Tracking the Priority Pathogens from Hospital to Natural Environment

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Abstract

Hospital outbreaks caused by multidrug- and even pandrug-resistant bacteria represent a challenge to clinical bacteriologists worldwide. The World Health Organization stressed the carbapenem-resistant (CR) *Acinetobacter baumannii* and *Enterobacterales* as priority human pathogens. An overview of the presence of CR bacteria possessing acquired resistance in the clinics and natural environment in Croatia will be presented.

CR clinical isolates of *A. baumannii* are dominated by the international clonal lineage IC2, and a minority belong to IC1. The same ICs were found in untreated sewage from hospitals, nursing homes, urban sewage, wastewater treatment plant including the effluent, and rivers as natural recipients of treated (or untreated) wastewater. CR *K. pneumoniae* accounts for 28% of clinical isolates in Croatia. Isolates of the same phenotypic resistance were recovered from river water and sediment. Clinically relevant CR bacteria disseminate via the human waste into the natural environment.

Proof of concept was checked at a field investigation. CR *A. baumannii* and *K. pneumoniae* were recovered from the river downstream discharge of untreated hospital wastewater, but not at the wellspring and upstream hospital. Moreover, these pathogens were retrieved after the discharge of effluent from the urban wastewater treatment plant but not upstream of the city of Zagreb.

Clinically relevant CR bacteria in the environment represent the source of human colonization, which can result in community-acquired and, consequently, nosocomial infections. Disinfection of wastewater should be obligatory to avoid the further enrichment of the environment with CR bacteria.

Keywords

Acinetobacter baumannii, antibiotic resistance, *Klebsiella pneumoniae*, waste; water.