Norwegian patients and retail chicken meat share cephalosporin-resistant Escherichia coli and IncK/blaCMY-2 resistance plasmids

In 2012 and 2014 the Norwegian monitoring programme for antimicrobial resistance in the veterinary and food production sectors (NORM-VET) showed that 124 of a total of 406 samples (31%) of Norwegian retail chicken meat was contaminated with extended-spectrum cephalosporin-resistant Escherichia coli. The aim of this study was to compare selected cephalosporin-resistant E. coli from humans and poultry to determine their genetic relatedness based on whole genome sequencing (WGS). E. coli representing three prevalent cephalosporin-resistant multi-locus sequence types (STs) isolated from poultry (n=17) were selected from the NORM-VET strain collections. All strains carried an IncK plasmid with a blaCMY-2 gene. Clinical E. coli isolates (n=284) with AmpC-mediated resistance were collected at Norwegian microbiology laboratories from 2010 to 2014. PCR screening showed that 29 of the clinical isolates harboured both IncK and blaCMY-2. All IncK/blaCMY-2 positive isolates were analysed by WGS-based bioinformatics tools. Analysis of single nucleotide polymorphisms (SNP) in 2.5 Mbp of shared genome sequences showed close relationship with less than 15 SNP differences between five clinical isolates from urinary tract infections, and the ST38 isolates from poultry. Furthermore, all of the 29 clinical isolates harboured IncK/blaCMY-2 plasmid variants highly similar to the IncK/blaCMY-2 plasmid present in the poultry isolates. Our results provide support for the hypothesis that clonal transfer of cephalosporin-resistant E. coli from chicken meat to humans may occur, and may cause difficult to treat infections. Furthermore, these E. coli can be a source of AmpC resistance plasmids for opportunistic pathogens in the human microbiota.