Antibiotic resistance determinants: an emerging pollutant in the environment

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The occurrence and spread of antibiotic-resistant bacteria is a public health problem globally, and aquatic environments are recognized as reservoir for antibiotic-resistant bacteria associated with antibiotic resistance genes. Antibiotic resistance hotspots are found not only in medical settings but also in environmental compartments that are subjected to anthropogenic pressure, such as municipal wastewater systems, pharmaceutical manufacturing effluents, aquaculture and animal husbandry facilities. The global spread of antibiotic resistance genes and their acquisition by clinically relevant bacteria is associated with the increased environmental pollution, which constitutes a serious challenge for health and welfare of humans. The effect of antibiotic resistance genes and antibiotic-resistant bacteria that are released from anthropogenic activities is currently considered to be a serious environmental problem.

The increasing spread of antibiotic resistance genes among environmental bacteria has led some scientist and researchers to consider antibiotic resistant bacteria and antibiotic resistance genes as emerging pollutants in the environment. These entities have an unusual characteristics and uniqueness when compared to other contaminants; their ability to amplify and spread, persisting in the environment. Antibiotic resistance is a threat to human and animal health worldwide, and key measures are required to reduce the risks posed by antibiotic resistance genes that occur in the environment.

However, antibiotic resistance is not just a medical or clinical issue but also an ecological matter. To understand the process by which resistance disseminate, it is essential to consider not only hospital sources, but also the ecology and evolution of resistant bacteria. This chapter will review antibiotics resistance genes and antibiotic resistant bacteria dissemination in aquatic environments, with special interest on pollution, and how it affects the ecosystems and their interactions with environmental and pathogenic bacteria, and finally to discuss the prospects to mitigate the dissemination of antibiotic resistance among environmental bacteria.

Keywords Antibiotics; Environment; Risk assessment; Transmission; Public health

References