

# ActInPak

## Biodegradable, active PLA-based food packaging

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COST FP1405

ACTIVE AND INTELLIGENT FIBRE-BASED PACKAGING – INNOVATION AND MARKET INTRODUCTION

7-9 November 2017, Tzuba Hotel, Judean Hills, Israel



COST is supported by the EU Framework Programme Horizon 2020

# Multifunctional PLA-based materials

*Co-axial electrospinning or emulsion techniques were applied for encapsulation/deposition of nanostructured (core shell) bioactive compound systems (Chitosan/Vitamin E/vegetable oils embedded in/or coated onto plasticized PLA substrate. Core – shell nanostructures protect labile compounds during processing at elevated temperature and pressure*

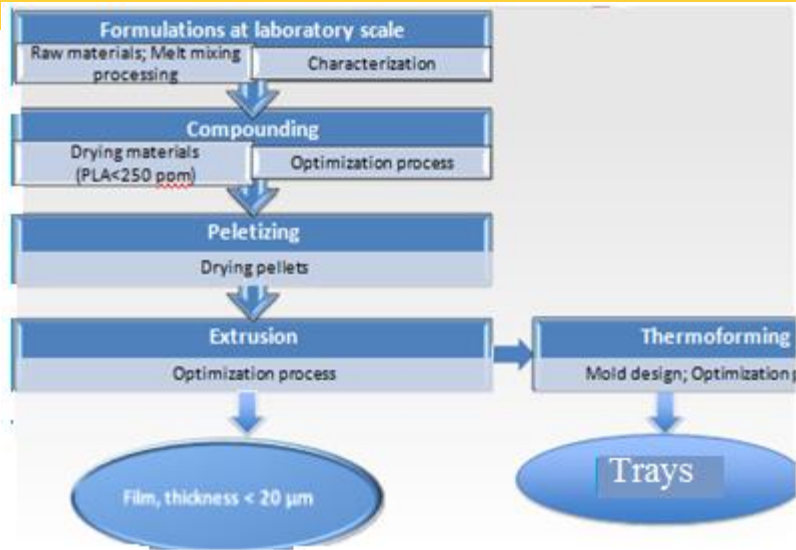
- **I. Antimicrobial/Antifungal:** improved shelf-life of the **minced poultry meat, fresh beef meet, fresh curd cheese and apple juice.**

Antimicrobial against: gram positive *Listeria monocytogenes*, *Bacillus cereus* and gram negative: *Salmonella typhimurium*, *Escherichia coli* pathogenic bacteria.

Antifungal: (*Aspergillus brasiliensis* ATCC 16404, *Penicillium corylophilum* CBMF1 and *Fusarium graminearum* G87) activity was close to 100%

- **II. Antioxidant:**  $IC_{50}$  higher than 20%
- **III. Barrier properties:** OTR at least 7 times lower; improved WVTR and carbon dioxide TR
- **IV. pH – Responsiveness:**  $pH_c \approx 6$
- **Overall migration values** in simulated media for PLA/plasticizers/CH/vegetable oils/CB nanoclay samples ( $mg/dm^2$ ) **<10  $mg\ dm^2$**  below required limits by regulation (EU) no. 10/2011.
- **Degradability:** under *Phanerochaete chrysosporium* fungus and *Trichoderma viride* action and by soil burial test
- **Chitosan/vegetable oils show synergistic activities.**

# Micropilot scale



Chicken breast packed in PLA-based trays and film

**Satisfactory physico-mechanical and thermal properties; Good sealing properties;**

**Degradability:** The materials and their soil burial degradation products do not show ecotoxicity or phytotoxic effects and moreover the contents of some elements (phosphorous: initial soil/after degradation 182/259 ppm; potassium 2260 /4540 ppm; chlorophyll 123/152mg) in soil had increased values.

**Microbiological analyzes** showed that the microbial load of the packed samples had lower values compared with the control mainly for those in contact with the PLA film covered with chitosan and rosehip essential oil by electrospinning, demonstrating that these materials have the potential to slow the development of microorganisms in tested chicken meat. **Self life increased with ~ 40%.**

*Market study performed in the framework of some multinational projects reveals that the environmental problems encountered forced producers to think to include degradable materials in packaging production [www.actibiosafe.ro, [www.n-chitopack.eu](http://www.n-chitopack.eu)] which should not have impact on environment.*



## ACKNOWLEDGEMENT

This work is based upon work from COST Action FP1405 ActInPak, supported by COST (European Cooperation in Science and Technology)

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