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Quantitative investigation of ESBL resistance in the Danish pork meat chain with estimation of the full burden of ESBL resistance carried in other bacteria than E. coli

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During 2015 to 2018 Danish the pork chain has been investigated qualitatively and quantitatively for ESBL resistance in E. coli and Enterobacteriaceae. The level of resistance carried by animals into slaughter was measured on caecal content (N=266). The contamination of the carcass at slaughter (N=266) was measured from carcass swabs of 1400 cm^2, and the contaminations at cutting (N= 288) and retail (N=529) were measured from meat cut samples of 100 cm^2 . Extended Spectrum Cephalosporinase (ESC) producing E. coli and Enterobacteriaceae were quantified by direct plating on cefotaxime containing media. In feces, on carcasses , at cutting and at retail the observed prevalence of cefotaxime resistant E. coli was 32%, 2%, 1%, and 1%, respectively. The observed mean log concentrations were 2.3 log cfu/g, 2.4 log cfu/1400 cm^2, -0.4 log cfu/cm^2, and at retail it was below detection limit. To quantify the total bacterial population carrying specific resistances, qPCR was performed using primers specific for *tetA* , *tetB*, for all bla_{CTX} genes, and for *uidA* (E. coli). The regression of qPCR C_T values against E. coli cell counts was used to design standard curves, which enable to link a qPCR C_T value to a corresponding cell count. By this way concentrations of bacteria carrying bla_{CTX}, *tetA* and *tetB* genes were estimated. The total number bacteria carrying *tetA* in pigs (caecum) was estimated to be 30 times the number of *E. coli* carrying *tetA*. For ESBL we estimate that the total number bacteria carrying bla_{CTX} in caecum was 30 times the number of E. coli carrying bla_{CTX}. Maximum likelihood methods and Tobit regressions are used to determine quantitative levels of TET and ESBL resistant E. coli below the detection limit, which enables us to do a comparative assessment of *E. coli* ESBL and of total ESBL carrying bacteria in the meat at retail. To substantiate modelling at retail, the more solid data generated at slaughter is included in the analysis. A perspective of the study is to compare the information obtained from this project against the information acquired in the current surveillance system for antibiotic resistance, and to discuss the potentials for adjusting the current surveillance.