Innovative packaging from farm to fork

Why:
The delivery of safe food from the producer to the consumer is a key priority for industry and authorities. It requires meticulous monitoring at every stage in the supply chain “from farm to fork”. Packaging plays a crucial role since its most important functions are preservation and protection of food.

- The industry needs effective packaging systems to preserve the food safely during distribution and storage while maintaining the food quality, along with increasing demands of the consumer for fresher, minimally processed, more convenient and safer foods.

- This leads to the need for developing innovative and safety modern packaging that have never been used and are produced by new processes. So there is the need to ensure the safety and benefits of such food packaging solutions can bring.
The role of packaging is, in most cases, a rather passive and inert one but during last decades the idea of active and intelligent packaging has got more attention and many commercial products are introduced and used in the food area.

**Active food contact materials** are intended to extend the shelf life or to maintain or improve the condition of packaged food. They are designed to deliberately incorporate components that would release or absorb substances into or from the packaged food or the environment surrounding the food.

Polymers are appropriate materials for the development of active structures thanks to their mass transport characteristics: permeation, sorption and migration. The active components can be incorporated into the package walls by diverse procedures. From there, the active agent can be released into the food or headspace to make their beneficial action, can remove food or headspace components which are sorbed into the polymer matrix or act by food contact.
On the other hand, **intelligent food contact materials** are intended to monitor the condition of packaged food or the environment surrounding the food.

Intelligent packaging systems can provide rapid, low cost, package integrated ways to determine the quality of food in consumer packages throughout the logistics chain from producer to consumer. For instance, total volatile basic nitrogen compounds (TVBN) have been recognized as indicators of seafood spoilage. In the case of other fresh products such as fresh chicken, volatiles produced by *Brochothrix thermosphacta* or *Clostridium perfringens* could be also monitored.

Combination of natural antimicrobial (active) and intelligent functions in packaging seems to be a really innovative and safe solution to achieve a proper preservation of fresh products and to prolong their short shelf life improving its quality. NAFISPACK will develop novel packaging solutions by addressing all packaging aspects within the supply chain.

**“Packaging plays a crucial role since its most important functions are preservation and protection of food”**

**from farm to fork**

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Objective

The project has two main objectives:

Development of innovative and safe packaging systems in order to increase fresh product shelf life by using two novel packaging technologies: antimicrobial active packaging and intelligent packaging for fresh fish, chicken, and minimally processed vegetables (MPVs).

Development of a safety assessment methodology that includes the chemical characterization and toxicological profile of intentionally and non-intentionally added substances present in these new packaging materials and that might migrate to the foodstuffs. Additionally microbiological studies are also included.

These packaging systems will satisfy European food safety policies, functional and marketing requirements, and will accomplish environmental, cost and consumer demands. This project aims at assuring the safety and quality of foodstuffs through the supply chain.

NAFISPACK will contribute to EU Framework Regulation regarding safety assessment and will help to fulfill the regulatory gap regarding active and intelligent packaging. The purpose is to supply proposals for advice to concerned parties, such as legislators, food inspectors and industry.
Project structure

The project is divided in 7 technical work packages:

- **WP1**: Sustainability of natural antimicrobials
- **WP2**: Active materials development
- **WP3**: Packaging system design
- **WP4**: Food safety
- **WP5**: Food Quality and shelf-life
- **WP6**: Intelligent packaging
- **WP7**: Environmental and social impacts
Work packages main objectives are:

**WP1. Evaluation of suitability of Natural Antimicrobials and their selection**
Selecting the natural antimicrobial (NA) substances for target microorganism, target food and the chosen packaging materials, having the highest possibilities of being successfully incorporated in final package and being effective in real applications.

**WP2. Development of effective active materials**
Developing polymeric active materials which contain the antimicrobial agent selected or polymers, which are antimicrobial by themselves.

**WP3. Packaging system design**
Design and up-scaling of packaging process systems for the polymer/NA additive systems. The implementation preparations will be performed together with industrial partners.

**WP4. Food safety: Chemical, toxicological and microbiological risks assessments**
Testing the new antimicrobial and the new intelligent packaging solutions developed for different chemical, toxicological and microbiological risks.

**WP5. Food quality and shelf life**
Providing information related to the effectiveness of the new packages developed in fresh fish, fresh chicken and minimally processed vegetables and evaluation of quality changes taking place in the food product during storage.

**WP6. Intelligent packaging**
Critical evaluation of pre-existing and new knowledge about chemical metabolites indicating the quality of the packaged product. The association between the quality and the metabolites will be also established.

**WP7. Evaluation of environmental and social impacts**
Evaluation of recyclability and re-use possibilities of the developed products. Life cycle assessment will be used to improve waste materials management through recycling or reusing processes.
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<th>Partners</th>
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