Treatment of hospital wastewater of Marrakesh (Morocco) with actinomycetes to eliminate multi-resistant bacteria

W. Korichi[1, 2, 3],M. Ibrahimi[1, 2, 3], T. Bourdin[3], Y. Ouhdouch[1], S. Loqman[2], L. Lemee[3]

[1]Laboratory of Biology and Biotechnology of Microorganisms, Faculty of Sciences Semlalia, Cadi Ayyad University, PO Box 2390, Marrakesh, Morocco

[2]Laboratory of Microbiology and Virology, Faculty of Medicine and Pharmacy, Cadi Ayyad University, PO Box 7010, Marrakesh, Morocco

[3]Institut de Chimie des Milieux et Matériaux de Poitiers (IC2MP - CNRS UMR 7285), Université de Poitiers, 4 rue Michel Brunet – TSA 51106, 86073 Poitiers Cedex 9, France

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Corresponding author: laurent.lemee@univ-poitiers.fr

Untreated wastewater is one of the major sources of pollution in Morocco; those of hospitals represent a potential source of microbiological pollution. Microbial agents of special concern are multidrug-resistant microbial strains. The latter are suspected to contribute to the spread of antibiotic resistance. Moreover, wastewater treatment plants which have not been designed to specifically eliminate multi-resistant bacteria (MRB) can generate sewage sludge that contains pathogen bacteria. The main valorization pathway for this sludge being land farming, the presence of MRB is an important issue.

Given this worrying situation, it is necessary to find a management and treatment solution to eliminate multidrug-resistant bacteria from hospital effluents. Actinomycetes from marine inhabitats are being used to produce most of the current natural antibiotics. Our aim is to develop a new means of biological control against these MRB through antagonist actinobacteria.

The purpose of this study was to observe the impact of the treatment of effluents from the Marrakesh hospital through the evolution of MRB during their interaction with antagonist actinobacteria. In this aim, microbial molecular biomarkers such as fatty acid methyl or aromatics were identified and monitored using thermochemolysis coupled with gas chromatography and mass spectrometry (Py-GCMS).

The molecular fingerprints of 6 Strains of MRB and 4 strains of actinomycetes were determined using Py-GCMS showing different fatty acids (observed as methyl esters) and aromatics profiles. Steroids were only observed in effluents whereas aromatic compounds which are more abundant in multidrug-resistant bacteria than in actinobacteria decreased during the treatment. Fatty acids characteristic of bacteria such as C12, C18:1, decreased during the treatment, while fatty acids characteristic of actinomycetes such as iC15, iC17 increased.This study demonstrated the potentiality of thermochemolysis to identify micro-organisms in organic waste and to monitor their fate amongst a treatment process.

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