

PRESENCE OF MULTIDRUG-RESISTANT ORGANISMS IN AQUATIC ENVIRONMENT: WHAT IS ITS IMPLICATION ON HUMAN HEALTH?

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Antimicrobials are used in not only health care facilities but also households. Some antimicrobials are excreted as unmetabolized products, contaminating the aquatic environment through sewage. For instance, 87% of the administered dose of levofloxacin (LVFX) was excreted unchanged in the urine within 48 hours [1]. Consequently, these excreted antimicrobials might have contributed to the emergence of multidrug-resistant organisms (MDROs) in the aquatic environment. Objective: This study aims to show the status of MDRO emergence in aquatic environment in Japan and discuss its implication. In 2009, depending on the location of water-treatment plants, 10 water samples were collected from Tama River (length: 138 km) in Tokyo. A total of 120 colonies of gram-negative bacilli were isolated. Bacterial species were identified and antimicrobial susceptibility tests (16 antimicrobials) were performed. The outcome measures were (1) percentage of drug-resistant strains among the isolated bacteria; (2) critical MDROs such as those resistant to imipenem (IPM) and quinolones or IPM and cephalosporins; and (3) antimicrobial concentration at sample collection sites. The antimicrobial concentration was less than the detection limit, except for amoxicillin and sulfamethoxazole-trimethoprim. Of the 120 isolates, 106 were resistant to at least 3 antimicrobials, including the undetectable ones. Of the 25 strains resistant to IPM, 6 were also resistant to ciprofloxacin/LVFX, 17 were resistant to at least 1 of the tested cephalosporins (cefazolin, ceftriaxone, cefuroxime, and cefotaxime), and 2 were resistant to all. The isolated bacteria showed resistance to antimicrobials whose concentrations were undetectable by LC-MS. Human health is threatened by MDROs. Primary exposure to MDROs might be recreational activity in an aquatic environment, and these MDROs possibly circulate in the community via infected people. Our results suggest the need to develop a monitoring system for MDROs in aquatic environment. Although the primary problem is ‘the excreted antimicrobials’; technically, it may not be wise to monitor the antimicrobial concentration. Funding Source(s): Japan Society for the Promotion of Science

[1] Koshikawa H et al., J. of Japan Society on Water Env. 2008; 31 (11): 651657.

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