

162 Characterization of the virulence and the antibiotic susceptibility profiles in bacteria isolated from wastewater treatment final effluents

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The increased prevalence of antibiotic resistance is one of the main problems faced by health professionals nowadays, consequently dealing with the expansion of nosocomial infections in hospitals and other health institutions. Wastewater Treatment Plants (WWTP) aim at the treatment of residual waters ensuring the preservation of the environment and ultimately, human health. Nevertheless, they also receive residual water from health institutions and research centres that can significantly contribute to the presence of pathogenic and resistant microorganisms in the sewage. The aim of this study was the isolation of potential pathogenic bacteria (*E.coli*, *S.aureus*, *S.enterica*, *P.aeruginosa* and *K.pneumoniae*) from the final effluent of four WWTP in the north of Portugal to subsequently evaluate some known virulence factors, such as their ability as biofilm formers and their susceptibility to different antibiotics. The amount of *E. coli* surpassed all the other species and *S.aureus* was the less frequent, considering all samples. The ability of biofilm formation depended on the species considered, but also on the sampled WWTP. For instance, *S. enteritidis* and *E.coli* showed low capacity to form biofilm, but they appeared with high CFU values. *S. aureus* showed a high capacity of biofilm formation but only a small number of CFU was counted. These data seem to indicate that *S. aureus* biofilms contain a huge amount of polymeric matrix, which could be an obstacle to antibiotic action. In one of the WWTP, most isolated bacteria revealed the lowest capacity to form biofilms, but they clearly had the highest antibiotic resistance profiles. In one of the WWTP, biofilm formation was greater for all isolates; indeed, it was the only WWTP where all isolated bacteria were capable to produce biofilm which was rated as moderately to strongly adherent, but showed, on the other hand, significant sensitivity to the tested antibiotics. For example, *P. aeruginosa* isolated in this WWTP revealed a significant ability to develop biofilm but presented the profiles of highest antibiotic susceptibility.

Similar tendencies for *S. enteritidis* and *K. pneumoniae* in other WWTP were obtained. Interestingly, it can be concluded that some species showed particular responses independently from the sampling plant, but others depended on the WWTP where the sample was collected. The data obtained also highlight that procedures used for waste water treatment are not effective in the removal of pathogenic bacteria, which appear in the final effluents and are subsequently discharged into a natural water body.

Keywords: wastewater treatment, environmental bacterial isolates, antibiotic resistance, biofilm formation, virulence profiles