

Institut des Biomolécules Max Mousseron (IBMM)

UMR 5247 CNRS-UM1-UM2

Faculté de Pharmacie

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# Biomolecules for Health and Environment

## Research Departments

- > Glycochemistry & Molecular Recognition
- > Nucleosides, Nucleotides & Nucleic Acids
- > Artificial Biopolymers
- > Biomolecular Organization
- > Lipids
- > Amino Acids, Peptides & Proteins

## Application Fields

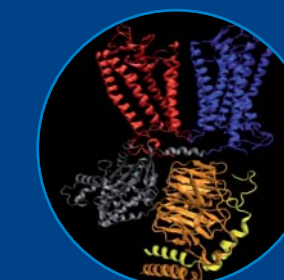
From Molecule to Medicine ...

### Fine and Medicinal Chemistry

- Anti-Bacterial Agents
- Anti-Viral Agents
- Anti-Cancer Drugs
- Anti-Obesity Drugs
- Aging
- Antimalarial Compounds
- Enzyme Inhibitors
- Controlled and Site-Directed Drug Delivery
- Neurodegenerative and Cardiovascular Diseases
- Angiogenesis Sites Targeting through Specific Peptides and Multiple Sclerosis Drugs
- Orphan and Rare Diseases
- Molecular Pharmacology
- Oxidative Stress
- Receptors Antagonists

### Biological and Diagnostic Tools

- Biolabels and Biochips
- Biomarkers
- Polymer-Based Biomaterials and Carriers
- Telomer-Based and Fluorinated Surfactants for Membrane Protein Studies
- Multifunctional Nanoparticles for Imaging and Therapy
- Recombinant Enzymes



Dermo-Cosmetology  
Agro-Chemistry (Plant Defense...)  
Environmental Protection (Green Chemistry...)

[www.ibmm.univ-montp1.fr](http://www.ibmm.univ-montp1.fr)

## Geographical Locations

### • Université Montpellier 1 Faculté de Pharmacie

15, Avenue Charles Flahault BP 14491  
34093 Montpellier, Cedex 5

### • Université Montpellier 2 Faculté des Sciences

Place Eugène Bataillon  
34095 Montpellier, Cedex 5

### • Ecole Nationale Supérieure de Chimie de Montpellier

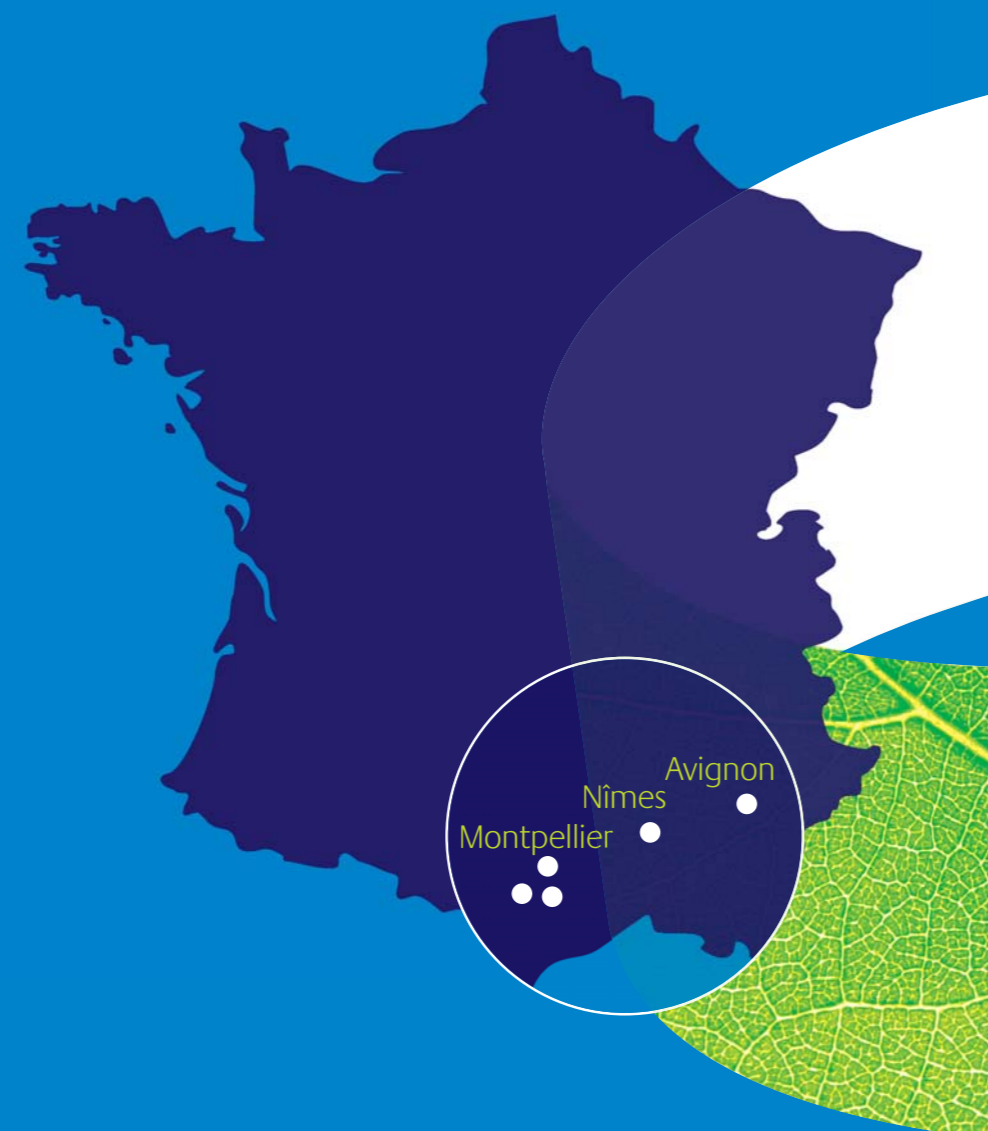
8, Rue de l'Ecole Normale  
34296 Montpellier, Cedex 5

### • CHU de Nîmes

Laboratoire d'Histologie-Embryologie-Cytogénétique  
Place du Professeur Robert Debré  
Avenue Kennedy, CS 83021  
30908 Nîmes, Cedex 2

### • Université d'Avignon et des Pays de Vaucluse Laboratoire de Chimie Bioorganique et des Systèmes Moléculaires Vectoriels

33, rue Louis Pasteur  
84000 Avignon



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# Research Areas of IBMM

## Chemistry of Biomolecules

### Multi-Step Synthesis of Bioactive Lipids, Antioxidants and Antimalarial Compounds

- Total Synthesis of Bioactive Lipids: Isofuranes, Neurofuranes, Neuroprostanes, Isoprostanes, Phytprostanes, Endocannabinoids Analogues
- Antimalarial Bis-Cationic Drugs and Prodrugs
- Nitrones and Nitroxides as Probes and Therapeutics

### Analogues and Components of Nucleic Acids

- Sugars, Heterocycles, Nucleosides, Nucleotides and Nucleic Acids Chemistry
- Nucleotides and Oligonucleotides Prodrugs
- Phosphorylated Effectors
- Site-Directed Delivery, Molecular Recognition
- Drug Analysis in Biological Media

### Amino Acids, Peptides and Proteins

- Amino Acids, Peptides and Glycopeptides
- Pseudopeptides, Peptidomimetics, Heterocyclic Scaffolds
- Stereoselective and Heterocyclic Synthesis
- Angiogenesis Sites Targeting Through Specific Peptides

### Biomolecular Organization

- Systems Chemistry: Emergency, Origin of Life
- Dendrigraft Poly-Lysines (DGL)
- Capillary Electrophoresis (CE)
- Synthesis of Fluorinated Compounds
- Synthesis of Hemi Fluorinated Surfactants

### Glycochemistry and Molecular Recognition

- Carbohydrate Chemistry
- Lectins Targeting
- Zinc Metallo-Enzymes Modulators
- Supramolecular Targeting of Drugs and Cosmetics

### Supramolecular Chemistry

- Glycorotaxanes
- Molecular Machines
- Molecular Knots
- Novel Approaches of Cell Targeting and Drugs Delivery

### Green Chemistry and Enabling Technology

- Catalysis
- Alternative Solvents
- Solvent-Free Synthesis
- Microwave Activation
- Mechanochemistry

### Molecular Modelling and Bioinformatics

### Artificial Biopolymers

- Biodegradable and Bioassimilable Polymers, Synthetic Biomaterials and their Biological Applications
- Biodegradation and Biological Fate of Polymers
- Macromolecular Prodrugs and Drugs, Drug Targeting
- Chemical Modifications of Polymers-Radiosynthesis
- Smart Polymeric Systems-Polyelectrolytes
- Glycosylated Based Amphiphilic Telomers for Membrane Proteins Studies

### In Vitro Pharmacological Studies

- Evaluation of Original Ligands Activity on Various GPCRs (Peptide Hormones...)
- Molecular Mechanisms Controlling the Function of GPCRs Receptors: Ligand/Receptor Interaction, Ligand Directed Selectivity in GPCRs Signalling, Receptor Interaction with Intracellular Partners, Conformational Diversity and Functional Selectivity, Receptor Dimerisation and Conformational Selectivity, Functional Analysis of Wild Type and Mutant GPCRs

### In Vitro Neuroprotection against Oxidative Stress

- Tocopherol-Induced Mechanisms
- Endocannabinoid-Mediated Mechanisms

### In Vivo Biological Studies - Neuroprotection

- Neurodevelopmental Consequences of a Prenatal Stress
- Prevention - Recovery - Prophylaxy

### Photobiology, Oncopharmacology and Pharmacotoxicology

- Melanoma Drug Resistance, UV and RCPGs (Melanocortin Receptors)
- UV and Skin Cancer, Photoprotection: Sunscreen Evaluation
- Proteasome and Carcinogenesis

### Nanocarriers and Therapeutic Targeting

- Carbohydrates for Drug Targeting
- Lysosomal Targeting for Enzyme Replacement Therapy
- Multifunctional Nanoparticles for Cancer Therapy
- Natural Extract Valorisation

## Biology and Pharmacology

## Synthesis and Analysis

### Research in Analytical Sciences of Biomolecules

- Mass Spectrometry and NMR Techniques
- Chromatography, Electrophoresis, Capillary Electrophoresis

### Solution Synthesis, Soluble Polymer-Supported and Solid-Supported Synthesis

- Automated Synthesis Platform
- Analysis Platform

## Biomolecules for Health and Environment

IBMM is one of the four Founder Institutes of the Pôle Chimie BALARD of Languedoc-Roussillon. The research and innovative activities concentrate on essential biomolecules such as lipids, nucleosides, nucleotides and nucleic acids, amino acids, peptides and proteins, glycosides, biopolymers, prebiotic molecules and fluorinated molecules. The research programmes conducted on biomolecules concern their design, their synthesis and their pharmacology. The related physiological and pathological mechanisms. They are also the essential precursor molecules for studying their related physiological and pathological mechanisms. They are also the essential precursor molecules for drugs of the future. The research activities of the IBMM are located at the interface between Chemistry and Biology. They aim to study and to understand the mechanisms of action biomolecules as well as the treatment of human and animal pathologies (infectious, cardiovascular, degenerative pathologies, cancer...) with applications in medicine of the future. Simultaneously, the applications of biomolecules cover vast fields such as cosmetology, agro food industry, nano and bio-materials, veterinary industry and environment-friendly agro chemistry within a sustainable development framework (green chemistry). The assets of the IBMM lie in the diversity of the skills, in the complementarity of the different research teams, in their international recognition, in the numerous academic and industrial collaborations developed and in its technology valorisation, innovation and transfer actions.

## Education Programs

- Master of Biomolecular Chemistry (UM1, UM2, ENSCM); Research Master of "Biomolecular Engineering"; Professional Master of "Applied Synthesis, Separation and Analysis" (SASA); Professional Master of "Strategies for Discovering Bioactive Molecules" (SDMB)
- Professional Master of "Cosmetics Aromas Perfumes Engineering" (ICAP)
- Professional Master of "Health Sciences and Technologies" (UM1, UM2, ENSCM) BIOLOGY-HEALTH, "Biomolecular Chemistry" and "Industrial Pharmacy"

## Technology Transfer Activities

- 7 Created Start-Ups (GENEPEP, COLCOM, Oleos, ART, MEDINCELL, S3F Chimie and AZASYNTH) and 1 Emerging (NanoMedSyn)
- 1 Technological Platform of Combinatorial & Automated Synthesis
- 1 ERT (Technologic Research Team "Drug Targeting")

## IBMM Analytical Platform

- Expertise: Macromolecules Analysis, Structural Characterization, Chemical Formula Determination
- Technologies: Nuclear Magnetic Resonance, Mass Spectrometry, Separation Techniques, Elemental Analysis, Chiroptic Measurements
- Equipments: 6 NMR Spectrometers from 200 to 600 MHz, 4 Mass Spectrometers (GC/MS, LC/MS, LC/MS/MS, MALDI/ToF-ToF), 4 Chromatography Systems (HPLC, UPLC, NanoLC, GC) Elemental Analysis (C/H/N/S/O Content Measurement), Polarimeter and Spectropolarimeter (Optical Rotation, Circular Dichroism, UV/Visible, Fluorescence Measurements)

