



Technology for sustainable protein innovation

Proteins for Food and Health Seminar Series

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Outline

- 1) Setting the scene
- 2) Examples of our capability
- 3) Summary



Setting the scene...

Global population forecast to grow by over a third by 2050 ⁽¹⁾

As global population increases, greater demand for protein

– seek alternate sources of protein

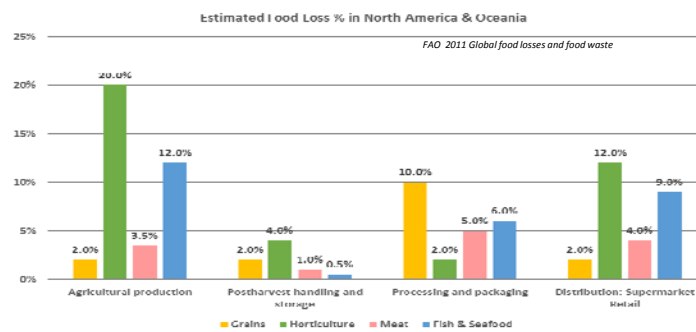


OR

– ways to improve utilisation of current sources, esp. those from food loss streams.

(1) Science (2010), 327:812-818

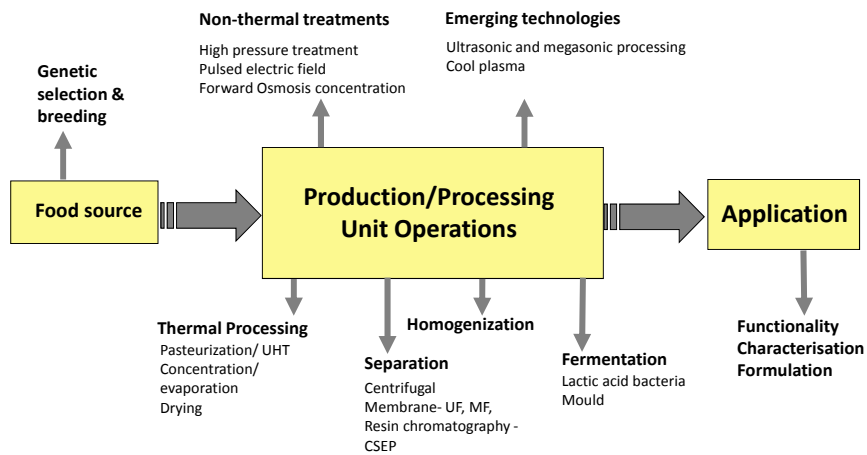
Food Loss Impact Across the Value Chain



Food Loss in Australia:
 Total: \$3.1 million tonnes food disposed; Value: \$3.2 billion
 Horticulture Loss & Waste: \$1.8 billion

RIRDC Workshop, Canberra 2015

CSIRO Capability



Cadwallader & Singh (2009)
 Advanced Dairy Chemistry-Volume 3
 Third Edition



Genetic selection and breeding

- Synthetic biology approaches to remove allergy causing proteins from foods. – altering or deleting gene functions by targeted genetic modifications.



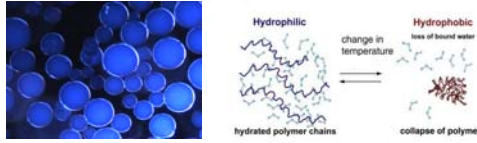
Barley Hordein reduced >10,000x
 56,000ppm to 3-5ppm

WHO Gluten-free target ≤ 20 ppm

CSIRO: Larkin & Howitt, 2017

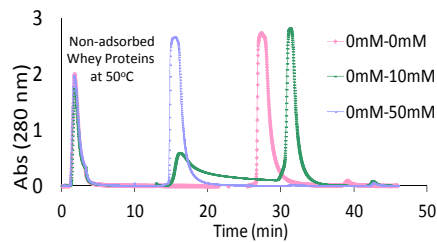


Stimuli responsive polymer (SRP) resin technology



Cheese whey At 50°C →  → Lactoferrin at 5°C

Temperature change used as an elution trigger rather than high conc. of salt



CSIRO: Liu and Taylor, 2012

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Membrane separation

Membrane processing adds value through the fractionation and concentration of bioactive and functional compounds .



Green leaves may contain a significant amount of protein: broccoli, moringa, cassava, spinach leaves contain ~27 to ~41% protein.



Key Attributes

- Relatively simple and accepted method commercially
- Separate proteins from other macro- and micro-nutrients and concentrate
- Long history of safe use
- Make use of on-farm waste to obtain underutilised protein ingredient.

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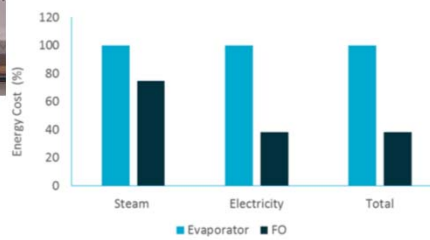
Forward Osmosis

Forward Osmosis is a membrane based process that operates under low hydraulic pressure and uses selective membranes to concentrate liquids



Key Attributes

- Cost effective
- Non-thermal concentration, proteins not denatured
- Retention of aroma compounds
- Enhanced functionality?
- Utilised early in the supply chain = reduced logistical costs



Extrusion

Extrusion is a versatile processing technology that combines multiple unit operations such as mixing, heating, cooking, shaping and forming into one integrated process.

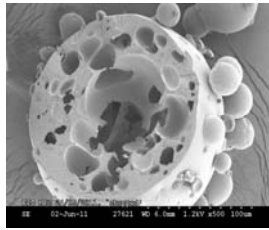


Key Attributes

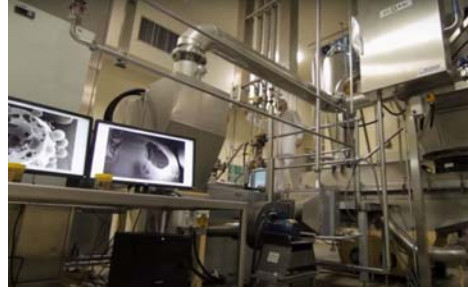
- Transformation of under-utilised food biomass
- Process integration
- High fibre, high protein (~30%) vegetable powder (or ingredient)
- Improved protein digestibility?
- Reduced anti-nutritionals?
- Enhanced functionality?



Extrusion Porosification Technology (EPT)



An electron micrograph of a particle of EPT powder



Key Attributes

- Significantly less energy required than conventional spray drying.
- Low temperature drying- maintain protein structure and functionality
- Foods with improved properties
- Foods retain flavour and aroma.
- Powders are easy to reconstitute, due to internal honeycomb structure



Summary

- Learnings from dairy industry =
 - Strong capability protein modifications,
 - separations,
 - Concentrations,
 - Drying
 - Ingredient/ product formulation
- Agility!!



Thank you

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