

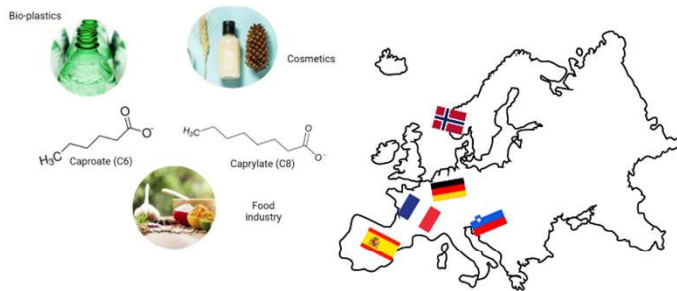
Stéphanie Perret, Hélène David, Henri-Pierre Fierobe, Nicolas Vita, Sandrine Pagès and Séverine Gagnot

Aix-Marseille Université, CNRS, LCB-UMR7283

Medium-chain-carboxylates (MCC) ?

Medium-chain-carboxylates (MCC) such as caproate or caprylate are chemicals used in various agro-industrial branches such as the food industry, cosmetics, or bioplastics.

They are mainly produced nowadays from fossil resources or plant oils (palm, coconut...). However, both of these solutions are unsustainable. Cell4Chem is a European project aiming to provide an **eco-friendly process** to produce MCC by microbial anaerobic communities from lignocellulosic biomass, an abundant and renewable material.



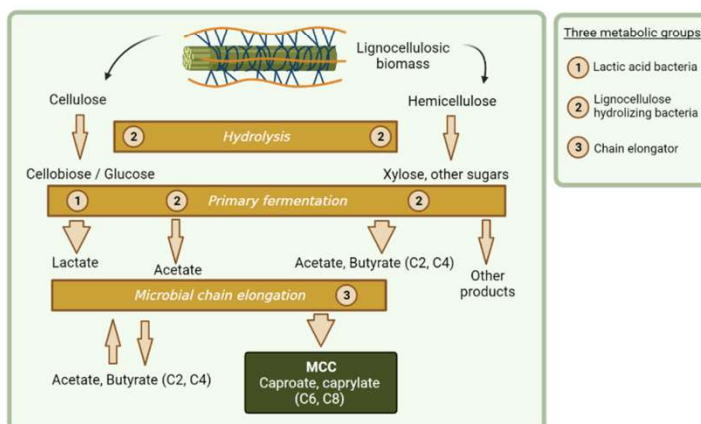
"Cell4Chem", a European project to produce MCC

A microbial community to design MCC from plant biomass

To efficiently produce MCC, a consortium composed of various **genetically modified strains and/or wild-type ones and/or enrichment cultures** will be engineered.

The main goal is to overcome the two bottlenecks of the process by :

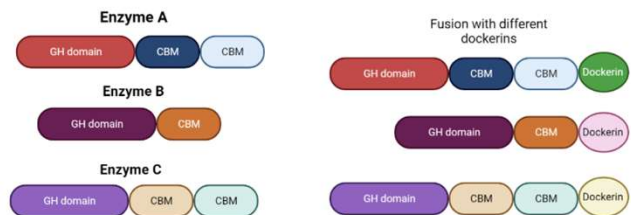
- **Optimizing cellulose degradation**
- **Increasing lactate production for chain elongation by using lactic acid bacteria**



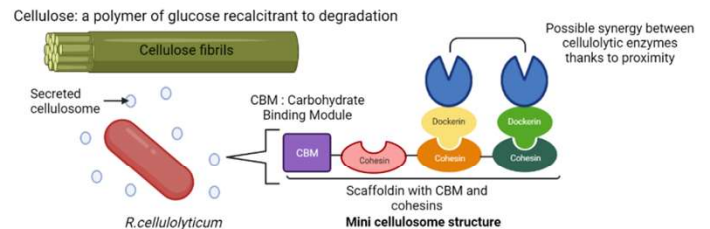
- Three metabolic groups
- 1 Lactic acid bacteria
 - 2 Lignocellulose hydrolyzing bacteria
 - 3 Chain elongator

Synthetic Biology to increase cellulose degradation

- Selection of cellulases (glycoside hydrolase, GH) to be produced in lactic acid bacteria
- Test combinations of enzymes and their synergies when they are free or in complexes



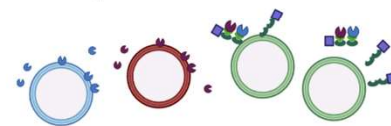
1A/ Set of cellulases with or without a dockerin domain



1B/ Complex of cellulases inspired from *Ruminoclostridium cellulolyticum* cellulosome

Future prospects

- Implement the enzymes in lactic acid bacteria and test different substrates for growth
- Test the best combination of enzymes.
- Construct strains with enzymes **surface anchored, free in the environment, or in complex**
- Mix the strains of lactic acid bacteria each producing an enzyme or a scaffoldin protein. Find the best combination.
- Test co-culture with lignocellulose hydrolyzing, measure growth and lactate production



2A/ Mixing the strains producing enzyme or scaffolding proteins

2B/ Engineering and monitoring of microbial community's dynamics