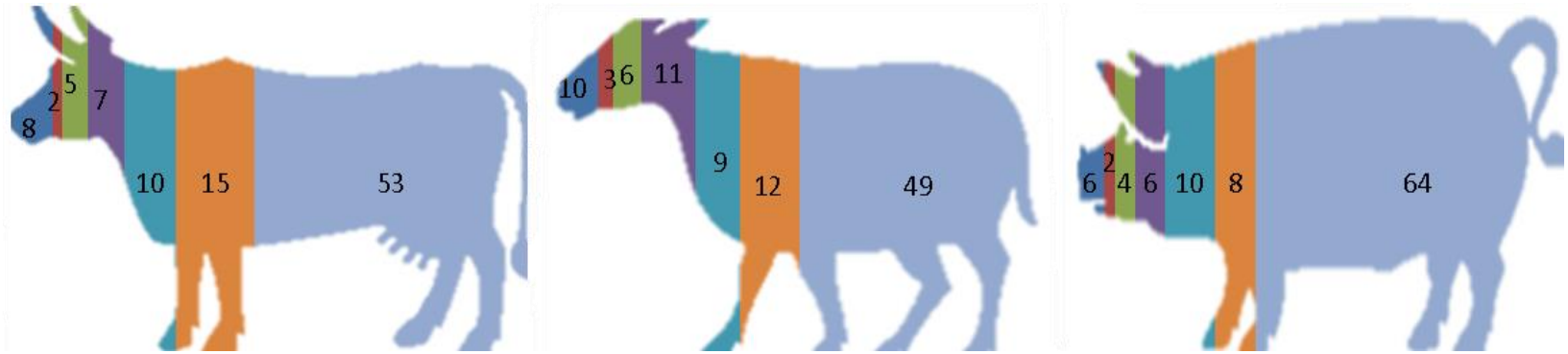
Exploring higher value opportunities for meat processing co-products.

Dr. Anne Maria Mullen & Dr Carlos Alvarez
Teagasc Food Research Centre, Ashtown, Dublin 15
anne.mullen@teagasc.ie
All Ireland Meat Science Conference 2019, AFBI, Belfast

teagasc
Agriculture and Food Development Authority

Meat co-products



(Mullen, Álvarez et al. 2015)

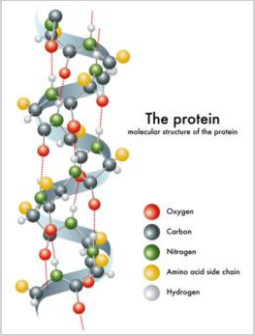
Many sources of protein rich co-products arising from fresh meat production

Other activities also produce co-products or side streams containing proteins…

exudates, cook-out, stickwater etc

Relevance to bioeconomy

- Increasing demand for protein rich food
  - Population growth projected to reach 9.1 bn by 2050
- Requirement for:
  - New or alternative protein sources
  - Optimising output from existing resources – circular economy



- Meat production increase projected: co-products (non-meat components) represent a large proportion live animal weight.
- Protein rich resources

- Many readily available and under-utilised, fit for human consumption and containing high amounts of protein, essential amino acids, vitamins, minerals, antioxidants, and bioactive peptides
- Established system (incl. safety controls) already in place
- **Best value/sustainable**

High value opportunities

- Co-products are protein rich sources
- Needs to be driven by desire to utilise co-product in its entirety: avoid generating more waste
- Properties and functional activity will determine application
- Functional properties will be influenced by processing conditions

APPLICATIONS for proteins derived from co-products

- Food
  - Ingredient (binder, emulsifier, foaming, gelling etc)
  - Protein enhancer: fortified foods
  - Supplement: iron source, naturally occurring bioactive compounds (taurine, carnitine, carnosine, creatine..)

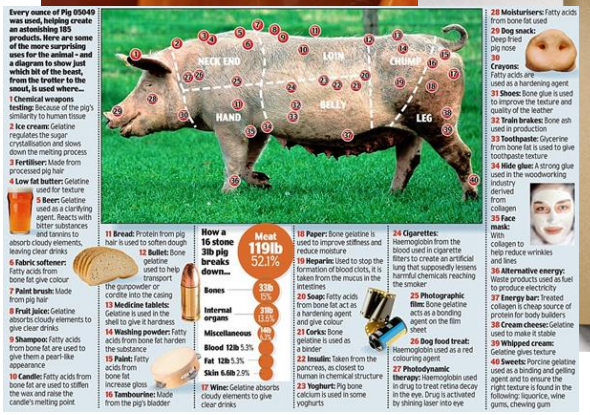
- Feed and pet food
  - Fish farms
  - Piglets
  - Broilers

APPLICATIONS for proteins derived from co-products

- Non-food applications
  - Biomedical: cell growth scaffold, wound repair, tissue engineering, valves for surgery,
  - Pharma: bioactive peptides as anti-diabetic, antithrombotic, antihypertensive, heparin, hormones, bile
  - Flocculants: for lignin or kaolin recovery
  - Packaging: gas barriers, water vapour barrier, petrol-based plastic replacement
  - Research/Diagnostics: cell culture media, BSA standard

Peptan®

Collagen peptides
for a healthy lifestyle

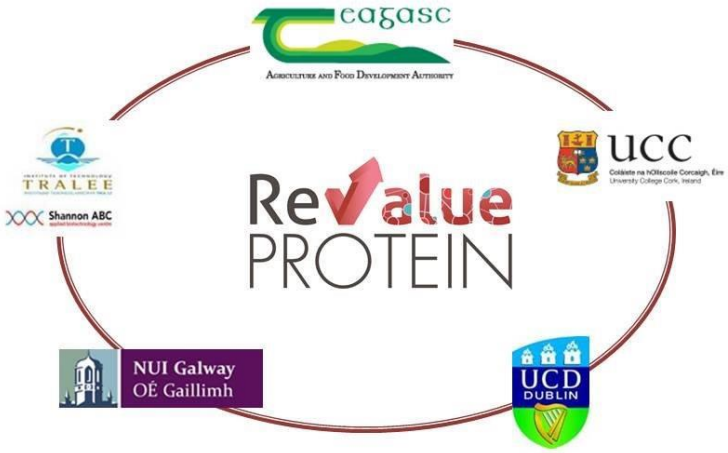


Recovery of value from co-products

- IRISH research approach…

ReValue Protein Project

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

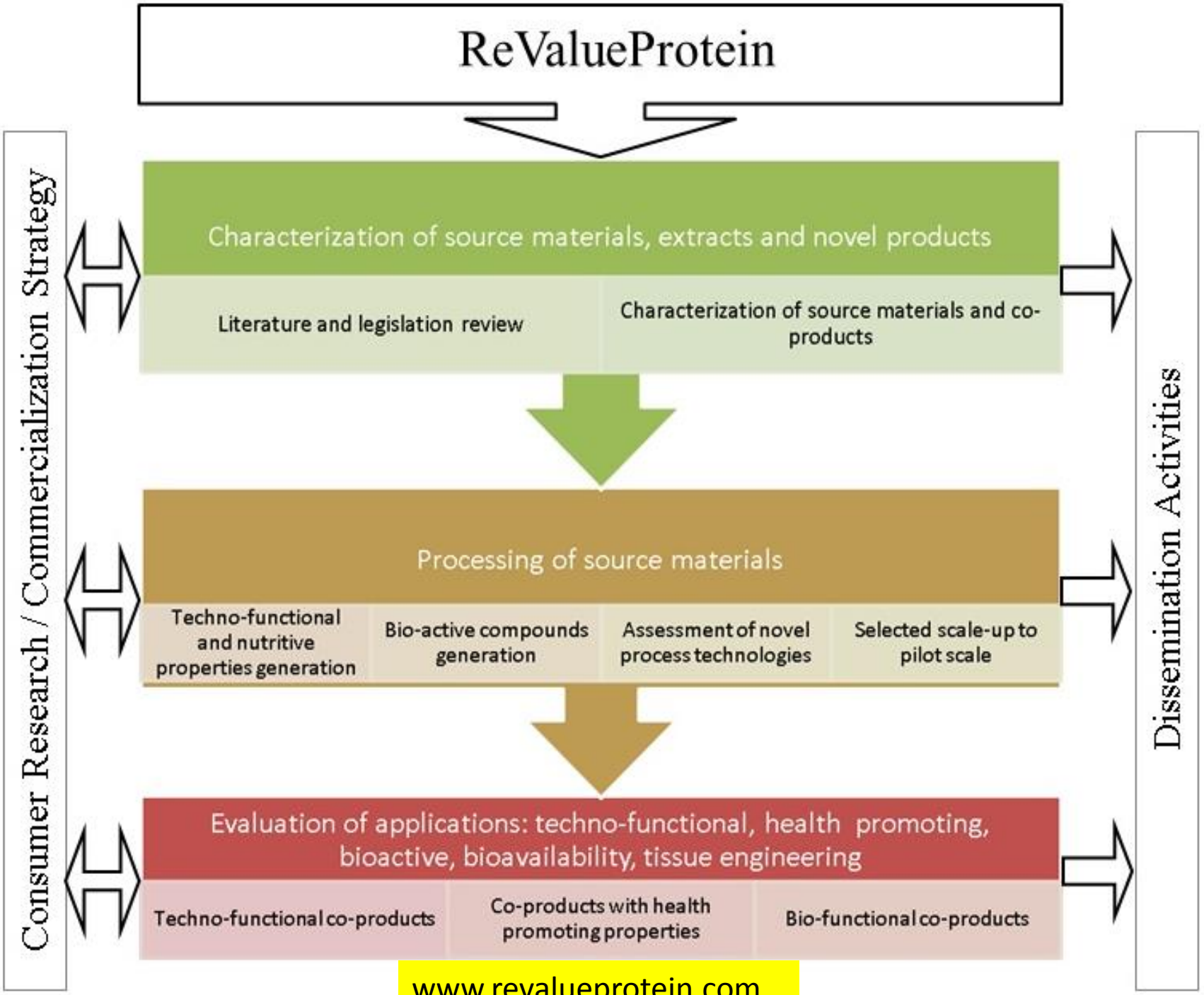


First Irish co-ordinated approach

Multidisciplinary team

Comprehensive review of source materials and opportunities from an Irish perspective

Project Co-ordinator, PI: Dr Anne Maria Mullen, anne.mullen@teagasc.ie
Research Officer: Dr Carlos Alvarez, carlos.alvarez@teagasc.ie


ReValueProtein
Consumer Research / Commercialization Strategy
Characterization of source materials, extracts and novel products
Literature and legislation review
Characterization of source materials and co-products
Processing of source materials
Techno-functional and nutritive properties generation
Bio-active compounds generation
Assessment of novel process technologies
Selected scale-up to pilot scale
Evaluation of applications: techno-functional, health promoting, bioactive, bioavailability, tissue engineering
Techno-functional co-products
Co-products with health promoting properties
Bio-functional co-products
Dissemination Activities
www.revalueprotein.com

Co-products sampled and characterised

Samples have been collected from different abattoirs across the country, or produced in Teagasc facilities.

- Red offal (lung, tongue, heart)
- Glue water
- Stick water
- Blood
- Cook-out
- Exudates
- Brine solutions
- Tendons
- Pancreas
- Cartilage

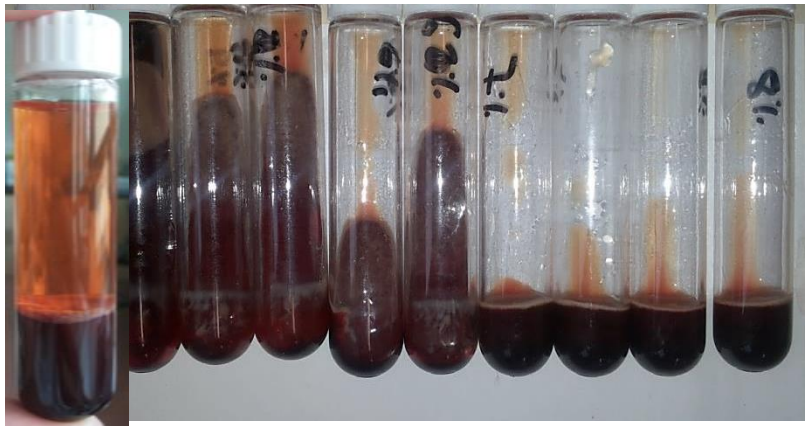
Variety of technologies considered

- Influenced by target protein(s) and target functionality
- Extraction: acid/alkaline, enzyme, US, PEF, HPP…
- Purification / concentrating: membrane filtration, elecro-dialysis, chromatography…
- Stabilisation: raw material, extracts, final product: temperature, drying, encapsulation, packaging etc

Functional properties of proteins

- Sources: blood, lungs, glue water, exudates, brine, hide
- Modelling approach to optimising functional lung protein extraction
- Emerging technologies assessed for enhanced extraction: ultrasound, pulsed electric field
- Proteins with good techno-functional properties identified
  - Emulsifying
  - Solubility
  - Gelling
  - WHC/OHC
- Tested in real food systems
- Scale up of selected processes

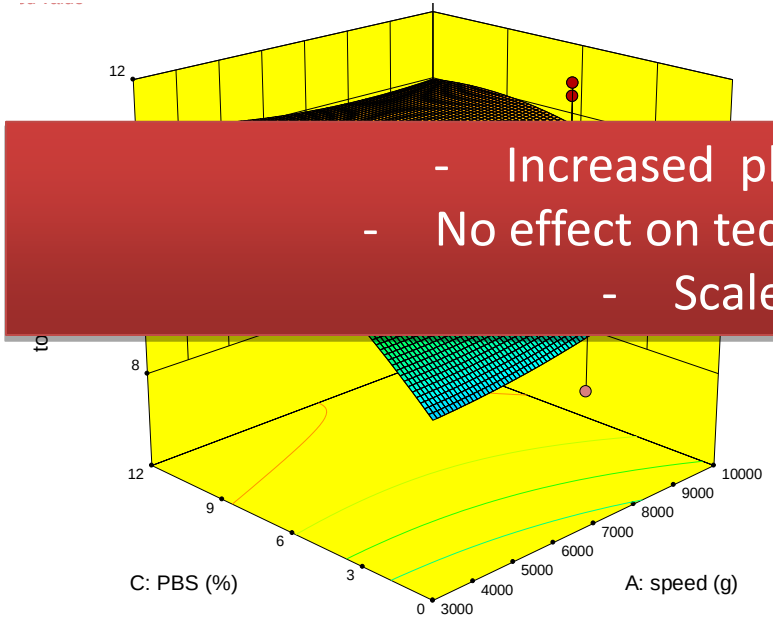
Blood: Improved plasma separation for higher value applications

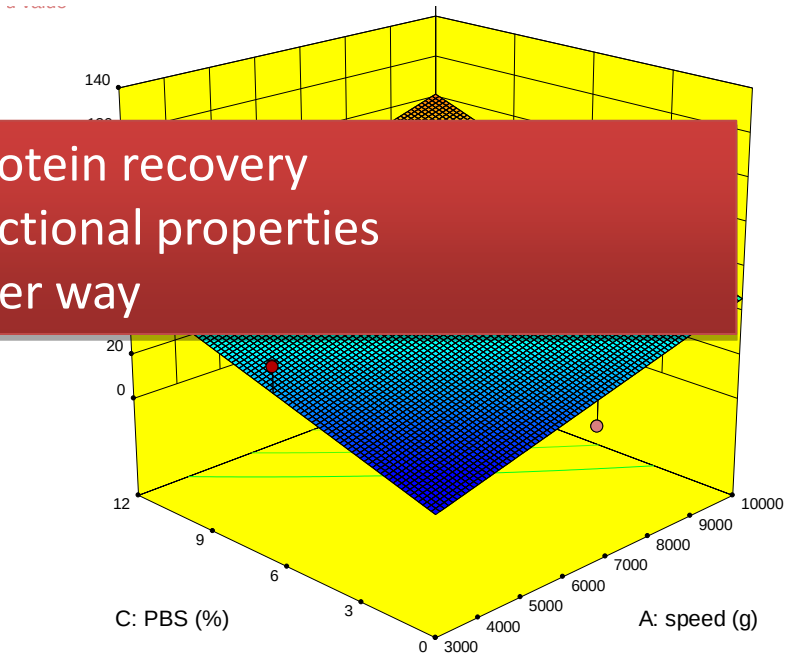


Pellet consistence of blood samples: control left side and treated samples on right treated

Difference between control and treated sample after centrifugation using large volume samples.

- Increased plasma protein recovery
- No effect on techno-functional properties
- Scale-up under way

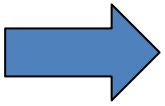




Recovery of gellifying proteins from fat rendering residue (glue water).

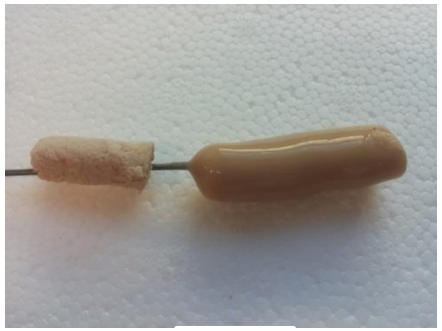
Dried glue water
Very high salt content

Excellent gelling agent



Gel free of salt

Gel stable when soaked
Salt diffuses out



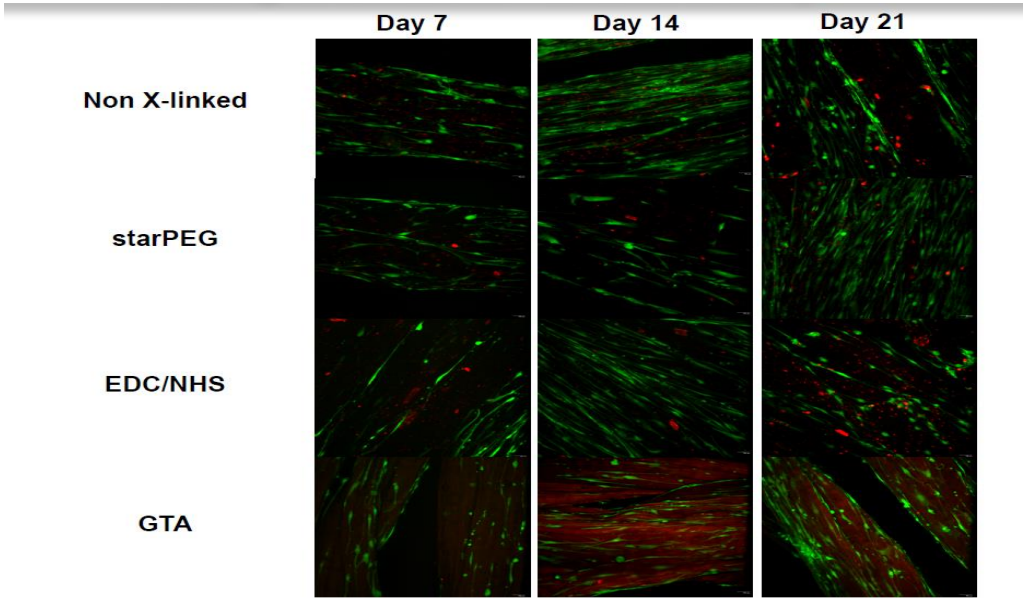
Five days

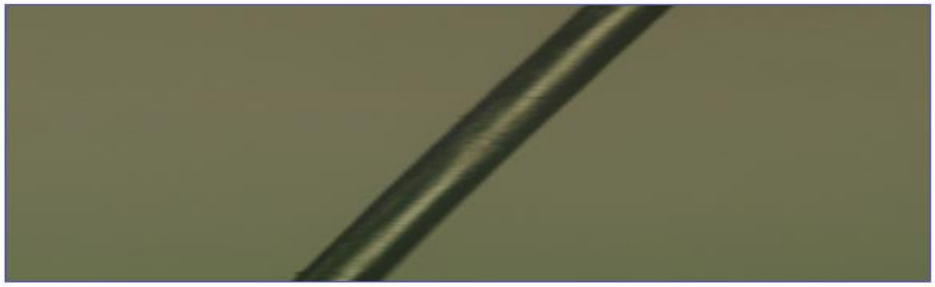
Collagen fibres: biomedical applications

OÉ Gaillimh
NUI Galway

Applications:

- Scaffold for cell growing
- Material for wound repair
- Drug delivery
- Cell culture systems
- Tissue engineering

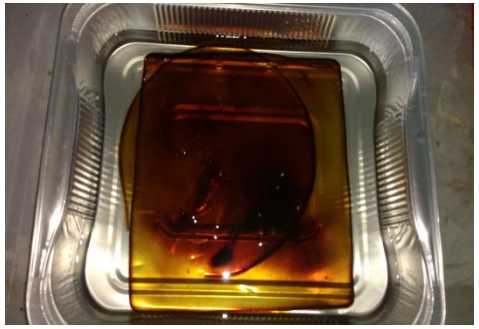


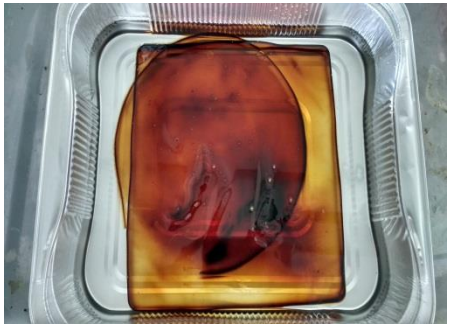


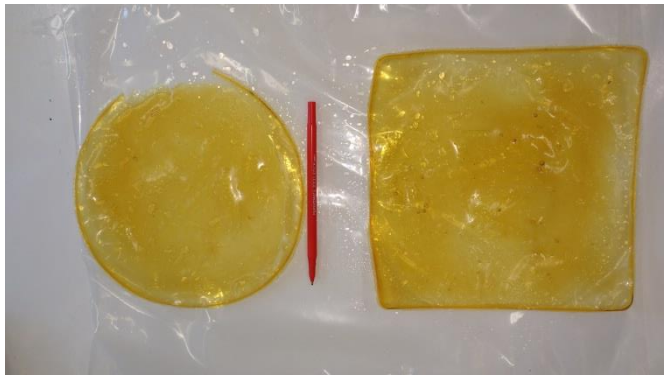
Blood proteins as material for bio-plastics

Agriculture and Food Development Authority

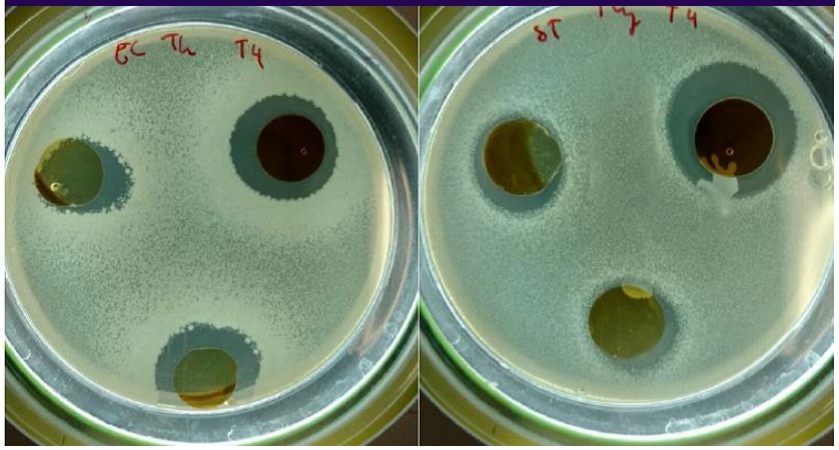
Technology to generate insoluble, transparent bio-plastic







Effective antimicrobial carrier



BioOpps: Business opportunities and challenges for meat co-products

BioOps: Business Opportunities and challenges for meat co-products

Co-ordinator: Anne Maria Mullen
Anne.mullen@teagasc.ie

Romain Couture, Research Officer

Facilitators and barriers for foods containing meat co-products
Dr Maeve Henchion

Onwards and upwards: business opportunities and challenges for co-products from the meat processing chain
Teagasc Ashtown
26th April 2018

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

Challenges → Opportunities

Negative sensory properties

- Lungs have an unappealing texture → Process to use it as a protein ingredient. Not all applications are for consumption

Scale

- Need an efficient logistics system → Collaboration amongst stakeholders to oversee the modalities

Category 3 products

- Cat 3 by-products → Collection, inspection and storage systems have to abide by regulation/legislation.

Recommendations to industry

- Recovery of proteins from alternative sources necessary – your products are valuable.
- Potential for coordinated Irish and European effort regarding recovery of value for co-products.
- New markets to explore and value to be recovered at many stages along the value chain.
- It is important to know your products potential applications, and to talk with your buyers about their uses.
- Try to find short-circuits applications before setting up complicated systems.
- Collective approach instead of individual actions: cross sectoral

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