

## THE UNIVERSITY OF REIMS CHAMPAGNE-ARDENNE

has recognized skills and know-how that are essential for the development of **innovative biobased molecules** with features highly sought-after by many sectors. Our technical means and scientific skills in the domain of biomolecules enable us to use white and green biotechnology and green chemistry to fractionate, extract and functionalise plant constituents, in particular agricultural by-products, into molecules with medium and high added value.

### From biomass expertise to product applications

#### Characterisation - Modelling - Processes

- Identification of molecules
- Development of biological and physico-chemical production and functionalisation methods
- Study of structures / properties / dynamics relationships
- Multi-scale modelling of lignocellulosic fractionation
- Molecular modelling / numerical simulations
- Monitoring the diffusion of enzymes in complex media
- Molecular characterisation of complex extracts (plants, fermentation media, algae)
- Study of mechanisms of action

#### Functionalisation

- Chemical functionalisation of biomolecules
- Enzymatic functionalisation (biocatalysis) of biomolecules
- Production of biobased molecular building

#### Bioproduction - Synthesis - Purification

- Purification of extracted or synthesised compounds (modelling, intensification, scale-up)
- Design, synthesis of analogues of natural molecules
- Production of biobased synthons
- Organic synthesis based on Biobased building blocks (synthons)
- Bioproduction (cell culture, liquid and solid state fermentation) of enzymes and plant and microbial secondary metabolites

#### Fractionation

- Physico-chemical fractionation: extraction
- Enzymatic fractionation: biocatalysis, liquid and solid state fermentation
- Study of the biological processes of deconstruction of lignocellulosic biomass



## 5 MAIN RESEARCH AREAS

- Biomass fractionation
- Synthesis and purification of biomolecules
- Functionalisation of biomolecules
- Characterisation of structure / properties of biomolecules
- Bioproduction of biomolecules

## KEY FIGURES



**60** Researchers and teacher-researchers



**+ than 10** patents

**+ than 40** industrial collaborations



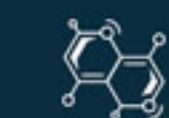
**9** European projects obtained in the past 5 years

**4** laboratories \*



\* UMR 614 URCA/INRAE Fractionnement des Agro-Ressources et Environnement (FARE) - Chaire Agro-Ressources FERmentation Enzymes (AFERE)  
USC INRAE 1488 Résistance Induite et Bio-protection des Plantes (RIBP)  
UMR 7312 URCA/CNRS Institut de Chimie Moléculaire de Reims (ICMR)  
UMR 7369 URCA/CNRS Matrice Extracellulaire et Dynamique Cellulaire (MEDyC) - Chaire de recherche Modélisation moléculaire et Agro-ressources : Ingrédients, Cosmétique, Santé (MAGICS)

## For applications in



Polymers



Fine chemistry



Cosmetics



Healthcare



Phytosanitary products



Biofuels



Biocontrol



Detergents



Pollution control

## State-of-the-art equipment at the service of our researchers and of an industry network



### Fractionation – Bioproduction – Synthesis – Purification – Functionalisation

- Bioreactors (1 to 20L)
- Solid state bioreactor
- Incubators
- Extraction / purification platform (supercritical CO<sub>2</sub>, microwave, preparative HPLC)
- Centrifugal Partition Chromatography
- Electron accelerator



### Characterisation of structure / properties

- NMR 500 MHz, 600 MHz (cryoprobe) coupled to LC-SPE NMR
- HPLC, GC, steric exclusion chromatography
- Mass spectrometers (Q-ToF, Orbitrap, coupled to LC-MS, ionic mobility)
- Spectrometers: UV-visible, IR, fluorescence
- ICP-MS
- Confocal microscope
- Multiscale molecular modelling platform (P3M)
- High Performance Computing Centre (ROME Supercomputer)

### Some publications

- Kutschera, A. *et al.* Bacterial medium-chain 3-hydroxy fatty acid metabolites trigger immunity in Arabidopsis plants. *Science* 364, 178 (2019).
- Magid, A. *et al.* Chimie du végétal et produits innovants à forte valeur ajoutée. (2018).
- Méline, T. *et al.* d-Xylose and l-arabinose laurate esters: Enzymatic synthesis, characterization and physico-chemical properties. *Enzyme and Microbial Technology* 112, 14–21 (2018).
- Besançon, C. *et al.* Umbrella Visualization: A method of analysis dedicated to glycan flexibility with UnityMol. *Methods* 173, 94–104 (2020).

### Quality training courses

#### Initial training

Are you looking for future collaborators? Do you wish to complete your studies? Many quality training courses provided at URCA focus on biomolecules.

To find out more: [www.univ-reims.fr](http://www.univ-reims.fr)

#### Vocational training

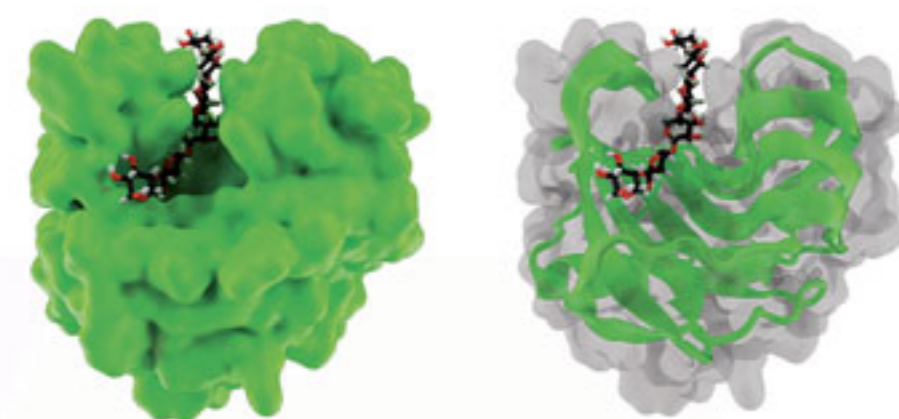
Does your structure / company wish to support its employees by training them in the fractionation, extraction, production, functionalisation and characterisation of biomolecules?

Our experts can help you. URCA's vocational training department is ready to meet with you to study your needs and offer you the most appropriate training solution.

To find out more: [dfpa@univ-reims.fr](mailto:dfpa@univ-reims.fr)

#### Contact :

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[direction.partenariatentreprise@univ-reims.fr](mailto:direction.partenariatentreprise@univ-reims.fr)



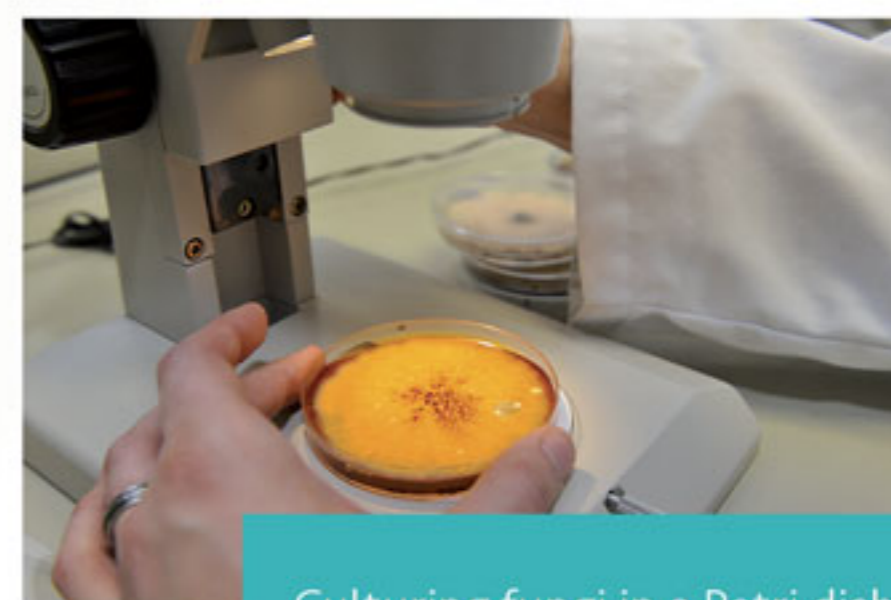
Modelling of an enzyme and its substrate



Biobased surfactant



Agromolecules, a springboard to structural diversity



Culturing fungi in a Petri dish