

# Nanotechnology and Food Safety

Risk Assessment Section

# Background

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- ❑ 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

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- ❑ 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

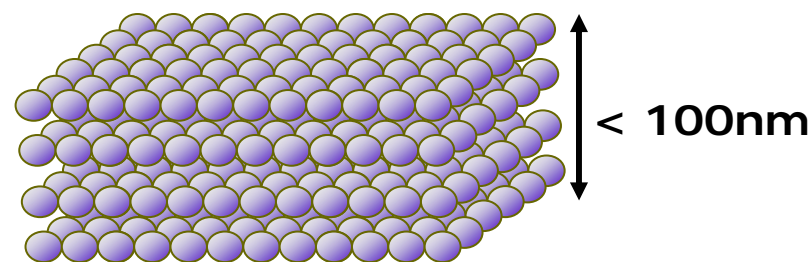
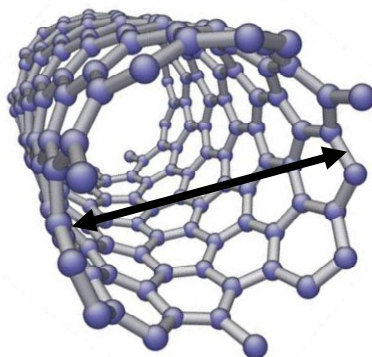
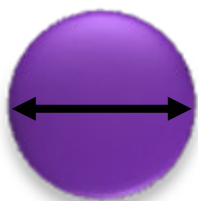
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- ❑ Only matters surrounding nanoparticles (NPs) or nanomaterials (NMs) that are deliberately introduced in foodstuffs and food contact materials were covered
  - NPs already present in food
  - Proteins, carbohydrates and fats with sizes extending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

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- Optical properties (colour)
- Material strength
- Conductivity
- Solubility
- Reactivity

# Application of nanotechnology

## -- Food contact materials

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- ❑ 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



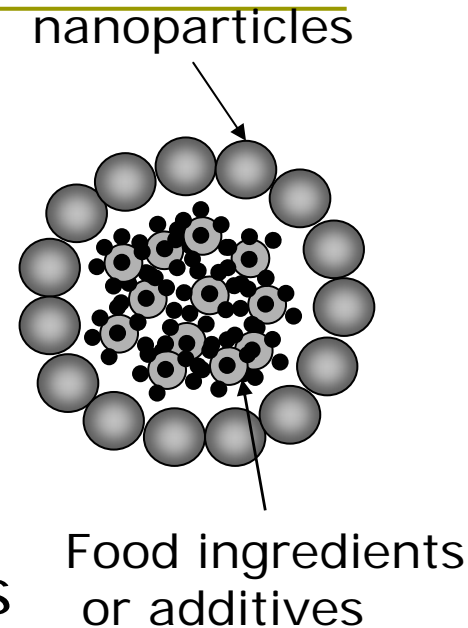
- ❑ Plastic wrap





# 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

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- ❑ Processing and formulation of food ingredients to form nanostructures
- ❑ Examples: spreads, ice-creams, yoghourts, mayonnaise
- ❑ Claimed to:
  - improve taste, texture and consistency
  - enhance bioavailability
  - allow mixing of “incompatible” ingredients
- ❑ No clear example of proclaimed food product

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## Consumer Products

An inventory of nanotechnology-based consumer products currently on the market.

After more than twenty years of basic and applied research, nanotechnologies are gaining in commercial use. Nanoscale materials now are in electronic, cosmetics, automotive and medical products. But it has been difficult to find out how many “nano” consumer products are on the market and which merchandise could be called “nano.”

While not comprehensive, this inventory gives the public the best available look at the 1,000+ manufacturer-identified nanotechnology-based consumer products currently on the market.

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# Concerns and health implications

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- ❑ 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

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- ❑ 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

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- ❑ 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

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- ❑ Use of NMs 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
- } **Pre-market safety assessment**
- Voluntary**
- ❑ Calls for precaution
  - new materials not previously assessed
  - products for which pre-market safety assessment is not required

# FDA

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- ❑ 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



# FSANZ

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- ❑ 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

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- ❑ 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

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- ❑ 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

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- ❑ 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

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- ❑ 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

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## □ 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