Bioeconomy in the food technology education
- fractionation of molecules for improved utilisation of marine rest raw materials

Dr. Eva Falch
Ass. prof. and vice dean education and innovation

Eva.Falch@ntnu.no
My experience in this…

- Research institute: 8 years
- Food and ingredient industry: 9 years
- Academia: 5 years

Timeline
• Main profile in science and technology
• > 40 000 students
• 362 doctoral degrees
• 8 faculties, 55 departments and NTNU University Museum
• 7134 person-years
NTNU will actively contribute to achieve the UN Sustainability Development Goals
Utilisation of marine rest raw materials

- WASTE OR VALUE?
- INTACT OR ISOLATED?
- CRUDE OR REFINED?

REST RAW MATERIAL

COLLECT

SORT

PROCESS

REFINE

FRACTIONATE
These are all molecules

- Molecules with different sizes, properties, advantages and disadvantages
  - **Advantages**: bioactivity, functionality, nutritional properties
  - **Disadvantages**: unpleasant taste and smell, unstability, pollutants and impurities

- Molecules can be changed (e.g. hydrolysed), fractionated or isolated.
Membrane technology can be used to:

• Recover and upgrade valuable components from sidestreams that today are low value products or wasted

• Improve functionality, bioactivity or sensory properties and reduce unwanted molecules – increase the applicability

• Improve economic benefits
Sensory properties and shelf-life is particularly challenging for applications for human consumption:

- Bitterness of certain amino acids, certain peptides and free fatty acids
- Lipid oxidation products
- Biogenic amines
- etc.

Fractionation might be a way to improve these challenges
Functionality and bioactivity (proteins and peptides)

• Functional properties
  – Antioxidative properties – e.g. ingredient for improvement of food, emulsification, etc.

• Bioactive properties
  – Hypertension (ACE-inhibiting effect), antimicrobial activity, antioxidative activity, etc.

• Quality
Membrane processes

- Microfiltration
- Ultrafiltration
- Nanofiltration
- Reversed osmosis

Figure 1: Pressure driven membrane technology
We have also used the membrane system for

Fractionation of:

• bioactives from macro algae
• whey proteins
• different fish proteins (now cod and herring)
Master projects 2018/19
Increased utilisation of side streams from fish processing

- Fillet
- Viscera
- Head
- Cut-offs

Enzymatic hydrolysis → Protein hydrolysates → Fractionation → Fractionated peptides

- Antioxidative effect of proteins from fish processing (fractionation)
- Bioactivity of proteins from fish processing (fractionation)

Functionality:
- Bioactivity
- Antioxidative effect

Master project 1 and 2 (protein)
Master project 3 (lipids)

Oil quality from fish processing
Oil analysis
Lipid analysis
Examples of bioeconomy student theses – spring 2018

Fresh rest raw material for the asian marked

- Cod milt
- Munkfish liver

Utilization of side streams form marine lipid processing

- Side streams

Nuclear magnetic resonance spectroscopy to evaluate composition, applicability and shelf life.
Final words

- Fractionation of molecules might improve the utilisation and prevent waste
- Students with the right knowledge and skills can innovate the food industry and secure food supply for a growing population….and use their knowledge to teach decision makers
- This requires a symbiosis with external actors of the food value chain
Thank you!

Eva.Falch@ntnu.no