

GROUP ORGANIC CHEMISTRY 2 – GLYCOCHEMISTRY (GLYCO) – SYSTEMS CHEMISTRY (SYSCHEM) ICBMS - UMR 5246, UNIVERSITÉ CLAUDE BERNARD LYON 1 - CNRS - INSA LYON - CPE LYON

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The Organic Chemistry 2 laboratory is involved in carbohydrate, peptide, and nucleotide chemistry. We are particularly interested in applying fundamental principles of chemical reactivity, supramolecular chemistry, and systems chemistry to understanding the very rich chemistry, molecular evolution, and biology of these molecules.

Our team is part of the ICBMS, a synthetic chemistry and biochemistry research and teaching unit, working under the authorities of University Lyon 1, CNRS, INSA Lyon and CPE-Lyon (www.icbms.fr). It belongs to the Department of Chemistry and Biochemistry of the Faculty of Sciences and Technology, located on the La Doua Campus of the University of Lyon in Villeurbanne.

TOPICS & KEYWORDS

Organic synthesis – Organic Methodology - Biologically active compounds – Natural product Synthesis – Supramolecular Chemistry

- Systems Chemistry –Signal Transduction
- Glycolipids Glycoclusters –Bioconjugates

– Carbohydrates– Proteins – Nucleosides – Peptides –Synthetic cells

CARBOHYDRATE CHEMISTRY

Glycochimie Chimie Systémique

Developing new methodologies for producing novel carbohydrate and glycomimetic structures remains a fascinating and productive challenge for David Gueyrard. The richness of the stereochemical, structural, and electronic environment of carbohydrates provides an inexhaustible source of chemical insight, while our rapidly evolving understanding of the many biological roles of carbohydrates provides the motivation for the synthesis of new molecular tools and inhibitors.

TOTAL SYNTHESIS

Target-oriented synthesis remains an essential component of chemical innovation and training. Our group uses the structural and stereochemical elements of sugars as well as the innovative methodologies developed for carbohydrate chemistry for the synthesis of complex natural products.

SUPRAMOLECULAR CHEMISTRY

The design of macromolecules incorporating multiple saccharide copies on a central core scaffold provides novel glycoclusters, as designed by Seb Vidal. Their interactions with bacterial lectins prevent the adhesion of pathogen to host tissues for their applications in anti-bacterial therapies.

RNA & PEPTIDE SYNTHESIS

The synthesis on solid support of synthetic biomacromolecules is challenging because of the sheer size of the target compounds (7-15 nm). Their properties of folding into 3D structures are fascinating and can be used for example for drug vector purposes, or for the study of the evolution of primordial cells.

SYSTEMS CHEMISTRY

is the joint effort of prebiotic and supramolecular chemistry to find the roots of Darwinian evolvability in artificial chemical systems. We use phospho/glyco-lipidic vesicles as dynamic compartments for the enclosure of synthetic peptides and RNA.



hydrophilic hydrophobic 5'-GGGGCUCUU LAAALAAALAAALA-3'-ACCACCUCGAGGX-Fluo amphiphilic peptidyl-3'-RNA-5'



| EQUIPMENT

- > State-of-the-art organic synthesis facilities
- > Automated column chromatog
- > UV-Vis, IR and polarimeter
- > Automated solid support DNA/RNA
- synthesizer + conductometric detection
- Automated solid support peptide synthesizer + UV detection
- Analytical and semi-prep HPLC
- > Speed Vac concentrator
- > Confocal microscopy facilities

| EXPERTISES

- > Organic synthesis and methodology
- > Glycosylation reactions
- Inhibitor design and synthesis
- > Stereoselective reactions
- > Preparation of linidic vesic
- > Synthesis of macromolecules

COLLABORATIONS

The LCO2 was created in 1962, so named following V. Grignard's Laboratoire de Chimie Organique. The LCO2-Glyco group has strong collaborations with leading teams in France and around the world in carbohydrate science, organic synthesis, and medicinal chemistry. The group has also collaborations with industrial partners such as Elicityl and Sanofi.

The LCO2-SysChem group is part of a growing international research network on the emergence of complex chemical systems that aims at the construction of synthetic living cells.

RECENT PUBLICATIONS

"Rational Design and Synthesis of Optimized Glycoclusters for Multivalent Lectin-Carbohydrate Interactions: Influence of the Linker Arm." Chem. Eur. J. 2012, 18, 6250.

Total Synthesis of Bistramide A and Its 36[Z] Isomers: Differential Effect on Cell Division, Differentiation, and Apoptosis." Chem. Eur. J. 2012, 18, 7452.

"A hydrophobic disordered peptide spontaneously anchors a covalently bound RNA hairpin to giant lipidic vesicles". Org. Biomol. Chem. **2014**, 12, 6363 - 6373 "RNA as Major Component in Chemical Evolvable Systems" in: Chemical Biology of Nucleic Acids, Fundamentals and Clinical Applications, V. A. Erdmann, W. T. Markiewicz, J. Barciszewski (eds.), RNA Technologies (series), Springer 2014, pp. 1–24.

STAFF

Sébastien Vidal, Research Associate Pierre Strazewski, Professor Michele Fiore, Associate Professor David Gueyrard, Associate Professor Peter G. Goekjian, Professor Elisabeth Janvier, Administrative Assistant

1-2 Post-Docs 5-6 PhD Students 2-4 Graduate Students

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