Hungarian University of Agriculture and Life Sciences

Szent István Campus

Agricultural Biotechnology (Animal) MSc Course

ANTIBIOTIC RESISTANCE AND BIOFILM FORMING ABILITY OF PSEUDOMONAS AERUGINOSA STRAINS ORIGINATING FROM WASTEWATER TREATMENT PLANTS

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Summary

Plastic has evolved over the previous century from being non-existent to a common and essential component of contemporary life. Although plastic has many benefits over other materials, its widespread manufacture and quick disposal are causing serious problems for the environment, the economy, and ethics. Six hundred million of the eight hundred million tons of plastic manufactured up until 2015 were thrown away as waste. As a consequence of their low degradation rate, microplastics (MP) persist in the environment for many years and interact with chemical compounds and microorganisms. Consequently, MPs present a new ecological niche for bacteria and eukaryotic colonization, dispersal and biofilm formation after exposure to the environment, named as 'Plastisphere'.

Wastewater originating MPs often reach the environment and present abiotic surface for biofilm formation. This ecological niche called plastisphere is considered as a hotspot of antimicrobial resistance. The aim of this research was to isolate biofilm forming and antibiotic resistant opportunistic pathogenic *P. aeruginosa* from wastewater treatment plants, to evaluate their antibiotic resistance profile and to determine their role in MPs colonization.

P. aeruginosa was found to be present in samples from all the stages of wastewater treatment plant (WWTP), we tested 87 samples and from these samples, 66 (75.86%) were positive for *P. aeruginosa*. Antibiotic assay was performed on some of the strains and most strains show an intermediate category of the 2019 WHO AWaRE classification of antibiotics for evaluation and monitoring of use. Five strains are multidrug resistant (MDR), and the main categories of antibiotics are fluoroquinolones, cephalosporins, penicillin, carbapenems and polymyxin. Biofilm assay the strains show a moderate to strong biofilm formation.

Six types of polymers (PA, PLA, LDPE, PVC, PET and PS) with a diameter of 4mm were used to determine which one is the preferred surface for *P. aeruginosa* to attach and multiply; PP, PS and LDPE according to our results are the most preferred surface for *P. aeruginosa* to attach and multiply. Some polymers did not form any biofilm for some of the strains used in this experiment.