Extended spectrum beta-lactamase-producing *Escherichia coli* from human and animal sources in Italy: a "One Health" approach.

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Introduction. *Escherichia coli* producing extended spectrum beta-lactamase (ESBL) is a serious public health concern. Food-producing animals have been suggested as a potential source for ESBL-producing *E. coli* affecting humans, thus surveillance requires a One Health approach. This study aimed to compare ESBL-producing *E. coli* isolates from humans and food-producing animals with respect to ESBL gene, phylogenetic group and sequence type (ST).
Materials and Methods. Overall, 919 ESBL-producing *E. coli* isolates from humans (n. 474) and food-producing animals (n. 445) were collected in six Italian Regions (2016-2017). Human clinical isolates were collected from urine (n. 375) or blood (n. 99) while indicator isolates from food-producing animals were recovered from the intestinal content or faecal samples of bovines (n. 131) swine (n. 120) and poultry (n. 194). Phenotypically confirmed ESBL-producing *E. coli* isolates were screened for the presence of the *bla*$_{\text{CTX-M-}}$, *bla*$_{\text{SHV-}}$ and *bla*$_{\text{CMY-2-like}}$ genes by PCR and sequencing and classified according to phylogenetic typing and MLST genotyping.
Results. CTX-M was the most frequent ESBL type in both human and animal isolates with CTX-M-15 predominant in humans (74.8%) and bovine (51.1%) but not in poultry (36.6%) and swine (31.7%). CTX-M-1 was common (58%) in swine. SHV type and and CMY-2-like were found mainly in animal isolates, especially in poultry (28.9% for CMY-2-like and 17.0% for SHV12). Human ESBL-producing *E. coli* isolates mostly (76.8%) belonged to phylogroup B2, while animal isolates were distributed among groups A (35.7%), B1 (26.1%) and C (12.4%). Only a few animal isolates (almost all recovered from poultry) were classified into group B2 (4.3%). Most human isolates (81.6%) belonged to the pandemic ST131 clone and frequently carried CTX-M-15 (66.3%). Among animal isolates, ST131 was rarely detected (n. 3 isolates from poultry) and never carried CTX-M-15. Other than ST131 isolates were disseminated among several different STs. Twelve STs were shared by human and animal isolates with ST10, ST410 and ST38 more frequently detected. Of note, ST410 isolates of both human and animal origin shared the same ESBL profiles including either CTX-M-15 or CTX-M-1.

Discussion and Conclusions. Different subgroups of ESBL-producing *E. coli* isolates from both human and animal source may share: i) ESBL genes but carried by different ST clones, ii) ST clones but containing distinct ESBL genes, iii) both ESBL genes and ST clones. According to our results the potential exchange of ESBL genes through plasmids or isolates from animal to humans and vice versa is feasible, underlying the need for a strict monitoring based on an "One Health" approach.