Challenges and Opportunities for Emerging Technologies in the Food Industry

Prof Lilia Ahrné
Department of Food Science
University of Copenhagen
Denmark
Drivers of change in food processing

**Consumer needs**
- Healthy & Tasty
- Convenience
- Tailored functionality
- Personalised products

**Sustainability/ economy**
- Resource Effective Processes (Water, Energy, Waste)
- Shorter and tailored processes
- Circular economy
- Shorter food chains
Emerging Technologies

- Non-thermal processing
- Structure processing
- Functional Powders
- Smart combinations of processing and packaging
- Sustainability
Non-thermal processing

- High pressure processing
- Membrane processing
- UV-light
- Pulsed Electric Fields
- Ultrasounds
- Plasma

Add value – Fresh
Extend Shelf-life
Improve functionality
Keep nutritional value
High Pressure Processing

Can safe raw milk be produced?

'Cold-pressed raw milk' method wins regulatory approval
UV light

- Reduces the microbial load of milk but not inactivate enzymes
- The process increases shelf life of dairy products by at least 30%
- Improve texture and aroma in cheddar cheese
- Used in South Africa approved in India and US for juices
Membrane filtration
Pulsed Electric Fields

- Electric field induces charges
- Compression and deformation
- Pore formation occurs
- Loss of physiological control systems leading to cell death
Cutting Improvement

http://elea-technology.de/
Challenges of non-thermal

- Tangible advantages clearly demonstrated
- Consumer acceptance
- Better fit in existing lines
- Multidisciplinary studies needed
- Need of demonstration sites
Functionalised powders

Encapsulation
Coating
Agglomeration

Nandiyanto & Okuyama (2011)
Innovative drying technologies

Innovative spray technologies like, supercritical CO2 spraying, electrospinning

Improved solubility
High bioavailability
Control release

Prof. Dr. -Ing M. Petermann
Structure Processing

Supercritical CO2 extrusion

Snacks from byproducts?

Foaming properties
3D printing
Membrane emulsification

Modification of lipids & induced crystallisation

Effects on butter and possibility to develop innovative and healthy spreads
Smart combinations of processing and packaging

Right and Simple
Sustainability

- Improving processing efficiency
- Extraction/fractionation (Circular economy)
- Process intensification
- Small scale processing units
Improving process efficiency

- In a non optimised process there is a potential to reduce energy consumption by 50%.
- In an optimised process there is a potential of reduce further 10% the energy consumption.

Holistic approaches
- Technology shift
- Reuse of energy

Optimise the process
Separation of wheat flour in starch and gluten

Conventional process

Concentrated process

Van der Goot et al. (2016) Concepts for further sustainable production of foods, journal of food engineering