

# Genetic properties of extended cephalosporin-resistant *Escherichia coli* in humans and animals

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## Key words

ESBL, Carbapenemase, Enterobacteriaceae, Humans, Animals, Switzerland

## Aim of the study

To determine if a link exists between extended-spectrum cephalosporin-resistant *Enterobacteriaceae* (ESC-R *Ent*) from animal and human origin.

## Material and methods

Determination of minimal inhibitory concentrations of antibiotics; detection of resistance genes using DNA microarrays and sequencing; Analysis of clonality using MLST and rep-PCR; plasmid analysis using PBRT, pMLST and next generation sequencing.

## Results and significance

A first study characterizing ESC-R in human patients revealed the presence of the high-risk *E. coli* clone ST131-carrying CTX-M-15 in Swiss settings (Seiffert et al. 2013. J. Antimicrob. Chemother. 68:2249). The second study revealed a prevalence of 70% ESC-R *Ent* in raw chicken-meat with Swiss meat mainly contaminated with *E. coli* containing *bla*<sub>CTX-M-1</sub> and *bla*<sub>CMY-2</sub>, whereas imported meat contained mainly *E. coli* harbouring *bla*<sub>SHV-12</sub>, *bla*<sub>TEM-52</sub>, and *bla*<sub>CMY-2</sub>. Meat also contains a *bla*<sub>VEB-6</sub>-producing *Proteus mirabilis* strain (Seiffert et al. 2013. Antimicrob. Agents Chemother. 57:6406-6408). The third study showed that 70% of the wet pet food was contaminated with *bla* genes (Seiffert et al. 2014. Antimicrob. Agents Chemother. 58:6320). The fourth study identified a novel *bla*<sub>CMY</sub>-carrying plasmids widespread in *E. coli* from humans, poultry meat, and broilers. The second part of the project unveiled that patients repatriated from foreign hospitals to Switzerland may be colonized with extremely drug-resistant (XDR) *Enterobacteriaceae* producing several carbapenemases including *bla*<sub>OXA-48</sub>, and *bla*<sub>NDM-1</sub> (Seiffert et al. 2014. Antimicrob. Agents Chemother. 58:2446; Seiffert et al. 25<sup>th</sup> ECCMID 2015). This project provides strong evidences confirming active gene and plasmid transfer between the human and animal reservoirs and also revealed that patients transferred from foreign countries may introduce XDR bacteria into Swiss hospitals. Continuous efforts should be made in all medical settings and along the entire meat production either further maintaining or implementing strict hygienic measures to limit the spread of life-threatening multidrug-resistant bacteria.

## Publications, posters and presentations

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