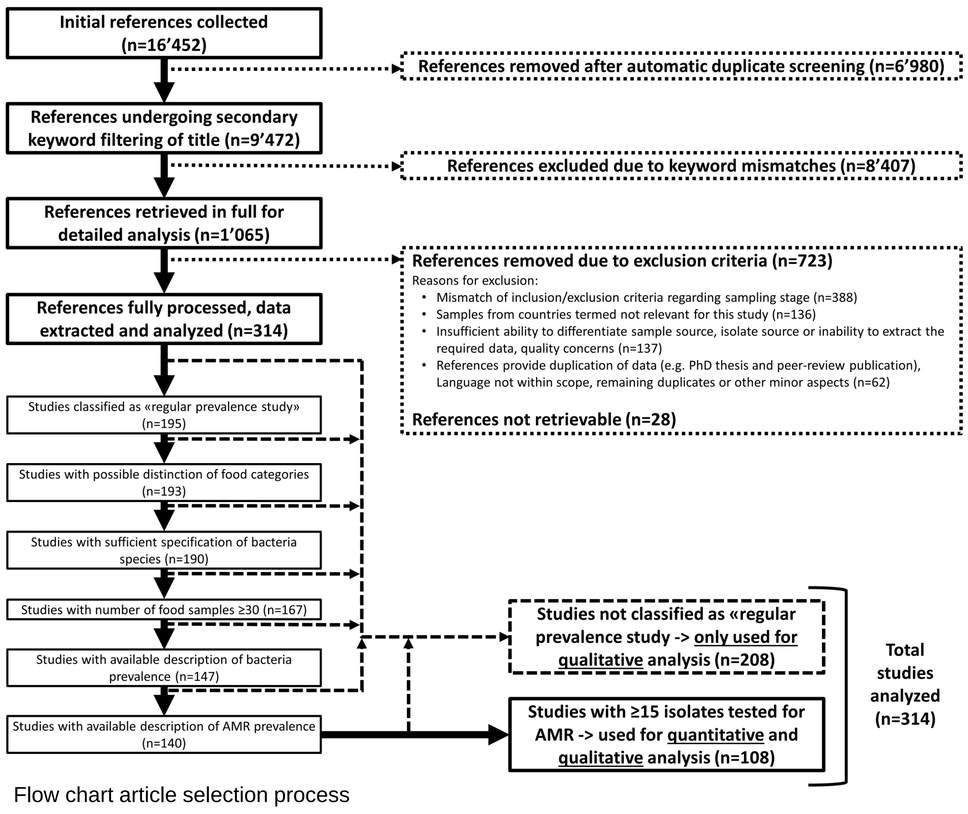
❖ A median AMRB prevalence of >50% was observed for meat and seafood harboring *Campylobacter*, *Enterococcus*, *Salmonella*, *E. coli*, *Listeria* and *Vibrio* spp. and to a lesser degree for milk products harboring technologically important bacteria (e.g. starter cultures). Predominant AMR bacteria prevalence was found in descending order against tetracyclines, penicillins and macrolides.

❖ In combination with Swiss food consumption patterns, AMR exposure scores of levels 1 (medium) and 2 (high) were calculated for *Campylobacter*, *Salmonella*, *E. coli*, *Staphylococcus* and *Enterococcus* in pork, poultry and beef; *Vibrio*, *E. coli* and *Staphylococcus* in seafood; and *Enterococcus* and starter cultures in fermented or processed dairy products.

Materials and Methods

❖ The minimum, median, and the maximum proportion of AMR samples/isolates was calculated across studies and by combination of food category, food item, bacterium species and antimicrobial class. Median AMR prevalence >0.5 was considered as high and a significant risk.

❖ The qualitative exposure assessment consisted in a tree-score combination of food consumption, bacteria prevalence and AMR prevalence, which were then used to calculate the overall AMR prevalence and AMRB exposure score. Each score ranged between 0 and 2, being 2 the highest value.



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Conclusions

❖ High level of human exposure to AMRB via food at retail level was observed.

❖ The potential risk of bias involved with the limited availability of data regarding certain organisms, fermented food products, technologically important bacteria and novel foods highlighted important knowledge gaps.

❖ There is a need to design and enforce phenotypic and genotypic surveillance of AMR in retail food as part of the One Health strategy for AMR surveillance.

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