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From the hospital effluent to the municipal wastewater treatment plant: bacterial communities and antibiotic resistance

A.R. Varela¹, C.M. Manaia¹, O.C. Nunes²

¹Escola Superior de Biotecnologia - Universidade Católica Portuguesa, Porto, Portugal

²LEPAE-Dep. Engenharia Química, Faculdade de Engenharia, Universidade do Porto, Porto, Portugal

Given the intensive use of antibiotics, hospital effluents, which often do not have any dedicated treatment and are discharged into the municipal collectors, are suspected to contribute to the dissemination of AR bacteria into the environment. In spite of this suspect, studies on the fate of AR bacteria from the hospital effluents to the receiving sewage treatment plants and the environment are scant. The main objective of this work was to assess the impact of the bacterial load from a raw Hospital effluent in the municipal wastewater treatment plant (WWTP) into which it is discharged.

Antibiotic resistance was assessed through successive sampling campaigns of raw hospital effluent and raw and treated wastewater of the municipal wastewater treatment plant to which the hospital effluent is directed. The presence of antibiotics and heavy metals in the samples was determined in the different samples. The microbiological analyses comprised the enumeration of total heterotrophs, enterobacteria and aeromonads on different culture supplemented or not with amoxicillin or ciprofloxacin (1).

Furthermore, the influence of the hospital effluents on the bacterial communities of the WWTP was investigated using 16S rRNA PCR DGGE. Cell counts and amoxicillin resistance rates were similar between the hospital discharge and the point of inflow to the WWTP. In contrast, ciprofloxacin resistance was detected to be about three times higher in the hospital effluent than in the raw municipal wastewater. The hospital discharge seems to have a significant impact on the levels of ciprofloxacin resistance that enter the WWTP. The treated effluent displayed a reduced cell density of about 100-1000 times for both total and AR bacteria. However, the treatment did not cause significant variations on the rates of amoxicillin and ciprofloxacin resistance. This study confirms hospital discharge as a significant source of AR into the environment. The variation in bacterial communities in the hospital effluent and in the WWTP raw and treated effluent is analyzed.

1. Novo, A and Manaia, CM, (2010), Factors influencing antibiotic resistance burden in municipal wastewater treatment plants, *Applied Microbiology and Biotechnology*, 87:1157 - 1166. <br type='moz' />