

Chemistry Department

## Microbial Mixed Cultures Technology

Chemical and Biochemical Engineering/  
Microbial Ecology and Technology Lab.



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(PI)

- PhD in Biological Engineering, specialization on Microbial Technology
- Participation in 16 projects as team member (6 national + 9 international + 1 European)
- PI of 2 national-funded projects

## Objectives

- Integration of the biorefinery strategy for the maximization of biomass “sensu lato” utilization towards sustainability.
- Utilization of microbial mixed cultures (MMC) for biotechnological process aiming at treating/valorising different effluent/waste/by-product of industrial, agricultural or domestic origin.
- Using biofuels by-products or residues (pyrolysis oil from chicken beds, glycerol from biodiesel production) and organic waste/by products (municipal solid waste, vegetables and food processing wastes) for the production of biodegradable bioplastics of the polyhydroxyalkanoate type.

## Methodology

**Substrates:** chemical analysis to define C/N/P ratio of feed, to use directly or to complement. Conversion of sugars into VFA's by anaerobic digestion.

**Culture selection:** Sequencing batch reactor for culture enrichment, with high specificity for internal storage of polyhydroxyalkanoates (PHA).

**PHA production:** Batch reactor for maximizing polymer content on biomass, using nitrogen limitation. Polymer extraction.

**Polymer characterization:** Mw, Mn, PI, Tg, Tm, Tc.

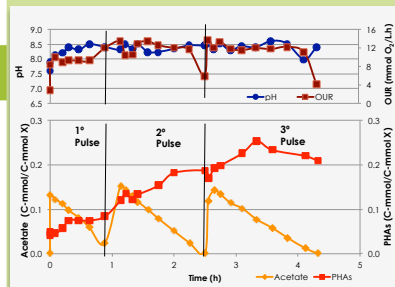
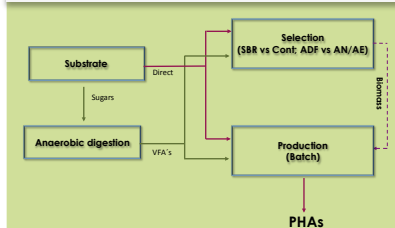
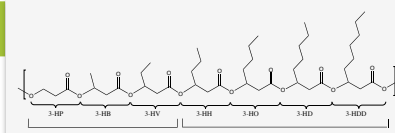
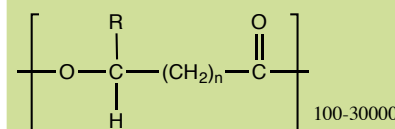
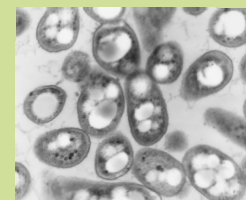
**Microbial identification:** FISH, DGGE.

## Expected Results

- Selection of microbial mixed cultures (2-3 organisms) able to produce co-polymers from chicken-bed pyrolysis oil, glycerol waste and organic wastes.
- Optimization of anaerobic digestion conditions to formulate different feed compositions.
- Tailor-made PHAs with diverse monomeric composition, resulting from the several feed formulations, that will be reflected on the polymer thermo-chemical characteristics and ultimately on polymer applications.
- Lowering PHA production cost by combining microbial mixed cultures, renewable carbon sources and new polymer extraction procedures.

Funding:

- PTDC/AAC-AMB/100790/2008, 2010-2013, Microbial Contribution to the Valorisation of waste/by-products from Biofuel Production.
- PTDC/AAC-AMB/111316/2009, 2011-2014, ECOBIOTEC - Ecobiotechnology based on the use of mixed microbial consortium producing PHA from waste carbon sources.



FISH

