

# **Evaluation of the Ecological Risk and the Development of Antimicrobial Resistance due to the Presence of the Macrolide Antibiotics Azithromycin and Clarithromycin in Romanian Aquatic Environment**

## **Abstract**

The presence of antibiotics in the aquatic environment can result in the emergence of antibiotic-resistant pathogens. In this paper, our aim was to identify, quantify and distribute macrolide antibiotics in the aquatic environment in the river basins of Arges-Vedea, Buzau-lalomita and Dobrogea-Litoral and of the Danube River. In the Arges-Vedea river basin area, clarithromycin was detected most frequently, i.e. 58.62%, in the Buzau-lalomita river basin area with a frequency of 92.31% azithromycin was detected, and in the Dobrogea - Litoral river basin area clarithromycin was detected with a frequency of 35.48%. The highest concentration of azithromycin, 559 ng/L and of clarithromycin, 502 ng/L was recorded in the Buzau-lalomita river basin. The ecotoxicological RQecotox risk was also estimated, as well as the risk of developing antibiotic resistance of RQAMR pathogens, by the ratio of Measured Environmental Concentration (MEC) and Predicted No Effect Concentrations (PNEC). The study also aimed to investigate the prevalence of antibiotic resistance in potentially pathogenic bacteria isolated from aquatic environments. Thus, for  $\beta$ -lactam antibiotics, *E. coli* strains isolated from the Danube River exhibited a very high level of resistance to ampicillin (51%) and high level to azithromycin (43%), cefazolin (38%), amoxicillin+clavulanic acid (36%) and cefoxitin (26%). Low and respectively, low level resistance was noticed for aztreonam (6%) and imipenem (4%).

## **Keywords**

Antibiotic Resistance Bacteria (AMR); Aquatic Ecosystems Environmental Risk Assessment; Macrolide Antibiotics