PUBLISHABLE SUMMARY

1.1 Background

The main scope of the MEATCOAT Project is the development of a new functional antimicrobial edible coating for meat packaging that can improve the integrity and safety of fresh products and replace part of the less efficient and recyclable plastic packaging used today. In addition, the proposed system will be able to increase shelf-life of every single product due to their antimicrobial characteristics.

The proposed project aims at helping mainly the big community of SMEs that compose the fresh food industry (and particularly fresh meat sub-sector), to recover part of its declining competitive advantage by developing a new concept of edible coating that enables a better preservation and quality of meat products and a longer shelf life in the market.

Secondary, this project will also benefit two other sectors dominated by SMEs: the coating manufacturers (in especial food coating producers), who need new products to launch to the market, and the food retailing and restaurant sectors. The former is mainly made up of SMEs and high added value (knowledge-based) innovative products can provide them with a sufficient competitive advantage to remain competitive and support their growth. The latter has both large and small business but the small the ones that are more suffering due to deficiencies of present packaging systems.

All these communities represent mature sectors in Europe, they create annual revenues valued in about €40.5 B and require continues effort in research and development in order to get new process and products that make able to differentiate in a very competitive market in order to attend the consumer demand with increasing level of quality exigency.

A huge amount of fresh meat is disposed every-day from market selves. Better ways of preservation would avoid this and produce huge saves in the full supply chain. In addition, there exists significant social, political and legislative pressure to develop new products based on renewable sources that can replace present oil-based plastics whose recycling activity is not yet sufficiently efficient and cheap. EC legislation is trying to curb the landfill disposal of recyclable or non-recyclable plastics arriving today to land fields, by encouraging the development of new products replacing recyclable or non-recyclable plastic packaging, as MEATCOAT proposes with a natural coating that can help in reducing the use of plastic packaging.

Regarding environmental issues, several European Environmental regulations are in place, which are heavily influencing packaging development in the EU. The Packaging Directive 2004/12/EC sets out recycling and recovery targets to be met by 2008. As a result there are high levels of innovation in green packaging including lightweight and bio-based packaging materials. On the other hand, all new developments and innovations in the packaging industry will have to meet the current European standards and regulations for food contact materials, safety and public health (Regulations EC1935/2004, EC2073/2005 and EC 450/2009), as well as the requirements of the REACH -Registration, Evaluation and Authorization of Chemicals- legislation. This fact arises as one of the main challenges of this project.

MEATCOAT has developed an innovative edible bio-based packaging system with antimicrobial properties to extend the shelf life of fresh meat products. The creation of a protective skin film barrier on the food surface slow down the oxidation processes and avoid the bacterial growth in the meat surface, enabling an enhanced preservation and

quality of the food and safety in the consumer. This edible film is developed mainly natural renewable compounds which constitute an inexpensive and reliable source of raw material for the formulation of edible coatings.

1.2 Project Objectives

The aim of MEATCOAT project is to develop an antimicrobial edible coating directly applied to the fresh meat or meat products, providing a substantially longer shelf life to the meat and complying with the following requirements:

.- Total cost of packaging materials cheaper that present solutions (saving outer multilayer film and controlled atmosphere gas compensates the extra price of the edible coating for packed meat, and prolonged shelf life compensates by far the use of the coating and the spraying system on retailers and restaurants).

.- Usable or integrated with present equipment (controlled atmosphere equipment).

.- Avoid organoleptic modifications to the food (i.e. transparent, inodorous, unflavoured or interact chemically with the meat enzymatic components, etc.

Scientific Objectives:

.- To improve the State of the Art about the suitability of peptide compounds, and their derivatives, as raw material for edible coating formulation. Determination of suitable peptide sequences.

.- To develop a new formulation from self-assembly peptide poly-ion complex hydrogel and composites material for food applications.

.-To increase present knowledge of the effect of additives on mechanical and gas barrier properties on edible films and composites developed from peptide materials, and their biodegradability.

.-To raise the scientific comprehension of the effect of this edible peptide based self-assembly peptide hydrogel, and composites thereof, on microorganism's growth, oxidative stability, package gas concentration and other shelf life factors for fresh meat packaging.

.- To establish the effect on microbiological growth of edible films intended for the use on fresh meat material.

Technological Objectives:

.- The formed films with the achieved material should have good mechanical properties, film forming properties and low water vapour and oxygen gas permeability. See below desired properties of final coating:

Water vapour transmission rate (g/m^2)/24 h: <60.

Oxygen transmission rate: (g/m^2)/24 h: <200.

Tensile Strength: 14 MPa.

Impact Strength: >70.

Haze: 3%.

Light Transmision: 80%.

.- The developed edible film is microbiological active against common bacterial that provoke the meat spoilage such as Pseudomonas, Brochothrix Thermosphacta, Escherichia Coli, etc. The provoked log reduction (CFU/g) on these microorganisms is 2 log.

.- The developed material should allow increasing the shelf-life of the product more than 3 days compared with conventional meat packaging.

1.3 Project Progress (2nd Period)

MEATCOAT project was officially started on the 1st of December 2011. The project is structured into nine work packages and the planned duration is 30 months. During the 1st period, work focused on the study of suitable hydrogels based on synthetic peptide sequences and natural proteins blended with biopolymers. Besides, formulation and characterization of edible composite based on achieved hydrogels has been started.

During the 2nd period the work continued with the selection of an optimal hydrogel-based composite coating. The core formulation was complemented with active substances, able to provide antimicrobial and antioxidant properties, and led to an active edible composite, which was fully characterized and tested in its properties. Finally, studies on application and validation of the proposed solution took place.

Next, the most remarkable results achieved up to date are presented:

- Design of edible composite film formulation. Several components have been tested to study the effect on the properties of edible coating: proteins, polysaccharides, plasticizers, barrier enhancers, emulsifier, antioxidant, antimicrobial, gelation aids, crosslinking agents, etc.
- Optimization of the characterization tasks of the edible composite films.
- A good compatibility of the components and additives has been achieved.
- Settlement of a procedure for the preparation of edible composite films.
- Formulation and characterization of edible composite films.
- Study of coating application on meat surfaces.
- Formulation of antimicrobial edible coating.
- Study the antimicrobial activity and active coating application on meat surfaces.
- Sensory, Optical and mechanical characterization of active edible coating.
- Study of degradability, antioxidant activity and moisture barrier of the final composite. Identification of potential hazards of edible films.
- Coating application. Technology integration and validation.

1.4 Consortium Members

List of participants:

Participant Legal name	Partner Short name	Country
Asociación para la Investigación de la Industria Cárnica de La Rioja	CTIC	ES
European Livestock and Meat Trading Union	UECBV	EU
Romanian Meat Association.	ARC	RO
IFIP Institut du Porc	IFIP	FR
Diasa Industrial S.A.	DIASA	ES
1&1 Pulspack e.k.	PULS	DE
Pepceuticals Ltd.	PEP	GB
NEAL S.A.	NEAL	ES
Tecnologías Avanzadas Inspiralia.	ITAV	ES
SP, Technical Research Center of Sweden.	SP	SE

1.5 Project Contact and Logo

Emilio San Martín García
Centro Tecnológico de la Industria Cárnica de La Rioja (CTIC)
Ctra. nacional 120, Km 22,8, 26315, Alesón (La Rioja)

España

E-mail: esanmartin@ctic-larioja.es
Web: http://www.meatcoat.eu/