



Innovative multicomponent drug design (IMODE) for enhancing regional strategic advantages in pharmaceutical and biomedical applications

Funding source: European Regional Development Fund (ERDF)

Programme priority: 1. Technological and social innovation

Programme priority specific objective SO 1.2 Increase the delivery of innovation in smart specialisation sectors

Coordinator: Frédéric AFFOUARD (UMET, Université Lille1)

Duration: [1st July 2016 – 30th June 2020]

Total ERDF obtained: 3.6 million euros

Partners: Univ. Lille1 (France), Univ. College London (UK), Univ. Lille2 (France), Univ. Ghent (Belgium), Univ. East Anglia (UK), Immabiotech (France), Univ. Greenwich (UK), Eurasanté (France), Ashford & St Peter's Hospital (UK), Cubic Pharmaceutical (UK) and Roquette (France)

Associated partners: Fondation Digest Science (France), Univ. Cambridge (UK), NOVITOM (France), Fédération des Biomatériaux (France), Linkam Scientific Instruments (UK), Cyversa (UK) and Different Strokes (UK)

Staffs to be recruited: 10 PhDs, 5 postdoctoral fellows, 1 project assistant manager

Project summary:

The IMODE project is motivated by an unmet need for developing solutions to address societal challenges for improved healthcare, novel and effective medicines for various cardiovascular or digestive diseases which have inadequate or lack of treatment whilst maintaining low medical costs.

The challenging project goal is to integrate transdisciplinary research by involving academic research groups and enterprises to build upon and strengthen the creativity and innovation in order to create a strategic advantage for innovative pharmaceutical and medical applications within the 2 Seas Area.

The ability to deliver efficiently a drug to the patient strongly depends on its physical solid state properties. Most drugs are difficult to deliver because they are not water-soluble. This provides the impetus for developing new approaches to design new enhanced

pharmaceuticals. The use of multicomponent drug designs such as co-crystal or co-amorphous systems is an emerging area of interest worldwide with enormous potential. The complexity of pharmaceuticals compounds and their challenging specific properties (instability, difficulty to crystallize/amorphize) can significantly prevent successful industrial development. The IMODE project includes research for the development of multicomponent systems to: i) accelerate discovery of co-forms by developing fast syntheses and robust prediction tools, ii) develop novel advanced ready-to-use formulations and continuous manufacturing processes, iii) produce new medical devices loaded with bioactive molecules that respond better to the patients' needs and iv) accelerate preclinical validation with Mass Spectrometry Imaging. Formulations and medical devices will benefit from pharmacogenetics survey, pre-clinical trials with the potential to be directly adopted for industrial applications.

The challenging objectives of the project are highly multi-disciplinary in nature (material sciences, chemistry, biology pharmacy, medicine) and have required to reach a critical mass in terms of expertise, human resources and equipment which was not available until now in the 2 Seas Area.

Main expected outputs:

- Prototype of techniques for offline screening and inline processing analysis that allow: significant time saving for co-drugs screening and reducing costs since it requires very low quantities of drug.
- Design of new multicomponent drug-drug active ingredients in different physical states with optimized solubility and stability properties.
- Development of stable formulations using new different preparation and characterization techniques in line with the current regulatory guidelines including scale-up evaluation and preclinical trials.
- Development of bio-based matrix solid dosage form for oral controlled drug delivery
- Development of new medical devices prototypes with property of prolonged delivery of co-drugs elaborated from advanced techniques for the treatment of coronary artery diseases.