Nanotechnology and Food Safety

Risk Assessment Section
Background

- Accelerating development of nanotechnology in the food industry
- Nano-sized materials behave differently compared to their conventional counterparts
- Limited knowledge on the effects of these applications on human health
Objectives

- Present the basic principles of nanotechnology
- Identify potential safety implications associated with the application of nanotechnology in the food sector
- Review the strategies for risk assessment of engineered nanoparticles
Scope

- Only matters surrounding nanoparticles (NPs) or nanomaterials (NMs) that are deliberately introduced in foodstuffs and food contact materials were covered
  - NPs already present in food
  - Proteins, carbohydrates and fats with sizes extending from large polymers down to nanoscale
Nanotechnology

- **Nanotechnology:**
  - No internationally harmonised definition
  - Process of controlling the size and shape of materials at atomic and molecular scale; sized between approximately 1 and 100 nanometer (nm) in at least one dimension
New physiochemical properties

- Optical properties (colour)
- Material strength
- Conductivity
- Solubility
- Reactivity
Application of nanotechnology
-- Food contact materials

- Largest share of current and short-term predicted markets
- Incorporate NPs into shaped objects and films to improve:
  - durability
  - optical and barrier properties
  - resistance to temperature and flame
Examples of nano food contact materials available in market

- Polyethylene terephthalate (PET) bottle
- Polypropylene container
- Plastic wrap
Nanoencapsulation of food ingredients and additives

- Second largest area of nanotech application in the food sector
- Extension of microencapsulation
- Nanocarriers to encapsulate food ingredients and additives:
  - mask unpleasant tastes and flavours
  - protect ingredient from degradation
  - improve dispersion of insoluble ingredients
  - harness controlled delivery
Nanostructured food ingredients and additives

- Processing and formulation of food ingredients to form nanostructures
- Examples: spreads, ice-creams, yoghurts, mayonnaise
- Claimed to:
  - improve taste, texture and consistency
  - enhance bioavailability
  - allow mixing of “incompatible” ingredients
- No clear example of proclaimed food product
Project on Emerging Nanotechnologies (PEN)
Concerns and health implications

- Alter absorption profile and body metabolism
- NPs as indirect sources of food contaminants
- Unknown toxicity of NPs
- Lack of analytical methods and predictive model to evaluate safety of NPs
Safety of nanomaterials in food

- No tenable evidence that food or food contact materials derived from nanotech is any safer or more dangerous than their conventional counterparts.

- No general conclusion can be made on the safety of nanofood and food contact materials incorporated with NMs.

- No evidence of instances where ingested NMs have harmed human health.
Knowledge on NMs relies on info provided by the trade

- Methods for detection and characterisation of NMs in food are not readily available

- Knowledge regarding the presence of NMs in food relies on info provided by the industry, producers and marketing organisations
Health Canada

- Use of NMNs in food subject to same health and safety regulations apply to conventional materials

- Relevant regulations
  - Food Additive Regulations
  - Novel Food Regulations
  - Food and Packaging Materials Regulations

- Calls for precaution
  - new materials not previously assessed
  - products for which pre-market safety assessment is not required
FDA

- Safety of products containing NMs assessed similarly as respective bulk materials
- Premarket authorisation
  - e.g. colour additives
- Not subject to premarket authorisation
  - dietary supplements
  - food generally recognised as safe
Size of particles in food is only one of a number of considerations relevant to food safety
Safety assessed depending on the type of substance or food in question and the standards that applies
- e.g. processing aid, food additive, novel food
Availability of nanofood

- Available on the global market, mainly through internet trading

- Not aware of any country conducting risk assessment on specific food products produced using nanotechnology
Conclusions and Recommendations

- Currently no internationally agreed definition for ‘nanotechnology’ and related terms
  - clear and internationally harmonised definition would help to define scope for risk assessment and regulation

- No tenable evidence that food or food contact materials derived from nanotech is any safer or more dangerous than their conventional counterparts
Conclusions and recommendations

- No general conclusion can be made on the safety of nanofood and food contact materials incorporated with NMs.

- According to WHO, while consumers are likely to benefit from the technology, new data and measurement approaches are needed to ensure safety of products using nanotech can be properly assessed.
Conclusions and recommendations

- The approaches for safety evaluation of NMs vary from country to country but presumably follow similar pathways to those used for other materials proposed for use in food and food contact materials.

- Methods for detection and characterisation of NMs in food are not readily available. Knowledge regarding the presence of NMs in food relies on info provided by the industry, producers and marketing organisations.
Advices

To trade
- Ensure the products for sale are safe for human consumption
- Do not sell NMs that have not undergone safety assessment

To public
- Maintain a balanced diet
- Buy food from reliable suppliers
END

Thank you