



Characterization of Multidrug-Resistant Biofilm-Producing *Escherichia coli* and *Klebsiella pneumoniae* in Healthy Cattle and Cattle with Diarrhea

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Abstract

This study describes comparative occurrence and characterization of multidrug-resistant (MDR) *Escherichia coli* and *Klebsiella pneumoniae* (KP) in healthy cattle (HC) and cattle with diarrhea (DC) in India. During 2018–2020, 72 MDR isolates, including 35 *E. coli* (DC: 27; HC 8) and 37 *K. pneumoniae* (DC: 34; HC: 3), from 251 rectal swabs (DC: 219; HC: 32) were investigated for extended-spectrum beta-lactamase (ESBL), AmpC type β -lactamase and carbapenemase production, antimicrobial susceptibility profile, biofilm production, and efflux pump activity. Fifty-five MDR isolates were ESBL producers (ESBLPs) (DC: 50; HC: 5) and ESBLPs from DC were coresistant to multiple antibiotics. The *bla*CTX-M gene (50) was the most frequently detected β -lactamases followed by *bla*AmpC (22), *bla*TEM1 (13), *bla*CMY-6 (6), *bla*OXA1 (5), *bla*PER (2), *bla*DHA, and *bla*FOX and *bla*SHV12 (1 each). Plasmid-mediated quinolone resistance determinants *qnrB*, *qnrS*, *qnrA*, and *qepA* were detected in 18, 16, 2, and 3 isolates, respectively. Twenty three isolates revealed mutation in *gyrA* and *parC* genes. Tetracycline-resistance markers *tetA*, *tetB*, *tetC*, and *tetE* were detected in 33, 10, 3, and 2 isolates, respectively. Only one of the 41 imipenem-resistant isolates harbored *bla*NDM-5 and two were colistin-resistant. Altogether, 20 MDR isolates were strong biofilm producers and 19 harbored different virulence factors. This is the first ever report from India on the presence of MDR Enterobacteriaceae with resistance to even last-resort antimicrobials in the bovine diarrhea.