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Poster **#2** proposé par : **Nucleosyn**

New Modifications of Ionizable Lipids Creating Effective Therapeutic Compounds

Auteurs : ***Nicolas Chopin, Sébastien Picard, Florent Bodinier & Jean-Christophe Truffert***

Synthetic lipids have numerous desirable properties for applications in nanotechnologies. These compounds are used to prepare liposomes and lipid nanoparticles (LNPs) to encapsulate and deliver active pharmaceutical ingredients, such as nucleic acids, various drugs, vaccines, or even small molecules. A lipid nanoparticle (LNP) typically has a spherical shape with an average diameter between 10 nm to 1 µm. Different types of lipids are employed to achieve the desired composition for accurate and efficient delivery of the active ingredients, such as ionizable lipids (DODMA, ALC-0315, SM-102…), cationic lipids (DOTMA, DOTAP…), helper lipids (DSPC, ALC0159), cholesterol derivatives, and branched lipids. Nucleosyn produces and supplies a broad range of synthetic lipids from milligrams to multi-kilos quantities. In addition, developing new modifications of these lipids is crucial for creating increasingly effective therapeutic compounds. In this context, the expertise in custom synthesis becomes paramount for the development of various analogues characterized by modifications of the hydrophobic tail, the linker and the polar head. Here we present some examples of lipids provided by Nucleosyn and our custom synthesis strategy to generate innovative compounds.

Contact du poster : **Jean-Christophe Truffert**

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Poster **#3** proposé par : **Laboratoire LIENSs, UMR 7266**

Elaboration et étude de gélules ou microsphères à base de biopolymères d'origines végétales

Auteurs : ***Camille DABBADIE, Oussama ACHOUR, Jérémy CARPENTIER, Marie LETOURNEAU, Reynald BONNARD, Nicolas MICHEAUD, Zoulikha REZZOUG, Stéphanie BORDENAVE-JUCHEREAU, Thierry MAUGARD***

La gélatine animale issue du collagène (d'origine bovine ou porcine) constitue un ingrédient incontournable des industries nutraceutiques, pharmaceutiques et alimentaires. Associé à des réticulants chimiques, ce polymère est utilisé pour ses propriétés gélifiantes et filmogènes à des températures proches de l'ambiante. Cependant, son utilisation pose des contraintes liées à son origine animale, qu'elle soit sanitaire, éthique, religieuse ou associée au régime alimentaire. Dans un contexte éco-responsable, la substitution de la gélatine par des biopolymères d'origines végétales (marines ou terrestres) issus de ressources renouvelables, biocompatibles et biodégradables est un enjeu majeur. Nos travaux visent à associer des polysaccharides d'origine algale (carraghénanes), aux propriétés gélifiantes et filmogènes, et des protéines végétales (protéines de pois) aux propriétés émulsifiantes. La formulation polysaccharide-protéine retenue devra offrir des propriétés mécaniques et filmogènes équivalentes à celles de la gélatine pour la réalisation de microsphères ou de capsules softgels contenant un actif lipophile.

Contact du poster : **Camille DABBADIE**

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Poster **#4** proposé par : **Research PIECES**

Innovative preclinical models to dissect molecular, cellular & tissular mechanisms in a physiological 3D-living tissue environment

Auteurs : ***Amandine Roux***

Research PIECES is a startup of Biotechnology labeled Deeptech and based on the campus of the University of Poitiers. The goals of the startup are to understand the physiology and the physiopathology of the Central Nervous System (CNS) through Research, Development & Treatment to fight against neurological diseases and to study the impact of the environment on the CNS. For that, we provide biological and innovative systems to dissect molecular, cellular and tissular mechanisms in a physiological 3D-living tissue environment.

90% of potential therapeutic molecules fail in the clinical trials phases due to the lack of robust and translatable preclinical models. So, we develop customizable, preclinical models with the advantages of in vivo and in vitro without the disadvantages.

Our models are physiological, no artificial (versus organoid/bioprinting), dynamic (versus in vivo) and integrated (versus in vitro), allowing to generate robust and translatable results, close to human physiology and thus, avoid failing in clinical trial phases. As an alternative to animal models, they also reduce drastically the number of animals used in R&D, following the EU rule of 2030.

They can be used for early drug discovery stages, tests of toxicity and in many therapeutic areas, as neurodegenerative diseases (Parkinson, Dementia with Lewy Bodies, etc.) or cancer.

They can also permit to study the environment with the role of pesticides, or endocrine disruptors on the CNS. Our products/services are designed for all the researchers from Academia (CNRS, Inserm, etc.) to Pharmaceutical Industry (CRO, CDMO, etc.), and Army (as antidote to neurotoxins) and animal health (veterinary products).

Research PIECES has the innovation to find the future therapeutic molecules of tomorrow to cure neurological diseases as neurodegenerative diseases or cancer.

Contact du poster : **Amandine Roux**

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Poster **#5** proposé par : **IFREMER**

Innovative polysaccharides as matrices for encapsulation of lactic acid bacteria and antimicrobial peptides

Auteurs : ***Léna GUYON, Sandrine BONNETOT, Camille BORE, Elodie FONSECA NASCIMENTO, Méline CALATRABA, Laetitia KOLYPCZUK, Sylvia COLLIEC-JOUAULT, Delphine PASSERINI, Agata ZYKWINSKA, Christine DELBARRE-LADRAT***

This study explores the use of innovative polysaccharides derived from deep sea bacteria for the development of macro and microgels, aiming at the encapsulation of lactic acid bacteria (LABs). LABs and their metabolites such as bacteriocins are useful for the biopreservation of food to inhibit the growth of pathogens. Encapsulation of LABs or their antimicrobial peptides inside matrices may improve their stability and viability in hostile environment while ensuring controlled release of antimicrobial compounds.
Unique polysaccharides with novel chemical structures were identified and isolated from deep sea bacteria. Their anionic nature gives them innovative physico-chemical and biological properties. We obtained macro and microgels by ionic cross-linking in the presence of divalent cations through extrusion and emulsification (microfluidics) methods, respectively. Polysaccharide-based matrices were then used to encapsulate either Carnobacterium divergens, a LAB inhibiting Listeria monocytogenes and used as bioprotective strains for seafood products, or nisin, an antimicrobial peptide produced by Lactococcus lactis. Promising results were obtained for applications in food biopreservation and probiotic delivery systems for health benefits.

Contact du poster : **Léna Guyon**

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Poster **#6** proposé par : **IFREMER**

Encapsulation of growth factor loaded microgels into a thermoresponsive hydrogel based on a marine exopolysaccharide for tissue regeneration

Auteurs : ***Léna Guyon [1], Arnaud Fillaudeau [2], Corinne Sinquin [1], Méline Calatraba [1], Stéphane Cuenot [2], Sylvia Colliec-Jouault [1] and Agata Zykwinska [1]***

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[2] Nantes Université, CNRS, Institut des Matériaux de Nantes Jean Rouxel, France

Osteochondral defects are relatively common and appear with aging or as a result of trauma. If these injuries are untreated, they often evolve to osteoarthritis and ultimately lead to total joint replacement [1]. One promising strategy to regenerate osteochondral lesions is the use of the tissue engineering approach. Association of cells and signaling proteins, such as growth factors, with a biocompatible hydrogel may lead to the regeneration of the healthy tissue. In this context, the aim of the present study was to encapsulate Transforming Growth Factor-β1 (TGF-β1), used for cartilage regeneration, or Bone Morphogenetic Protein 2 (BMP-2), used to induce bone formation, into microgels. These microcarriers were used to enhance both growth factor bioactivity and bioavailability. To this end, a capillary microfluidic approach was applied. These microgels were then incorporated into a thermoresponsive hydrogel. Both microgels and hydrogel were based on infernan, a marine bacterial exopolysaccharide (EPS) endowed with glycosaminoglycan (GAG)-mimetic properties [2,3,4]. The microgels stability and growth factor release profiles were assessed. Different release kinetics from hydrogels were observed for free and microgel encapsulated growth factors. The biological evaluation of the bifunctional hydrogel loaded with growth factor microcarriers to repair osteochondral defects will then be assessed in vitro and in vivo.

Acknowledgment: Financial support was provided by ANR, the French National Research Agency within the framework of the SMARTIES project (ANR-22-CE52-0005).

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Contact du poster : **Léna Guyon**

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Poster **#7** proposé par : **SATT AxLR**

Formulations innovantes par micro-encapsulation de nématodes entomopathogènes pour lutter contre les insectes ravageurs de cultures ou vecteurs de maladies

Auteurs : ***Lina Ait Ameur, Aurélie Perrin, Julien Cambedouzou, David Cornu***

La France poursuit son objectif de réduction de 50% de l'utilisation des produits phytosanitaires dans l'agriculture d'ici à 2030. Les solutions alternatives restent peu nombreuses et leur essor se heurte à de nombreux freins, tels que la stabilité des matières actives sur le terrain. Pour répondre à ces enjeux, nous avons mis au point une technologie de micro-encapsulation d'actifs de biocontrôle dans un polymère d'origine naturelle. Cette technologie est adaptée à tout les actifs de biocontrôle dont des organismes vivants, micro- et macro-. La validation opérationnelle de cette technologie est réalisée dans le cadre de 2 programmes de recherche portant sur la formulation par micro-encapsulation de nématodes entomopathogènes (NEPs). Les NEPs sont des organismes parasites, naturellement présents dans le sol, connus depuis longtemps mais dont l'utilisation pour la protection des cultures reste limitée à des marchés de niche, en raison de leur fragilité sur le terrain. Nos travaux ont démontré notre capacité à protéger différentes espèces de NEPs en association avec des ingrédients actifs naturels, augmentant ainsi leur résistance et leur stabilité dans des conditions environnementales. Ces formulations seront prochainement évaluées sur le terrain sur différents modèles d'insectes ravageurs de cultures ou vecteurs de maladies.

Contact du poster : **Aurélie PERRIN**

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Poster **#8** proposé par : **OROXCELL**

In vitro prediction of the performance or equivalence,of different formulations of the same drug substance using a 3D reconstructed human intestinal tissue model : application to generics or drugs in development

Auteurs : ***Christophe DINI et Rola BARCHAM***

The BCS based regulatory biowaiver of clinical bioequivalence studies provides significant relief from the regulatory burden on the development of generic products as well as the ethical advantage of avoiding unnecessary exposure of healthy human volunteers. Over 50% of the world most used and essential oral, immediate-release drugs are estimated to fall into the BCS Class I and Class III classification, representing an enormous potential for companies developing generic formulations or managing the lifecycles of existing products to save money and time. In the context of in vitro studies, Caco-2 cell lines have become the most frequently used in vitro models to perform such studies. The present work evaluates a novel primary human cell-based 3D organotypic small intestinal microtissues to be a potential pathway for evaluating in vitro bioequivalence, but also using formulated API to estimate the impact of formulation in promotion of absorption and to make comparison of adult versus pediatric forms which are currently in development, at doses corresponding to those employed in clinics. The permeability coefficients across the microtissues were determined for a panel of benchmark drugs with known human absorption. The reference substances were accurately classified into low and high permeable drugs. The 3D organotypic Human small intestinal tissue model is eligible to elaborate a correlation curve according to BCS based biowaivers. The predicted fraction absorbed in human determined with the EpiIntestinal model was equivalent in both tested conditions, test adult form (capsule of 500 mg) vs. pediatric form (Sachet content of 500 mg). The object of this work is to give an insight into the added value that could bring the 3D organotypic Human small intestinal tissue model, over Caco-2 cells, for selecting appropriate formulations to improve systemic drug exposure or anticipate the impact of a change in formulation for generics or pediatric drug products.

Contact du poster : **Christophe DINI**

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Poster **#9** proposé par : **Lesaffre international**

New co-drying process of a mixture of bacteriophage and yeast product

Auteurs : ***Jean-Bernard Souici, Nathalie Claisse, Alan Israel, Edith Poulain, Renaud Toussaint, Hugo Roume, Mickaël Boyer***

Antibiotic-resistant infections present a serious health concern worldwide for humans, animals or plants and alternative treatment methods are needed. Bacteriophages (phages) are selective viral predators of bacteria. Abundant and ubiquitous in nature, phages can be used to treat bacterial infections (phagotherapy). The outcome of phagotherapy depends on phage titer and viability. However, bacteriophages have limited stability and undergo significant drops in phage titer during processing and storage. Also, they can be inactivated by harsh conditions such as pH encountered in human and animal gastrointestinal tract or UV-irradiation from sunlight on plant, rendering its application challenging. Little attention has been devoted to the effect of bacteriophage formulation on phagotherapy outcomes. We report here a new process to produce solid and stable entities using a new bacteriophage and yeast or yeast derivative co-drying process.

Contact du poster : **Nathalie CLAISSE**

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