Guidance on Risk Assessment Concerning Potential Risk Arising from Applications of Nanoscience and Nanotechnologies in the food and feed chain

EFSA Stakeholder Consultative Platform 15th Meeting

Brussels 8 April 2011

Dr. David Carlander
Scientific Committee and Advisory Forum Unit

www.efsa.europa.eu
1. Considerations for Risk Assessment of Engineered Nanomaterials

2. Draft Guidance and Public Consultation

3. Adopted Guidance
• Some nanomaterials may be of low safety concern whereas others, especially if persistent and highly reactive, may be of a higher risk.

• *In vivo* toxicity data are needed for most assessments. Currently no validated *in vitro* methods available.

• Limited practical risk assessment experience in the food area.
The information requirements for risk assessment will vary depending on the properties and intended use. Less data is expected where no significant exposure is shown to take place.

Risk assessment of nanomaterials needs on a case-by-case basis.
Main uncertainties and challenges

- Analytical limitations in the measurement of nanomaterials in various matrices.

- Additional testing experience with nanomaterials is needed to establish optimal approaches.

- Long term oral exposure information is missing and extrapolation from shorter exposure is not yet reliable.

- Bioaccumulating and persistent nanomaterials are likely to end up in the food/feed chain as contaminants.
A rise of applications concerning nanomaterials in different food and feed sectors is expected both inside and outside EU.

An intensive learning curve of potential risks of nanotechnology applications is expected over the coming years with possible refinement of relevant risk assessment methodologies.
Public consultation on: "Guidance on risk assessment concerning potential risks arising from applications of nanoscience and nanotechnologies to food and feed"

Deadline: 25 February 2011

EFSA’s Scientific Committee has launched a public consultation on a draft guidance on risk assessment concerning potential risks arising from applications of nanoscience and nanotechnologies to food and feed. The guidance offers practical guidance for the risk assessment of applications involving the use of nanoscience and nanotechnology in the area of food and feed (including food additives, enzymes, flavourings, food contact materials,

• Request from European Commission accepted by EFSA in December 2009

• Scientific Committee Working Group preparatory work

• At the deadline, 25 February 2011 (6 weeks), about 35 organisations (academia, industry, NGO, authorities (EU and international)) had provided about 255 comments

• Scientific comments are addressed by experts and they enhance the scientific quality and clarity
• The guidance was discussed and adopted by the Scientific Committee at its Plenary Meeting 5-6 April,

• It is currently undergoing final editorial check and will be published shortly

• The ENM Guidance offer practical guidance for risk assessment of applications involving the use of nanoscience and nanotechnology in the food and feed chain
  
  – Aimed at applicants and risk assessors
• The risk assessment paradigm (hazard identification and hazard characterisation followed by exposure assessment and risk characterisation) is appropriate.

• Complement current guidance documents available for various applications.
  – Provide guidance on nano specific considerations that need to be assessed in addition to conventional aspects.
  – Current EFSA guidance documents for the intended use of the ENM are to be followed, with modifications as described in the ENM Guidance.
• **Comprehensive characterisation needed**
  - Size, size distribution, morphology, surface chemistry, catalytic activity, stability/shelf life, specific surface area (for dry powders) etc...
  - Concentration, dispersion medium, agglomeration-aggregation state etc...
  - Information on method of production, intended use, batch to batch variation, stability/shelf life etc...
  - Information not provided should be justified
Characterisation at several steps

- **As manufactured** (pristine state)
- **Prior to use in food/feed** (as delivered to producer)
- **As used in food/feed**
- **As used for toxicological testing**
- **In biological fluids and tissues**

  - Determination under the intended use conditions is the main objective

  - Acknowledged that characterisation can be difficult in certain matrixes

  - Methods used need to be carefully selected and described and demonstrated to be fit for purpose
Exposure scenarios

- Outline anticipated exposure scenarios as this will influence the extent of the hazard characterisation.
  - Direct or indirect addition to food/feed
  - Certain applications may give rise to a very limited exposure
  - Where ENM exposure is not detected by appropriate methods, conventional risk assessment should be considered for any non-nanoform fraction
Toxicity Testing Outline

1. **No persistence of ENM in preparations**
2. **No migration from food contact materials**
3. **Transformation before digestion**

   1. **Transformation during digestion**
      - *In vitro* digestion studies
   2. **Information on non-nanoform available**
      - Compare genotox, ADME and repeat dose 90-day study
   3. **No information on non-nanoform available**
      - Provide full data according to relevant EFSA guidance for intended use, with modifications to tests as proposed
ENM Present in Food/feed?

No

Consider need for further testing
E.g.
No migration from FCM
- Follow EFSA FCM Guidance
Transformed to non-nanoform in food/feed matrix before ingestion
- Follow relevant EFSA Guidance for non-nanoform

Yes

ENM absorbed from the GIT? (e.g. from assessment of stability in GI fluids or ADME data)

No

ENM is completely transformed into non-nanoform in the GIT?

Yes

Assess local GIT effects and possible ENM absorption before transformation
Test according to relevant EFSA Guidance for non-nanoform or refer to existing data*

*This information may be available from already assessed/authorised product

No

ENM is not (or only partially) transformed into non-nanoform

In vitro tests:
Genotoxicity
- Gene mutations in mammalian cells test
- In vitro micronucleus test

In vivo tests:
ADME
Repeated-dose 90-day oral toxicity
In vivo genotoxicity (if positive in vitro or not testable in vitro)
Toxicity tests

• **In vivo test**
  – ADME (absorption, distribution, metabolism, excretion)
  – 90-day rodent repeat oral toxicity, considering extended endpoints (e.g. endocrine activity and immuno- and reproductive toxicity)

• **In vitro tests not yet validated. Provide screening and initial understanding of biological effects.**
  – Genotoxicity

• **Additional in vitro/in vivo tests triggered by initial results**

• **Limited datasets not considered appropriate**
Exposure assessment

- **Determination of the amount present in food/feed**

- **Estimate worst case exposure unless information suggest otherwise.**
  - Assume that all added ENM is present, ingested and adsorbed in the nanoform.
Uncertainty Analysis

- Applicants should discuss uncertainties
- Characterisation, detection and measurement may present difficulties
- Current toxicity testing methods may need modifications and specific considerations.
- The ENM Guidance will be updated as scientific knowledge evolves. EFSA is following the developments.