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AQUACULTURES AS RESERVOIRS OF PLASMID–MEDIATED QUINOLONE RESISTANCE GENES

Patricia Antunes¹,²; Joana Campos¹; Joana Mourão¹; Joana Pereira²; Carla Novais¹; Luisa Peixe¹

¹REQUIMTE, Laboratório de Microbiologia, Faculdade de Farmácia, Universidade do Porto, Portugal
²Faculdade de Ciências da Nutrição e Alimentação, Universidade do Porto, Portugal

Quinolones are critical antibiotics (AB) for the treatment of human infections. Plasmid–mediated quinolone resistance genes (PMQR) were described in aquatic settings but the input of aquacultures for their spread in nature remains scarce. We aimed to study the contribution of trout farms to the spread of bacteria carrying PMQR genes to aquatic environments downstream of the production systems.

Samples were collected from water/sediments upstream (n=13) and downstream (n=13) of farms, water/sediments from juvenile/adult fish ponds (n=15) and feed (n=6) from 2 Portuguese trout aquacultures (TR–A/TR–B: winter/summer: 2010–2012). They were plated in MacConkey with ciprofloxacin and Aeromonas Agar after enrichment. Genes coding resistance to fluoroquinolones [qnr, qepA, aac(6’)-lb-cr, oqxAB] and other AB were searched by PCR/sequencing. AB resistance was studied by agar diffusion/Etest (CLSI/EUCAST). Species were identified by ID32GN/16SrDNA sequencing. Clonality (MLST: Escherichia coli), characterization of plasmid (PL) and integrin backbones (PCR, rep–PCR and/or sequencing), conjugation assays and genomic location (I–Ceul/S1 PFGE hybridization) were done.

PMQR genes were found in 9% (n=14/160) of the isolates: Aeromonas spp (3: upstream/downstream river water/adult ponds water/TR–A), E. coli (6: ST423–CC23, ST641, ST661, ST1049, ST2739: upstream/downstream river water/TR–A, juvenile/adult ponds water or sediment/TR–B), Klebsiella spp (2: downstream river sediment/TR–A, feed/TR–B) and Citrobacter freundii complex (3: sediment from adult pond/TR output/TR–B: feed/TR–A) with MIC to ciprofloxacin (0.19–1 mg/L) above ECOFF for Enterobacteriaceae. The qnrS1 was found in an untappable (UN) PL of E.coli (2): qnrS2 in UN PL of Aeromonas: qnrS3 in PL (2 UN/1 IncN) of E.coli and in an IncN PL of a C. freundii complex. The oqxAB in IncN–F hybrid or UN PL of 2 MDR Klebsiella spp and aac(6’)-lb-cr in IncU PL in Aeromonas. Different qnrB alleles, including a new variant, were chromosome located in E. coli (1), Klebsiella spp (1) and C. freundii complex (1). Transferable PL were found only in E. coli carrying qnrS1 (2) or qnrS3 (2). Most strains carried other AB resistance genes, class 1 integrons and/or IS26.

The detection of different PMQR genes in different species and samples in both TR strongly suggests that this ecological niche might constitute a reservoir/vehicle for antibiotic resistance genes of relevance for human and animal health.