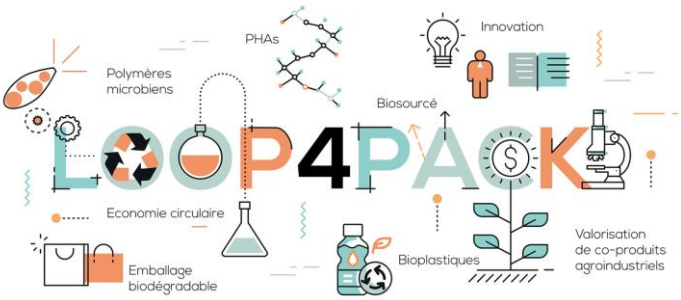

Coline Perdrier's thesis abstract,
involved in T1 and T3 of the project.

"Controlled PHAs biosynthesis using pure cultures of a model strain *Cupriavidus necator*"

The thesis project aims to study the effect of variations in nutrient supply on the biosynthesis performance of scl-PHAs and especially of the P(3HB-co-3HV) copolymer, using a *Cupriavidus necator* model strain in pure culture. Two aspects are particularly important: (i) the monomer composition of the copolymer obtained, with a desired high content of HV monomers; (ii) the distribution of these monomer units along the polymer chain. Indeed, as the two previous points have a direct impact on the final thermomechanical properties of PHA-based materials, their control by the feeding strategy would allow to broaden the range of applications of PHAs.

The study of the composition of culture media and its variations will initially be carried out with synthetic media which are similar to those that can be obtained by pre-treatment of co-products from the agro-food industry (McCain wastes) to facilitate the understanding of the phenomena. Volatile fatty acids from acidogenic fermentation of potato peels and glucose from starch hydrolysis are therefore the main substrates studied in this work.

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Figure n°1: Instrumented bioreactor (20L)

The production of PHAs is ensured by an instrumented bioreactor (working volume: 20L; Figure n°1) in which two phases of culture follow one another: 1/ the biomass production phase in the bioreactor; 2/ the accumulation of PHAs in the bacterial cells. The second phase of culture is thus dedicated to the kinetic and stoichiometric study of the production of P(3HB-co-3HV) for controlled substrate feeding conditions but also the impact of these feeding strategy on the nature and properties of the PHAs obtained. For this reason, the task T3 which corresponds to the characterization of the polymers obtained at each production is essential to the results interpretation.

The feeding strategies tested will be based on current knowledge from previous work and will focus on nutritional phosphorus limitation in the presence of volatile fatty acids. Nutritional phosphorus limitation has already shown, in the case of *Cupriavidus necator*, a strong potential to direct metabolic carbon and energy flows within the cell and thus maximize the conversion of odd-numbered carbon volatile fatty acid substrates to HV monomers. The metabolic modeling of the different carbon and energy flows will be used as a complement to better understand, predict and design the different feeding strategies of the experiments.

The results of this work will also be compared to the effects of the phosphorus limitation strategy on the production performance of PHAs in mixed culture (Thesis work of Mattéo Castiello- PhD student involved in task T1 of the LOOP4PACK project).

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