

BOOK OF ABSTRACTS

8TH MEETING OF YOUNG RESEARCHERS
OF UNIVERSITY OF PORTO



Biosorption of fluoroquinolones by activated sludge and aerobic granules sludge

V. R. A Ferreira¹, C. L. Amorim³, S. M. Cravo¹, M. E. Tiritan^{1,2,4}, P. M. L. Castro³,
C. M. M. Afonso^{1,4}

¹ Laboratório de Química Orgânica e Farmacêutica, Dep. Ciências Químicas, Faculdade de Farmácia da Universidade do Porto, Rua Jorge Viterbo Ferreira 228, 4050-313 Porto, Portugal.

² CESPU, Instituto de Investigação e Formação Avançada em Ciências e Tecnologias da Saúde (IINFACTS), Rua Central de Gandra 1317, 4585-116 Gandra, Portugal.

³ CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Universidade Católica Portuguesa/Porto, Rua Dr. António Bernardino Almeida, 4200-072 Porto, Portugal.

⁴ CIIMAR: Centro Interdisciplinar de Investigação Marinha e Ambiental da Universidade do Porto, Rua dos Bragas, 289, 4050-123 Porto, Portugal.

Antibiotic residues have been detected in various environmental matrices, such as surface water and even drinking water. Although present at low levels ($\mu\text{g/L}$, ng/L), many antibiotics are bioaccumulative, pseudo-persistent and can promote resistance/alterations in bacterial populations [1]. Recent studies on antibiotics removal by activated sludge (AS) and aerobic granules (AGS) show biosorption as the dominant process, determining the fate of these micropollutants [2-3].

In this work the biosorption of three widely used fluoroquinolones (FQ) - ofloxacin (OFL), norfloxacin (NOR) and ciprofloxacin (CPF) - to AS and AGS was evaluated. A High Performance Liquid Chromatography with Fluorescence Detection (HPLC-FD) method was validated and used to follow the biosorption of the target FQ.

Data obtained in this study contribute to a better comprehension of FQ biosorption behavior in AS and AGS. At pH 7 AS showed better performance to biosorb OFL, NOR and CPF than AGS. The higher biosorption capacity of AS was probably due to the negative charge on its surface, evaluated by a zeta potential of -25.65 mV , at pH 7. OFL was the less biosorbed, both onto AS and AGS, because this FQ at pH 7 is mainly present in its anionic form. The equilibrium data for AS showed a better fit to the Langmuir model, while the model that presented better fit for AGS was the Freundlich model. The FQ could be desorbed from AGS at pH 3, pH 8 and pH 9 whereas at pH 4 the biosorption process was promoted.

Acknowledgment: This work was supported by FCT through the projects PTDC/EBB-EBI/111699/2009, CEQUIMED-Pest-OE/SAU/UI4040/2014, PEst-OE/EQB/LA0016/2013 and PEst-C/MAR/LA0015/2013.

References:

[1] Doorslaer, V.X. et al. (2014), *Fluoroquinolone antibiotics: An emerging class of environmental micropollutants*. Science of the Total Environment, 500 (501), 250-269.

[2] Amorim, C.L. et al. (2014), *Performance of aerobic granular sludge in a sequencing batch bioreactor exposed to ofloxacin, norfloxacin and Ciprofloxacin*. Water research, 50, 101-13.

[3] Li, B. et al. (2010), *Biodegradation and adsorption of antibiotics in the activated sludge process*. Environmental science & technology, 44 (9), 3468-73.