

Antibiotic Resistance in Aquatic Systems: From Urban Runoff to Resistant Microbes

Suhartono

Department of Biology, Faculty of Mathematics and Natural Sciences,
Universitas Syiah Kuala

Email: suhartono@usk.ac.id

Abstract. Antibiotic resistance in water, especially the rivers of Banda Aceh in Indonesia, is an urgent environmental and public health issue. It is fuelled by multi-step mechanisms of interaction between anthropogenic, environmental and microbial ecology, where antibiotic-resistant bacteria (ARB) and antibiotic resistance genes (ARGs) spread through multiple pathways. These include hospital effluent, farm effluent and fisheries. Such resistance can be mediated by horizontal gene transfer (HGT) and mobile genetic elements, which allow resistance genes to move among bacterial species in these aquatic habitats. Combined with selective pressure from low-concentration antibiotics, the rich microbiome present in these bodies of water provides an ideal platform for resistance to evolve and propagate. In aquatic environments, including in Banda Aceh and its surrounding areas, the intersection of agricultural practices, urban discharge and microbial life are key players in this worrying trend, which highlights the need for better wastewater treatment and comprehensive monitoring programs to curb this growing public health challenges.