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Detection of Extended-Spectrum β-Lactamase-producing Bacteria in Fish Ponds

Falodun, Olutayo Israel, Iduma, Emmanuel Ikechukwu & Rabiu, Akeem Ganiyu
Department of Microbiology
University of Ibadan
Ibadan, Oyo State, Nigeria
E-mail: falod2013@gmail.com
Phone: +2348027342286

ABSTRACT

The widespread use of antibiotics in animal sector has aggravated the dissemination of Extended-Spectrum β-lactamases (ESBLs) that hydrolyses the β-lactam antibiotics. However, in recent literature, multidrug resistant ESBL-producing Gram-negative bacteria from fish pond water have not been extensively reported. Hence, this study was designed to determine the incidence of ESBL-producing Multi-Drug Resistant (MDR) Gram-negative bacteria from fish pond water in Ibadan. Fish pond water samples (n = 72) were collected from three fish ponds in Ibadan conurbation and analysed for isolation of Gram-negative bacteria using conventional methods. Antimicrobial susceptibility testing was performed using Kirby-Bauer disc diffusion. Phenotypic detection of ESBL was carried out using double disc synergy test while the ESBL genes (blaSHV, blaCTX-M and blaTEM) were identified by Polymerase Chain Reaction (PCR). The multi-drug resistant/ESBL-positive isolates were identified using 16S rRNA sequencing. A total of 82 bacteria isolates that comprised of 52 (63.4%) Pseudomonas species, 24 (29.3%) Plesiomonas species and 6 (7.3%) Morganella species were obtained from the fish pond. Forty-four (84.6%) Pseudomonas spp., 22 (91.7%) Plesiomonas spp. and 6 (100%) Morganella spp. resisted ceftazidime while 24 (46.2%) Pseudomonas spp., 11 (45.8%) Plesiomonas spp. and 4 (66.7%) Morganella spp. were resistant to trimethoprim/sulfamethoxazole. Pseudomonas spp. (n = 3), Morganella spp. (n = 1) and Plesiomonas spp. were multi-drug resistant. Out of the five isolates that were MDR, only Morganella spp. (n = 1) harboured the blaSHV and blaCTX-M ESBL genes. The detection of multi-drug resistant and extended spectrum β-lactamase Gram-negative bacteria from fish pond water showed that the aquacultural settings could constitute threat to public health.

Keywords: Extended-Spectrum β-Lactamases, Antimicrobial Resistance, Enterobacteriaceae, Fish ponds