

BIOCATalysis

Research team **BIOCAT** - BIOCATalysis

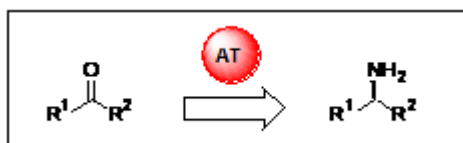
Leader : [Christine Hélaïne](https://iccf.uca.fr/annuaire/christine-helaine)(<https://iccf.uca.fr/annuaire/christine-helaine>), Associated Professor

Research topics

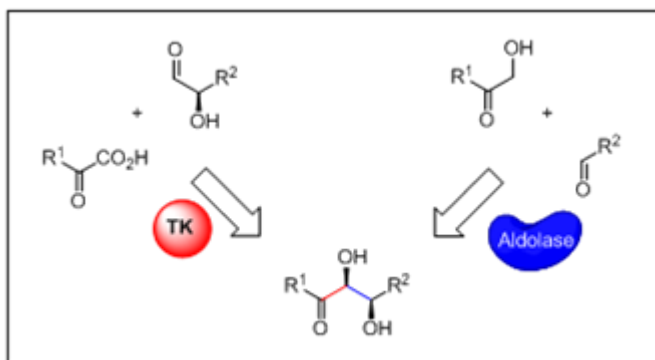
Biocatalysis in organic synthesis for chiral molecules preparation of biological interest. Enzymes are natural biocatalysts highly selectives and efficient. The chemo- regio- and stereoselectivity of biocatalysed reactions leads to environmental friendly process developments. They answer to several green chemistry principles : shortened syntheses, reduced organic solvents volumes, reduced energetic costs and enzymes are naturally biodegradables. Our aim integrates specificity studies and utilisation of synthetic potential of the enzymes produced from recombinant strains. Improvement and modulation of the enzymatic tools as well as exploration of new catalytic activities (mutagenesis or bank genome screening) are developed in collaboration with Genoscope (Evry, France) and several european laboratories.

Our work is focused on two main themes:

- [Enzymatic Transamination](https://iccf.uca.fr/english-version/research/biocatalysis-and-metabolism/biocatalysis/transaminations)(<https://iccf.uca.fr/english-version/research/biocatalysis-and-metabolism/biocatalysis/transaminations>) for non natural amino acid preparation. Aminotransferases (AT) in synthesis offer today a large number of possibilities to access to a broad diversity of chiral amines including alpha or beta aminoacids starting from carbonyl derivatives.



- C-C bond formation for chiral polyols preparation. [Aldolases](https://iccf.uca.fr/english-version/research/biocatalysis-and-metabolism/biocatalysis/aldolases)(<https://iccf.uca.fr/english-version/research/biocatalysis-and-metabolism/biocatalysis/aldolases>) and [transketolases](https://iccf.uca.fr/english-version/research/biocatalysis-and-metabolism/biocatalysis/transketolases)(<https://iccf.uca.fr/english-version/research/biocatalysis-and-metabolism/biocatalysis/transketolases>) are key enzymes of the glucidic metabolism. They stereoselectively catalyse a C-C bond formation, generally an addition reaction between a carbonyl donor substrate and an aldehyde acceptor substrate. These enzymes are useful tools for structurally diversified chiral polyols preparation. Our projects in this field concern aldolase and transketolase applications for the synthesis of chiral polyols, design and search of new catalytic activities as well as enzyme immobilization.



People

[M. Franck CHARMANTRAY](https://iccf.uca.fr/annuaire/m-franck-charmantray) (https://iccf.uca.fr/annuaire/m-franck-charmantray)

[M. Thierry GEFFLAUT](https://iccf.uca.fr/annuaire/m-thierry-gefflaut) (https://iccf.uca.fr/annuaire/m-thierry-gefflaut)

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[Marielle LEMAIRE](https://iccf.uca.fr/annuaire/marielle-lemaire) (https://iccf.uca.fr/annuaire/marielle-lemaire)

Students/Post-Doct

Name	Level	Financial Support	Dates
Juliane Abdoul Zabar	PhD student	ANR	October 2010 - January 2014
Nadia Touisni*	PhD student	BDI CNRS	October 2010 - December 2013
Egon Heuson	PhD student	MESR	October 2012 - December 2015
Rima Mahdi*	PhD student	Région Auvergne	October 2012 - December 2015
Marion Lorillière	PhD student	ANR	September 2014 - December 2017
Victor Laurent	PhD student	MESR	October 2016 - ...
Israël Sanchez Moreno	Post-doc	Région Auvergne	December 2010 - December 2012
Isabelle Sorel	Post-doc	ANR	September 2010 - March 2013
Thomas Moreau*	Post-doc	ANR	January 2013 - January 2014

Ghina Ali*	Post-doc	ANR	February 2014 - January 2015
Matilte Halma*	Post-doc	ANR	February 2015 - June 2017
Felipe Bruna Gonzalez*	Post-doc	ANR	October 2015 - December 2016
Romain Dumoulin	Post-doc	ANR	October 2015 - June 2017
Mélanie L'enfant	Post-doc	FRI Cluster	September 2017 - ...

* 50% team MI (group HDL)

Competences

Organic and analytical synthesis, micro-organisms culture, enzyme production, enzyme kinetics, inhibition studies, automatised or non-automatised enzymatic screening tests, analytical chemistry.

Programs and grants

2013- 2018 : ANR Blanc Franco-allemand, Thermo TK Ingénierie d'une transcétolase thermostable par évolution dirigée : nouvelle stréosélectivité, nouvelle spécificité de substrat, nouveau champ d'application
Porteur : L. Hecquet

2017-2019 : FRI Laboratoire (Région/BPI) « Des enzymes pour la chimie verte : production de polyols par voie biocatalytique » Porteur : L. Hecquet

2018-2021 : Pack Ambition Recherche (Région AURA), VALCOUPENZ, « Valorisation d'huiles végétales par coupure enzymatique » Partenaire : L. Hecquet

2018-2021 : H2020 - European Research Area (ERA), Programme ERA CoBioTech, TRALAMINOL.
Partenaire : L. Hecquet

Academic and industrial partnerships

NATIONAL ACADEMIES

Partners	Collaborator(s)	Topic
Team MI	C. Forano, C. Mousty, V.	Enzyme immobilization and development of biosensors

(ICCF)	Prévo	
Genoscope (Evry)	P. Marlière, M. Bouzon, M. Salanoubat, V. De Berardinis	Mining genomes for new catalytic activities development of new catalytic activities (mutagenesis, metagenomic banks)
ISM (Bordeaux)	M. Pucheault	Nanostructured catalysts in Unconventional Systems
EA 2633 (Orléans)	W. Mème	Herbicide and neurotoxicity. Impact of chronic ingestion of ammonium glufosinate on central nervous system activity

INTERNATIONALES ACADEMIES

Partners	Collaborator (s)	Topic
Univ. de Pharmacie de Copenhague	L. Bunch	Evaluation of glutamate analogues on central nervous system receptors
Universität de Stuttgart	G. Sprenger	Overexpression and mutagenesis modification of fructose-6-phosphate aldolase
Universität de Darmstadt	W. Fessner	TK substrate specificity modification
Universität de Bratislava	A. Lasikova	Enzymatic synthesis of chiral precursors
Universität de Barcelone	P. Clapes	Studies of fructose-6-phosphate aldolase substrate specificities
Madrid University	E. Garcia-Junceda	Synthesis of aminocyclitols

INDUSTRIAL PARTNERS

Partners	Collaborator(s)	Topic
Greentech (Saint Beuzire)	J.Y. Berthon, L. Rios	Synthesis of neutraceutical compounds
Metabolic Explorer (Saint Beuzire)	G. Bestel-Corre, R. Figge	Synthesis of chiral synthons
Glycoteam, Hamburg	G. Thimm, E.	Enzymatic synthesis of phosphorylated

(Allemagne)	Wieczorek	sugars
Biorebus (Paris)	L. Schwartz	Xylulose-5-phosphate analogues syntheses
Sigma-Aldrich	R. Wohlgemuth	Synthesis of monophosphorylated sugars
Rhodia(Bordeaux)	F. Sarrazin	Development of microfluidic reactors

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