

Determining Bacterial Antibiotic Resistance and Heavy Metal Tolerance in Clinical and Environmental Settings: Local Action of Global Importance

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The antibiotics, which are still the gold standard therapeutics against a large number of bacterial infections, and the heavy metals, which are in use in various anthropogenic activities, remain the two universal categories of environmental pollutants, and are unsafe to public health and biological safety [1]. As such, the use, misuse and overuse of antibiotics leads to the emergence and spread of multidrug resistant organisms (MDROs) [2], in different environmental settings, such as the water bodies, including sewages that act as mixing vessels for effluents from hospitals, agricultural field and domestic activities, on one side. The metal ions, on the other side, aid in the process of global emergence of MDROs in environmental and clinical settings too, thus sustaining the heavy metal tolerance in association with co-selection of bacterial antibiotic resistance [3,4].

The bacterial antibiotic resistances in the current clinical settings developed a great hindrance threatening the efficacies of almost all available antibiotics, amongst mainly the gram-negative pathogens: the ESKAPE as well the top listed WHO priority pathogens, such as *Escherichia coli*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*, and the gram-positive: *Staphylococcus aureus*, members also [5-8]. Moreover, the aquatic bacteria [9-11], constituted the potential human pathogens, as well as the 'ESKAPE' (*Enterococcus faecalis*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, *Escherichia coli*) pathogens, which represent a severe threat of emerging inoperable MDROs infections to humans.

Acquaintance with the local status of antibiotic resistance among potential pathogenic bacteria, in different settings is thus, crucial in combating bacterial antibiotic resistances. As the studies suggest, the bacterial MAR (multiple antibiotic resistance) indices might be of help in identifying the source of fecal contamination as well as to categorize the health risk contaminated niches, the clinical bacteria as well as the environmentally isolated bacteria of clinical relevance might be used as important tools in detecting and monitoring antibiotic (and heavy metal) pollution in given niches [11-13]. Moreover, the studies demonstrated the occurrence of plasmid, encoding multiple antibiotic and heavy metal co-resistances, among gram-negative bacteria from river and sewage, which potentially act as the source of dissemination of pathogenic bacteria and the bacterial antibiotic resistances [9-11,14], impacting the environmental as well as human health in this part of the globe, requiring public awareness on the issues of misuse and/or overuse of antibiotics, in our part of the globe. Such findings, therefore, suggest for a prioritizing research on antibiotic resistances among bacteria, mainly the 'ESKAPE' group of pathogens, for incessant public health scrutinizing activities in clinical and community settings, and among environmental bacteria as well, in order to tackle the emergence of multiple antibiotic resistant pathogenic bacteria, locally as well as globally.

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