

## New lab seeks supramolecular solutions for gene therapy

***A new EU-funded laboratory in Romania has given researchers a head start in applying the insights of supramolecular chemistry to biomedical applications such as gene therapy, tissue engineering and drug delivery.***



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‘Supramolecular’ chemistry is the study of weakly interacting assemblies of molecules. It has many potential applications in medicine as well as in materials science and catalysis. The focus of the EU-funded SupraChem Lab project is the design, synthesis and characterisation of supramolecular entities for biomedical applications.

The laboratory is part of the IntelCentre within the Petru Poni Institute of Macromolecular Chemistry in the Romanian city of Iași.

Marc Abadie, professor emeritus at the University of Montpellier, has been leading the SupraChem Lab team since 2017 as the current ‘ERA Chair’, a post created under the European Research Area to bring the expertise of distinguished scientists to the development of new research centres.

‘The challenges of the research we’ve undertaken were to set up a competitive research group and promote research of excellence for a better understanding of the mechanisms of medical therapeutic treatments involved in medicine, and ultimately to improve health care,’ he says.

### Gene therapy and hydrogels

One area of research concerns new ways to administer gene therapy. At present, genes are often delivered to their target cells by adapted viruses. The group is testing supramolecular non-viral ‘vectors’ using dynamic nano-frameworks and nano-structures.

Another area is research into hydrogels, versatile synthetic materials with many biomedical uses. Hydrogels based on chitosan, a carbohydrate polymer, are proving especially promising for tissue engineering and drug delivery.

‘For controlled delivery of drugs or other biologically active compounds, hydrogels must be sensitive to the most important stimuli in the human body, such as temperature, pH, ionic strength, glucose and biomolecules released by the organism in pathological conditions,’ Abadie points out.

The lab has strong links with the nearby University of Medicine and Pharmacy. ‘The medical school is renowned for its teaching and training of high-quality medical doctors,’ Abadie says. ‘The creation of SupraChem Lab is very important in such an environment and medical doctors and biologists have joined us.’

To assist the experimental studies, the lab has developed computer modelling and simulations of large-sized molecular structures and systems using different molecular dynamics and quantum mechanical techniques.

#### Challenges for research

‘One of our efforts and challenges is to understand the mechanisms of transport through tissues,’ Abadie says, ‘particularly in the therapeutic treatment of a disease where the active drug must be delivered directly to diseased cells without affecting healthy cells. As a result, smaller quantities of active substances can be used to treat the disease.’

‘Another challenge is to reconstruct damaged tissues by mimicking natural processes in cells and polymers, such as tissue engineering, self-healing, and so on.’

The lab also plays an important role in training future researchers, with 10 doctoral theses either completed or in progress. Students are also participating in international conferences and taking up internships in internationally renowned research groups.

In the few short years of its existence, the SupraChem Lab has made a solid start and Abadie is optimistic about the future. ‘At present, we are in the first phase of development of various protocols conducted in vitro. Further studies will concern in-vivo testing before future development. In the long term, our research will help in gene therapy, drug delivery, antimicrobial agents and markers for diagnostics.’

#### Project details

- Project acronym: **SupraChem Lab**
- Participants: **Romania (Coordinator)**
- Project N°: 667387
- Total costs: € 2 740 625
- EU contribution: € 2 465 620
- Duration: July 2015 to June 2020

#### See also

##### Project website:

[http://www.intelcentru.ro/suprachem\\_lab/](http://www.intelcentru.ro/suprachem_lab/)

##### Project details:

<https://cordis.europa.eu/project/rcn/197309/factsheet/en>

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