**NextFoodPack project: Integrated design and evaluation of new-generation packaging to protect perishable food products**

Thị-Thanh-Trúc Phùng 1, Emmanuelle Gastaldi 2, Felipe Buendia 3, Sandra Domenek 3, Jean Mario Julien 4, Louis Coroller 5,  Valérie Stahl 6,  Yvan Chalamet 7, Alain Guinault 8, Yvan Le Marc 9, Benjamin Duqué10, Thomas Karbowiak 1

1 Université Bourgogne Europe, Institut Agro, INRAE, UMR PAM, F-21000 Dijon, France

2 Université de Montpellier, Institut Agro, INRAE, UMR IATE, CIRAD, F-34000 Montpellier, France

3 Université Paris-Saclay, INRAE, AgroParisTech, UMR SayFood, 91120, Palaiseau, France

4 LNE, National Laboratory of Metrology and Testing, F-75015 Paris, France

5 Univ Brest, INRAE, Laboratoire Universitaire de Biodiversité et Écologie Microbienne, F-29000 Quimper, France

6 Aerial, Technical Institute in Food Industry, F-67400 Illkirch, France

7 Université Claude Bernard Lyon 1, INSA Lyon, Université Jean Monnet Saint-Étienne, CNRS, IMP, F-69622 Villeurbanne, France

8 PIMM, Arts et Métiers Institute of Technology, CNRS, Cnam, F-75013 Paris, France

9 ADRIA, Technical Institute in Food Industry, F-29000 Quimper, France

10 ACTALIA, Agri-food research and innovation center, F-50000 Saint-Lô, France

*\*presenting author*

Thomas Karbowiak 1

**Abstract:**

The ambitious goal of France's anti-waste law No. 2020-105 is to drastically reduce the use of single use plastics by 2040. While this target can be met for rigid plastic packaging through mechanical recycling, this recycling method is not yet sufficiently mature for flexible plastic packaging, which accounts for 45 % of all food packaging. In this case, the only way to achieve a reduction is to replace flexible plastic films with more sustainable solutions, such as paper-based materials, monomaterial films, and bio-based compostable blends.

In addition, the new European Packaging Packaging Waste Regulation (PPWR), adopted on April 24, 2024, sets a target of 55% packaging recycling rate by 2030. A key sector is modified atmosphere packaging (MAP) for perishable foods, such as meat and cheese, which represents a $15.9 billion market growing at a rate of 4.8% per year. MAP technology requires high gas barrier properties, necessitating major innovations. Current alternatives remain insufficient, and more in-depth assessments of health safety are needed, particularly for managing microbiological and toxicological risks.

**The main objectives of the NextFoodPack project are:**

* to design and optimize new flexible packaging able to meet the multiple requirements of MAP in terms of barrier properties, chemical and microbiological safety and whose end-of-life could be managed by developing innovative processes combining recycling and decontamination.
* to generate fundamental knowledge about formulation and generation of degradation products during processing and use, enabling a solid evaluation of toxicological safety using biotests able to evaluate cocktail effects, and original methods for rapid toxicological assessment.
* to create a software tool to manage microbiological risks and predict food shelf life in MAP.
* to develop an optimization tool integrating technical, environmental, health, safety, and social criteria to support the food and packaging industry make decisions to propose tailored and sustainable MAP for each specific use case.

**Acknowledgement**

This work was conducted from the support of the French government “Investissement d'avenir” program integrated to France 2030, bearing the following reference ANR-24-EMCO-0001.