

Application of bacteriophage cocktails for reducing the bacterial load of nosocomial pathogens in hospital wastewater

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ABSTRACT

Background and Objectives: In the third world and developing countries, hospital sewage is mixed with municipal wastewater. The treated effluent contains dangerous bacteria released into the environment and used in the irrigation of agricultural products, and eventually these bacteria may endanger the human health through foods. Antibiotic-resistant bacteria are mostly found in hospital wastewater. In water and wastewater treatment plants, large amounts of toxic and polluting substances are removed and destroyed, but this process does not eliminate bacteria.

Materials and Methods: Wastewater samples from 22 hospitals in Iran were collected and in the meantime specific phages (against drug-resistant pathogenic bacteria) extracted using the bilayer agar technique. Phage amplification was performed by employing a fermenter after phage identification. Amplified phages were added to the primary sedimentation pond using New-Brunswick biofermenter BioFlo/Celligen®115 and the bacterial count was evaluated for the desired bacteria.

Results: Our phage cocktail was able to reduce 99.8%, 99.4%, 99.5%, 99.8%, 99.7%, 99.8%, 99.6% and 99.9% of *E. coli*, *E. faecium*, *E. faecalis*, *K. pneumoniae*, *A. baumannii*, *P. aeruginosa*, *S. maltophilia* and *S. aureus* counts respectively.

Conclusion: The application of phage cocktails can remarkably help improve personal hygiene, the environment, and the optimization of surface water.

Keywords: Wastewater; Ponds; Bacteriophages; Environmental pollution; Drug resistance

INTRODUCTION

Industrial residual, urban, hospital, and agricultural waste are called wastewater. The composition of wastewater varies widely depending on its source, but often is formed from water, microorganisms such as bacteria, viruses, prions, parasites, organic particles such as feces, hair, and food as well as mineral particles, large solids, pesticide, chemicals,

etc (1). About 90% of the world's wastewater remains untreated, causing widespread surface and groundwater pollution, especially in low-income countries. The use of untreated wastewater, often contaminated with hospital wastewater, to irrigate agricultural lands is increasing while no alternative exists for farmers. Usually, hospital sewage contains pharmaceuticals, metabolites, biomolecules, anions, cations, radioactive isotopes, heavy metals, antibiotics, bac-

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