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BACTERIAL POPULATION – INTERFACE BETWEEN HOSPITALS, WWTPs AND AQUATIC ECOSYSTEMS

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Introduction

Wastewater treatment plants (WWTPs) are an important interface between rural, urban and clinical activities and the natural environment. Unfortunately, there is a major issue of the survival and transmission of the fecal bacteria from WWTPs into the natural emissaries and subsequently their dissemination over a large areal.

An important source of water contamination with microorganisms causing digestive infections is represented by domestic and clinical wastewater discharged into natural emissions.

In addition to the amounts of organic matter and nutrients, the microbiological inadequately treated WWTPs effluent could be continuously discharged the environment, negatively influencing the surrounding environment as well as a human health.

Overall, the hospitals have been major hot spots of pathogenic bacteria and thus facilitate their spread via treated WWTPs effluents, which have become a significant source of pathogenic bacteria released into downstream environment. In addition, hospital effluent with its multidrug resistant bacteria load, including the enteric pathogens, could pose a major problem to the community. The main goal of this paper was to shown the impact of WWTPs on fecal populations' bacteria and their spreading into the aquatic ecosystems.

Materials and methods

The wastewater sampling campaigns were trimestral collected during the year of 2019 from hospitals and WWTPs belonging to three cities from Romania (Iasi, Galati and Bucharest). At the same time, upstream and downstream surface water from WWTPs emissaries (Bahlui, Siret and Dambovita) were also collected. The quantitative and qualitative microbiological analyses were performed using Colilert-18 (IDEXX) for fecal densities (CFU/100 mL) and Omnilog systems (Biolog, USA) for bacterial species identifications.

Results and conclusions

The hospital bacterial contamination showed to be significant in terms of coliform bacterial, which induced high values of total and faecal coliforms in WWTP influents

(figure 1). It can be also observed that out of total coliform bacteria a proportion up to 50% was represented by faecal coliforms (figure 1).

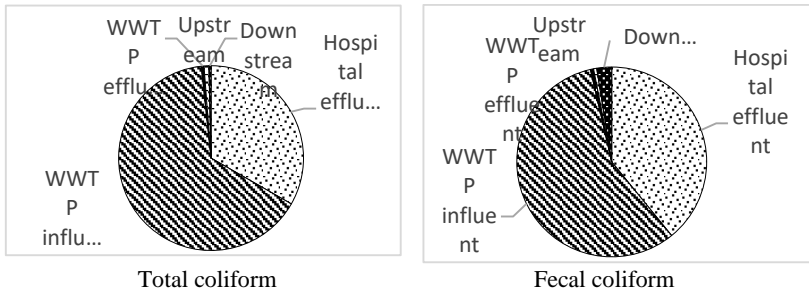


Figure 1. Quantitative results of total coliforms and fecal coliforms (CFU/ 100 mL) from wastewater and surface water samples

The assays were performed in triplicate tests.

Comparing the coliforms densities between total and fecal coliforms in downstream and upstream, it could be observed a dynamic of fecal population such that the fecal coliforms recorded a higher value in downstream (figure 2).

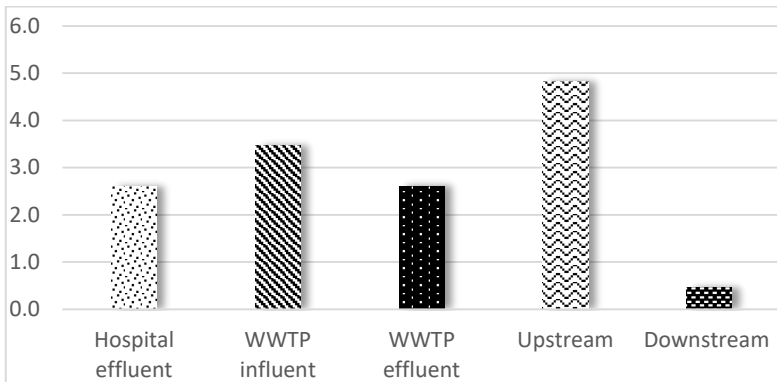


Figure 2. Influence of microbial populations structures by the rapport between total and fecal coliform densities

There were observed the contribution of anthropogenic activities by increasing the density of fecal bacteria in the emissaries.

Hospital effluent presented closely values of bacterial density with the WWTP influent values proving the fact that microbiological reduction was nonselective without reducing the fecal group.