P1494: Highly conserved *mcr-1*-carrying plasmids but polyclonal spread of colistin-resistant *Escherichia coli* from human patients and livestock products in Germany

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Background and Methods

Colistin is a last-line treatment option of infections with multidrug-resistant Gram-negative pathogens. In 2015, the emergence of the **mobile colistin resistance gene *mcr-1*** in *Escherichia coli* from livestock and humans was reported from Asia. Worldwide, screenings for this resistance trait started to investigate the distribution of *mcr-1*. Aim of this study was to **analyze genomes of 286 colistin-resistant *E. coli*** from Germany and to characterize the *mcr-1* carrying plasmids.

Selected for comparative analyses were **178 colistin-resistant *E. coli* from human patients**, collected from eight medical laboratories between 2010 and 2020. The previously PCR screening identified the presence of *mcr-1* in 62 of these 178 isolates.

Furthermore, **108 *mcr-1* carrying isolates from livestock products** were included for analyses. Altogether, the 286 isolates were subjected for whole genome sequencing (WGS; Illumina).

The *E. coli* phylogeny was analysed by multilocus sequence typing (MLST) and core genome (cg)MLST. The genetic environment of *mcr-1*, as well as **the plasmid content** was identified.

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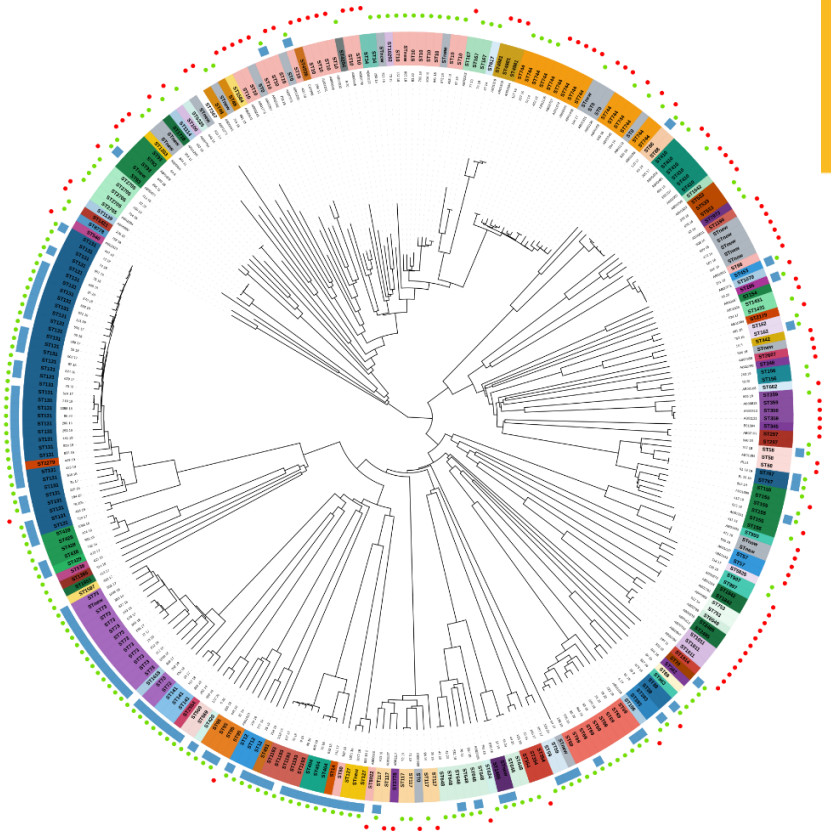
Results

WGS-analyses revealed that *mcr-1* occurred in 192 *E. coli* isolates. MLST/ cgMLST identified 27 different sequence types (STs). Three STs, **ST131**, **ST73** and **ST1193**, represented 52.3% of colistin-resistant *E. coli* from human (●) patients **without *mcr* genes** (■).

The most common STs in *E. coli* from livestock products (●) were **ST10** and **ST744**; generally these isolates showed more genetic diversity. The *E. coli* from livestock products were not closely related to isolates from human patients, and all isolates harboured *mcr-1* genes.

Other resistance genes encoded mainly beta-lactamases (TEM-1), extended-spectrum beta-lactamase (CTX-M). Carbapenemases (NDM-1/-5, OXA-48) were detected only in a few strains from human patients.



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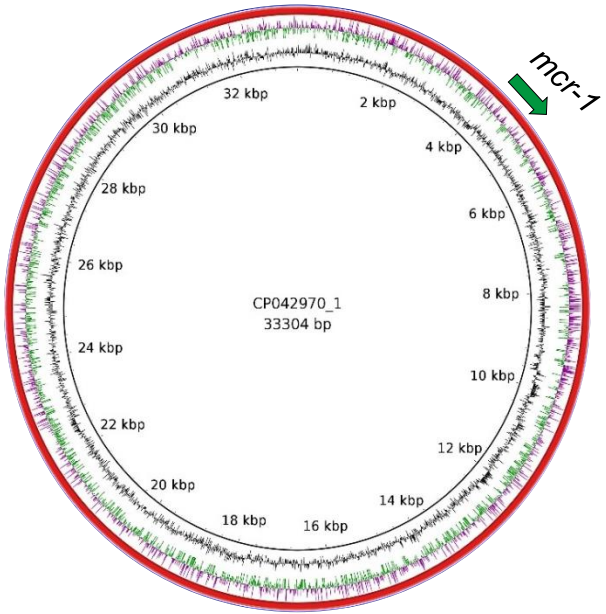
Results

Analysis of the genetic environments in the **192 *mcr*-positive isolates**, revealed the preferred integration of *mcr-1* in an IS*Apl1*-transposon structure in plasmids of various Inc groups.

Further, highly conserved **IncX4 plasmids of ca. 33 kb** size were present in 111 *E. coli* from human patients and livestock. The 33 kb IncX4 plasmid showed high similarity to plasmid CP042970_1.

IS*Apl1*-transposon structure



Conclusion

Our data revealed the presence of *mcr-1* in *E. coli* from human patients. But genomic analysis showed the importance of **potential horizontal transfer between humans and livestock** of colistin resistance gene *mcr-1* mediated mainly by IncX4 plasmids containing conserved IS*Apl1*-transposon structures.

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