

# Biodegradation of anti-inflammatory drugs and plastics. Identification of microbial activities by metagenomics

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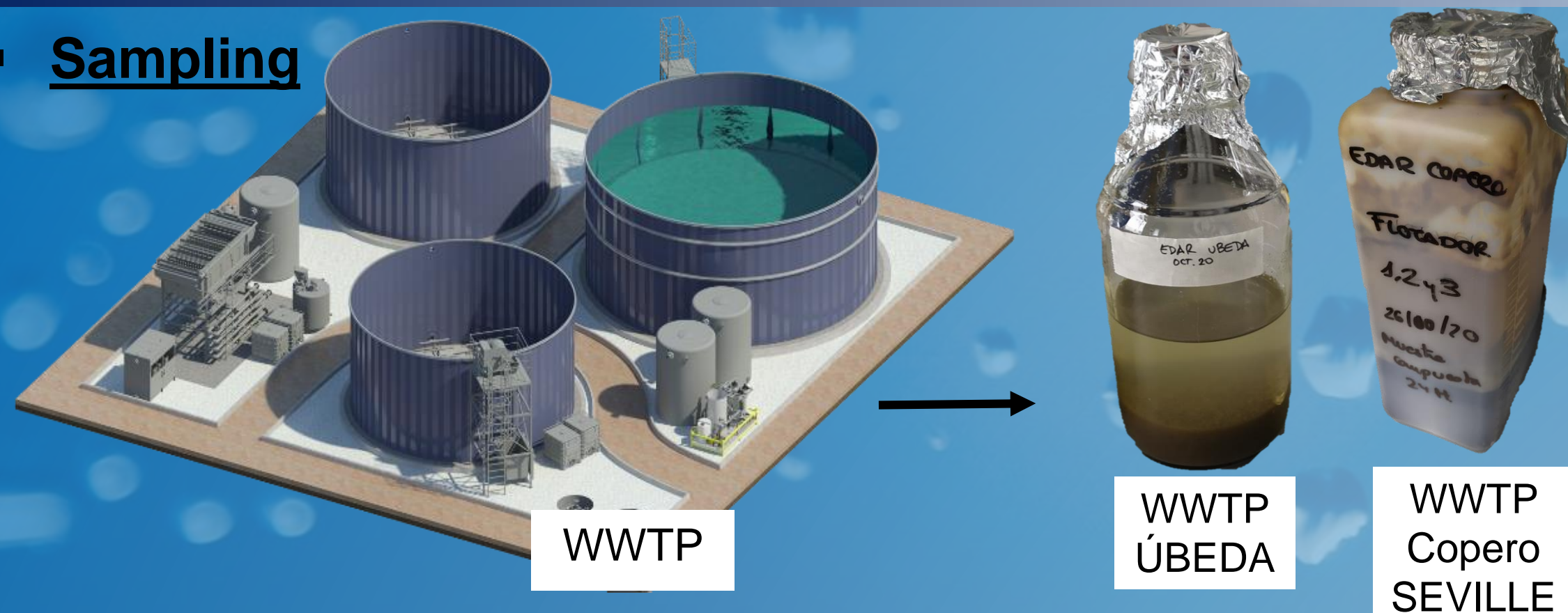
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## ➤ INTRODUCTION

The rise of plastic and its subsequent accumulation in the environment has led us to face great challenges in our society today. One of these huge challenges is to avoid plastic debris, especially **microplastics (PET)** as well as other emerging pollutants, such as **ibuprofen (IBU)**, **naproxen (NPX)** and **diclofenac (DCO)**, from reaching our seas or rivers, since wastewater treatment plants (WWTP) are not currently able to prevent this contamination. Therefore, we have performed several enrichments to isolate bacteria individually or in consortia of microorganisms from these WWTPs, in order to maximize the possibility of finding biodegradation routes for complex compounds. We have performed preliminary genetic, biochemical and microbiological analysis of the isolated strains or consortia that use these pollutants as a carbon source.

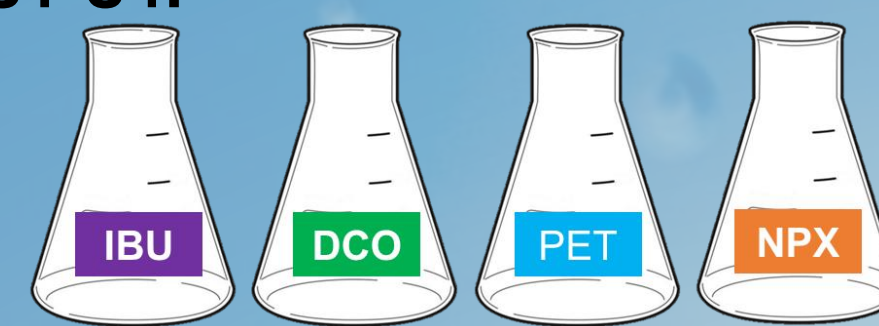
## ➤ METHODS & RESULTS

### ▪ Sampling

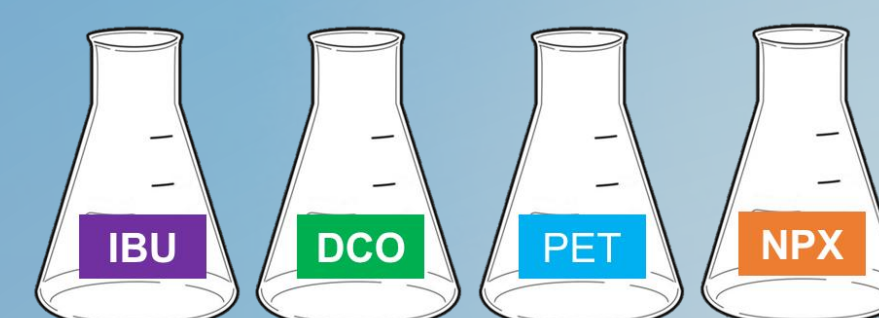


### Successive culture enrichments from in:

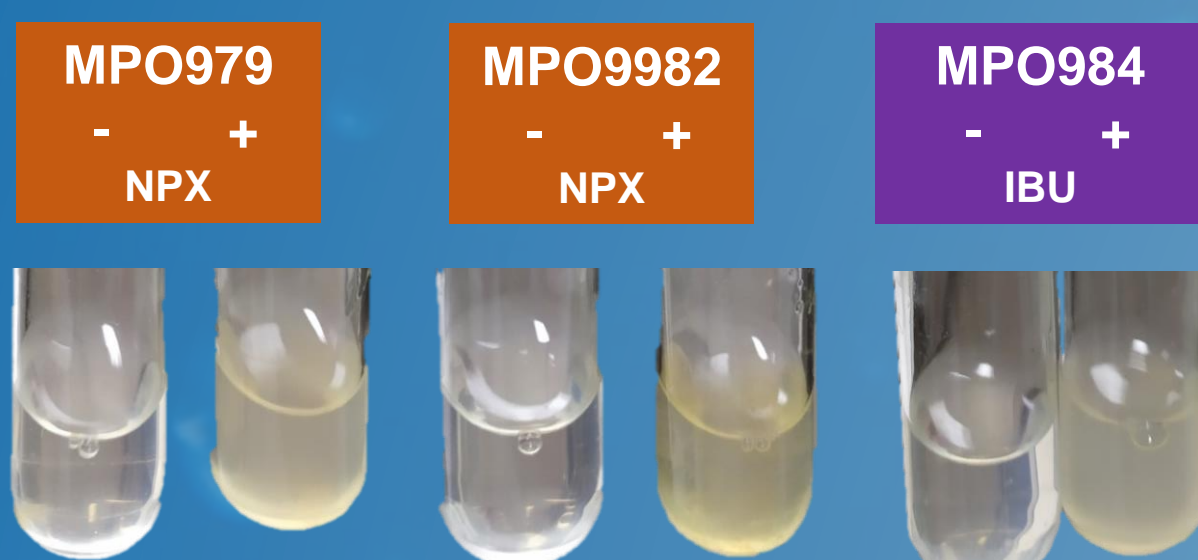
#### • Úbeda U1-U4:



#### • Copero (Seville) S1-S4:



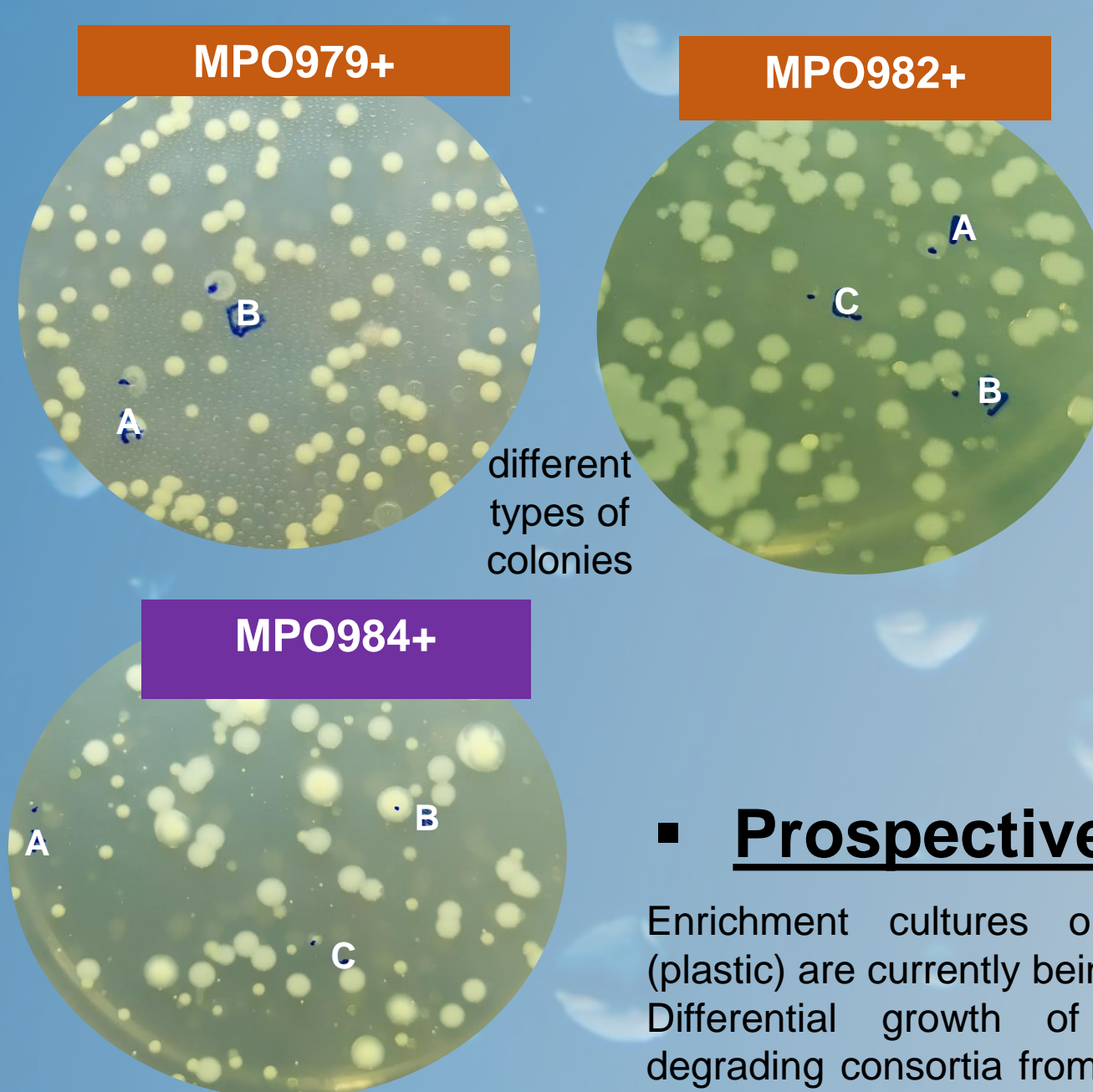
### ▪ Growth of selected strains in liquid culture in the presence/absence of C-source



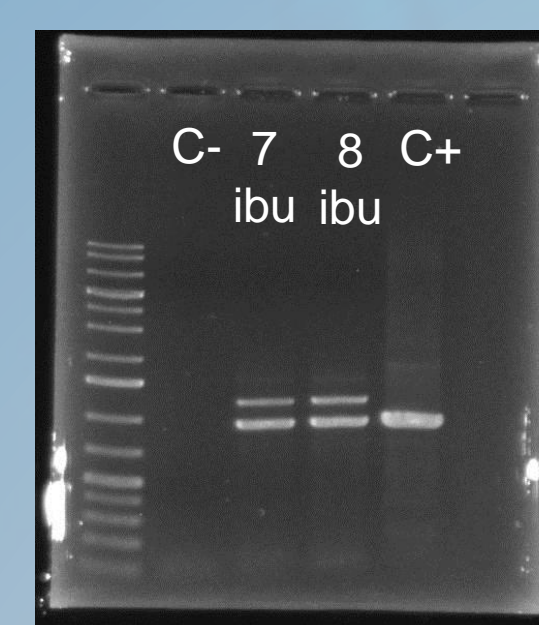
#### 16S rRNA analysis of degradation strains/ consortia

MPO 975+	IBU	Pseudomonas	MPO 980+	NPX	
MPO 976+	IBU	Pseudomonas	MPO 981+	NPX	
MPO 977+	IBU	Bordetella	MPO 982+	NPX	Bordetella
MPO 978+	IBU	Bordetella	MPO 983+	IBU	Achromobacter
MPO 979+	NPX	Bordetella	MPO 984+	IBU	Sphingomonas
		Achromobacter			Novosphingobium

### ▪ Characterisation of candidates on LB plates



### ▪ PCR amplification of *ibu* genes ▪ Gram stain of *ibu* genes



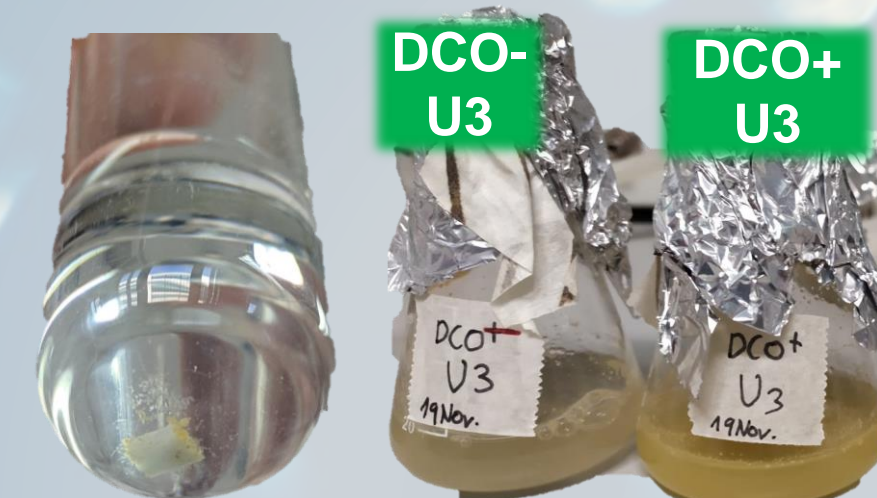
Confirmation PCR for *ipfG* genes for ibuprofen degradation on isolated colonies of MPO984



MPO975+ candidate Gram stain

### ▪ Prospectives

Enrichment cultures on DCO and PET (plastic) are currently being cultivated. Differential growth of a putative DCO degrading consortia from U3 show promising results. Biomass accumulates around PET particles is detected.



## ➤ CONCLUSIONS

Fifteen enrichment cultures able to grow in IBU, DCO and NPX have been obtained from WWTP samples,

- *Ibu* degradation genes for several strains have been identified
  - Taxonomical analysis based on 16S rRNA has been done on 16 strains
- The results obtained so far are highly promising for defining new biodegradation routes for these compounds.

## ➤ REFERENCES

Magni, S. *et al.*, (2019). The fate of microplastics in an Italian Wastewater Treatment Plant. *Science of the Total Environment*.

Pino, N. J. *et al.*, (2011). Isolation of a selected microbial consortium capable of degrading methyl parathion and p-nitrophenol from a contaminated soil site. *Journal of Environmental Science and Health*.