



## PhD Offer Microencapsulation and bioartificial liver



**Laboratory** : UMR CNRS 6600 Biomechanics and Bioengineering  
Research topic : From cell-material interaction to artificial organ

**Location** : Université de Technologie de Compiègne (Technological University of Technology, Compiègne, France)

**Research Supervisor** : Dr Cécile Legallais, Senior Researcher at CNRS  
[cecile.legallais@utc.fr](mailto:cecile.legallais@utc.fr)

**Title** : Hepatocyte encapsulation and culture in 3D bioreactors for further application in virology or for human transplant.

### **Description:**

Our laboratory has a wide expertise in culture of liver cell lines in 3D for temporary liver support (bioartificial liver), particularly through our biomechanical approach which aims at characterizing / optimizing the flow and mass transfer in bioreactors. We wish, in parallel, and following new collaborations proposed by clinical partners (Hepatic Physiopathology INSERM U632, Montpellier, on the one hand, and Laboratoire de Virologie, CHU Amiens, on the other hand) to address new application areas that require encapsulation and large scale culture of hepatocytes in 3D.

The objectives of the PhD thesis are to study the behavior of different liver cell types (new lines, primary cells, differentiated stem cells) in a controlled environment such as that offered by the alginate beads and home made bioreactors. The specifications for a bioartificial organ capable of hepatic cells culture depend on the applications: in virology, we aim at developing a more relevant model for in vitro culture of pseudo-virions from the virus Hepatitis C; for the transplantation of encapsulated hepatocytes, we first aim at offering the cells a three-dimensional environment, close to the liver organization, including possibly the extracellular matrix. Therefore, we need:

- To optimize the operating conditions for encapsulation (type of alginate, other biomaterials, composition, density, functionalization).
- To define the properties of diffusion and retention associated with these new matrices
- To characterize the mechanical behavior of the beads, in a bioreactor or after implantation
- To characterize the cells behavior and functions, depending on the type of cells and materials used.

### **Previous knowledge and requested competences :**

Master Degree (MS) in Bioengineering, biomaterials, cell biology. Interested in working with clinical teams. Good mobility (some of the work will be achieved with partner laboratories). English language can be used, the candidate is expected to be willing to learn French during the PhD.

**Financial support** : State-funded doctoral grants provided by the French ministry of Higher Education and Research, allocated to priority-subjects. 1633 to 1900 € brut/month, depending on the contract.