



# Book of Abstracts

## BioMicroWorld 2015

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## Removal of a mixture of chiral pharmaceuticals by an aerobic granular sludge bioreactor and its effects on the biomass

Catarina L. Amorim<sup>1</sup>, Irina S. Moreira<sup>1</sup>, Ana R. Ribeiro<sup>1,2,3</sup>, Lúcia H.M.L.M. Santos<sup>4,5</sup>, Cristina Delerue-Matos<sup>4</sup>, Maria E. Tiritan<sup>2,5,6</sup> and Paula M.L. Castro<sup>1</sup>

<sup>1</sup>CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Universidade Católica Portuguesa/Porto, Rua Arquitecto Lobão Vital, Apartado 2511, 4202-401 Porto, Portugal

<sup>2</sup>CESPU, Instituto de Investigação e Formação Avançada em Ciências e Tecnologias da Saúde, R. Central de Gandra, 1317, 4585-116 Gandra PRD, Paredes, Portugal

<sup>3</sup>Present affiliation: LCM – Laboratory of Catalysis and Materials – Associate Laboratory LSRE-LCM, Faculdade de Engenharia, Universidade do Porto, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal

<sup>4</sup>REQUIMTE/LAQV, Instituto Superior de Engenharia do Porto, Instituto Politécnico do Porto, Rua Dr. António Bernardino de Almeida, 431, 4200-072 Porto, Portugal

<sup>5</sup>CIIMAR– Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Rua dos Bragas, 289, 4050-123 Porto, Portugal

<sup>6</sup>Laboratório de Química Orgânica e Farmacêutica, Departamento de Ciências Químicas, Faculdade de Farmácia da Universidade do Porto, Rua Jorge Viterbo Ferreira 228, 4050-313 Porto, Portugal

In the last decade, pharmaceuticals have received increasing attention as emerging pollutants. Most of the drugs currently in use are chiral pharmaceuticals (CPs), commonly marketed as racemates i.e. an equimolar mixture of two enantiomers. Although enantiomers have similar physicochemical properties, most isomers differ in their biological activities [1]. Additionally, these compounds are poorly removed at wastewater treatment plants being eventually discharged into the environment.

Aerobic granular sludge sequencing batch reactors (AGS-SBR) is a relatively recent promising biotechnology for wastewater treatment. AGS is formed by microbial self-aggregation and has advantages over activated sludge, such as dense and strong microbial structure, ability to withstand high organic loadings and tolerance to toxicity [2]. This technology has been successfully applied in the treatment of domestic and industrial wastewater but further knowledge on the removal and impact of micropollutants such as CPs is scarce.

In this study, a synthetic wastewater supplied with a racemic mixture of CPs (alprenolol, bisoprolol, metoprolol, propranolol, fluoxetine and its metabolite norfluoxetine, venlafaxine and salbutamol) was continuously fed into an AGS-SBR during 28 days. Removal efficiencies ranging between 48-97% were achieved for the targeted CPs. Norfluoxetine exhibited the highest removal efficiencies for both (*S*)- and (*R*)-enantiomers (up to 94% and 97%, respectively) and enantiomer fractions ranging from 0.44 to 0.74 in the effluent, indicating stereoselectivity occurring during the treatment process, with preferential removal of the (*R*)-enantiomer. For all other CPs no enantioselectivity was observed. Concerning the particle size distribution for AGS-SBR, a decrease in the percentage of larger granules was observed probably because the presence of CPs in the influent triggered a gradual disintegration of the AGS which was also confirmed by an increase in the effluent solid content. Moreover, microscopic observations revealed that AGS changed its morphological features due to CPs exposure.

**Keywords:** Aerobic granular sludge; chiral pharmaceuticals; removal efficiency; granular structure.

### References

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