

Department of Chemistry

## Cheese whey integrated valorisation

Biochemical and Process Engineering Group



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(Postdoc, since 2012)

- PhD in Chem&Biol Eng, UMinho, 2012
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## Objectives

The increasing cost of fossil resources and growing environmental awareness are key drivers for the emerging shift from fossil-based to bioplastics. Polyhydroxyalkanoates (PHAs) are bio-based and -degradable, and have a high technical replacement potential relatively to conventional plastics.

Cheese whey (CW), a problematic surplus of dairy industries, is a promising feedstock for mixed microbial cultures (MMC) PHA production. Moreover, its high protein content, may be recovered as whey protein concentrate (WPC), a second added value product with an increasing market momentum.

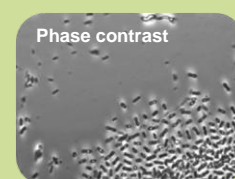
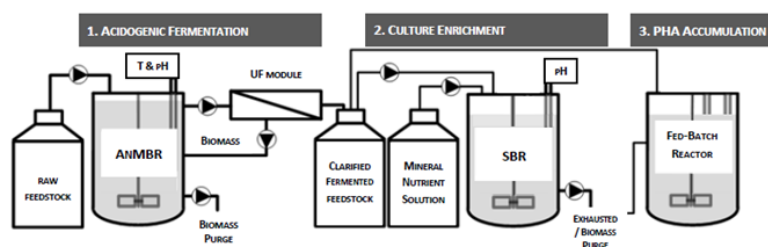
Therefore, the aim of this project is developing a fully integrated process for the valorisation of the different fractions of CW, comprising the production of two added-value products: PHA and protein concentrate.

## Methodology

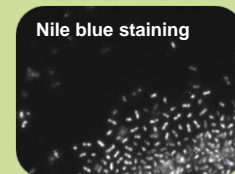
WPC will be obtained by ultrafiltration (UF).

The MMC PHA production from surplus feedstocks is carried in a three-stage process, consisting of:

- (1) ACIDOGENIC FERMENTATION STAGE [organic content conversion into volatile fatty acids (VFAs)];
- (2) CULTURE SELECTION STAGE [to obtain a MMC with high and stable PHA storage capacity, and to produce the biomass to be used in the subsequent stage];
- (3) PHA PRODUCTION STAGE [maximise PHA cell content].



Phase contrast



Nile blue staining

PHA inclusions in bacterial cells

## Expected Results

- Optimisation of the upstream treatment for protein recovery by UF;
- Optimisation of the three-stage bioprocess;
- Define strategies to effectively manipulate PHA composition and molecular weight, aiming to produce the required polymer for specific bioplastic applications (product design);
- Scale up of the three-stage bioprocess as proof of concept.

The output of this research is expected to contribute to the development of a process for PHA production by MMC using renewable sources, which is a promising alternative as a valid bioplastic production technology.

Funding:

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MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR

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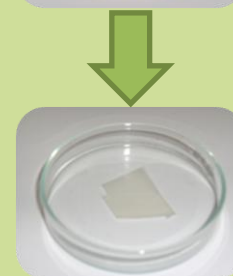
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CW powder



PHA film

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