

O.324. Anaerobic biological removal of pharmaceuticals: impact of these micropollutants towards different microbial groups in anaerobic communities

Ana Rita Silva¹, Joana Costa¹, Andreia Filipa Salvador¹, Gilberto Martins¹, Maria Madalena Alves¹ and Luciana Pereira¹

¹CEB- Centre of Biological Engineering, University of Minho, 4710-057 Braga, Portugal

Pharmaceutical compounds are originated essentially from anthropogenic activities and end up in wastewater treatment plants (WWTP). Despite the low concentrations usually detected in wastewater (ranging from ng L⁻¹ to µg L⁻¹), levels of mg L⁻¹ have been detected in some countries. Moreover, in conventional WWTP these compounds are hardly degraded and tend to accumulate in sludge, being an environmental and public health problem.

A possible treatment and valorization of contaminated sewage sludge is through anaerobic digestion, but for that purpose, the effect of these micropollutants on the activity of crucial microbial groups present in the anaerobic sludge (i.e., acetogenic and methanogenic microorganisms) must be assessed.

In this work, the effect of ciprofloxacin (CIP), ibuprofen (IBP), diclofenac (DCF), and 17α-ethinylestradiol (EE2), on the activity of acetogenic and methanogenic anaerobic communities was investigated¹. The microorganisms respond dissimilarly to these micropollutants, at different concentrations (0.01-100 mg L⁻¹), but in general they were more affected by CIP, followed by EE2, DCF and IBP. The specific methanogenic activity (SMA) was not affected in concentrations ranging from 0.01 to 0.1 mg L⁻¹. However, acetoclastic methanogens were the most sensitive microorganisms, being affected by all the pharmaceuticals, at higher concentrations. The SMA of these microorganisms was inhibited ≈20% by 1 mg L⁻¹ of CIP, and circa 50% with higher concentrations. Acetogenic bacteria were not affected by IBP at all the tested concentrations, but they were sensitive to CIP at concentrations above 1 mg L⁻¹, and to DCF and EE2 at concentrations above 10 mg L⁻¹. Instead, hydrogenotrophic methanogens were not affected by any concentration, indicating their lower sensitivity.

It can be concluded that methanogenic communities were not severely affected by these pharmaceuticals. So, the application of anaerobic digestion for the treatment of wastewater and sewage sludge contaminated with pharmaceuticals seems promising. Indeed, another study showed that CIP can be removed by anaerobic sludge in the presence of carbon materials (99% removal), and treated wastewater was much less toxic than before the treatment (≈46% detoxification), as assessed with the standard bioassay using *Vibrio fischeri*².

References

¹Silva, A.R. et al. *Ecotoxicology* **29**,866–875(2020).²Silva, A.R. et al. *Int.J.Mol.Sci.***22**,2932(2021).