



European Food Safety Authority

# THE POTENTIAL RISKS ARISING FROM NANOSCIENCE AND NANOTECHNOLOGIES ON FOOD AND FEED SAFETY

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International Symposium  
**NANOTECHNOLOGY IN THE FOOD CHAIN**

Opportunity & Risks

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Organized by Federal Agency for the Safety of the Food Chain in the framework of Belgian EU Presidency

- **What are the health & safety issues of nanoparticles in food?**
  - EFSA's 2009 Opinion
  - Risk assessment of applications
- **Which risk assessment issues need to be addressed for nanotechnology in food?**
  - Preparation of guidance on nanomaterials
- **Is there a prioritisation with respect to research needs?**
  - Challenges & uncertainties

# What are the health & safety issues of nanomaterials in food?

## SCIENTIFIC OPINION

### The Potential Risks Arising from Nanoscience and Nanotechnologies on Food and Feed Safety<sup>1</sup>

#### Scientific Opinion of the Scientific Committee

(Question No EFSA-Q-2007-124a)

Adopted on 10 February 2009

#### SCIENTIFIC COMMITTEE MEMBERS

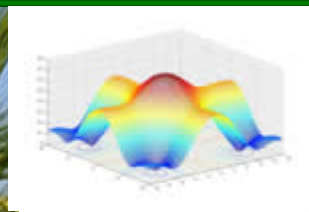
Sue Barlow, Andrew Chesson, John D. Collins, Albert Flynn, Anthony Hardy, Klaus-Dieter Jany, Ada Knaap, Harry Kuiper, John Christian Larsen, Pierre Le Neindre, Jan Schans, Josef Schlatter, Vittorio Silano, Staffan Skerfving and Philippe Vannier.

#### SUMMARY

Following a request from the European Commission the European Food Safety Authority (EFSA) was asked to provide a scientific opinion on potential risks arising from nanoscience and nanotechnologies on food and feed safety. In view of the multidisciplinary nature of this subject, the task was assigned to the EFSA Scientific Committee.

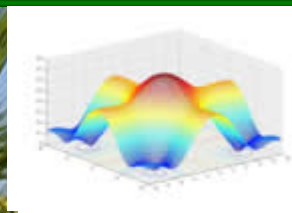
This opinion addresses engineered nanomaterials (ENMs). Food and feed are addressed together, since the basic aspects (applications and potential impacts) are expected to be similar. This opinion is generic in nature and is in itself not a risk assessment of nanotechnologies as such or a survey of tentative applications or possible uses thereof or of specific products.

- The opinion is generic in nature, is not a risk assessment of nanotechnologies, of applications or of specific products.
- It considers Engineered Nanomaterials (ENM) and identifies issues such as existing limitations on exposure and data availability and main uncertainties.



# Conclusions of the 2009 opinion

- The nanospecific properties and characteristics of ENM are likely to affect their toxicokinetic behaviour and toxicity profile
- The risk assessment of ENM has to be performed on a case-by-case basis, based on proper identification and comprehensive characterization of the ENM as used in food/feed, and on exposure data
- For certain applications there may currently be specific difficulties to generate requested data.



# Risk Assessment of Applications

- Based on EFSA March 2009 opinion, EFSA has preparedness to assess applications.
- EFSA risk assessors will not be able to conclude unless sufficient data is submitted.
- No consensus guidance for risk assessment have yet been produced at the international level for the food and feed area.



## Two assessments have been provided by EFSA on risks of specific nanomaterials in food and feed:

- CEF Panel: No safety concern for titanium nitride for use as food contact material on the basis of proven absence of migration into food.
- ANS Panel: Submitted data were insufficient to adequately characterise silver hydrosol and the Panel could not provide an opinion.

**No new applications have been received by EFSA.**



## 2009 Request – Terms of Reference

EFSA is requested to **prepare a guidance document**...including food additives, enzymes, flavourings, food contact materials, novel foods, feed additives and pesticides...

...This document should **provide practical recommendations for the risk assessment** of food related applications of nanotechnology **to the extent possible with current knowledge**...





**Experts in nanoscience, nanotechnologies, risk assessment**

**Mona-Lise Binderup, Qasim Chaudhry, Wim De Jong, Corrado Galli, David Gott, Rolf Hertel, Akihiko Hirose, Wolfgang Kreyling, Hermann Stamm and Stefan Weigel**

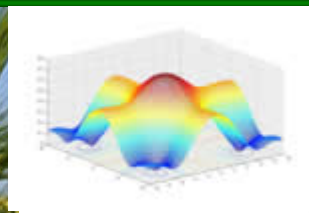
**Meetings during 2010**

**Minutes are published on EFSA website**



- **Focus on oral administration**
- **Case-by-case assessment**
- **Information and data needs related to exposure and use scenarios**
- **Complement to current guidance documents available for various areas/sectors**
  - **Provide guidance on nano specific considerations that need to be assessed in addition to conventional aspects**

- **Reformulation of already used and approved food/feed/ingredients**
  - **Assess if available information can be used**
  
- **Novel food/feed/ingredients not previously used in food/feed**
  - **Additional data needs for a full evaluation**



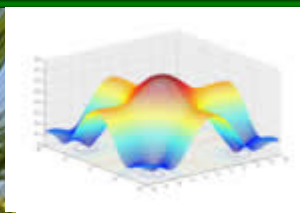
- **Comprehensive characterisation needed**
  - **E.g. size, size distribution, morphology, surface chemistry, catalytic activity, stability/shelf life, volume specific surface area (for dry powders).**
  - **Concentration, dispersion medium, agglomeration-aggregation state**
  - **Information on method of production, intended use, batch to batch variation**

# Characterisation at several steps

- **Prior to use in food/feed**
- **As used in food/feed**
- **As used during toxicological testing**
  - **Acknowledged that characterisation can be difficult in certain matrixes.**
  - **Methods used need to be carefully selected and described**



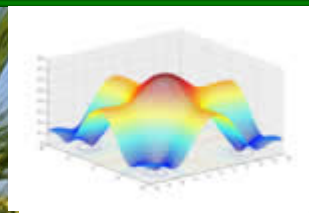
- **Outline anticipated exposure scenarios as this will influence the extent of the hazard characterisation.**
  - **Direct or indirect addition to food/feed**
  - **Certain applications may give rise to a very limited exposure**
  - **Where nano-form exposure is not detected by appropriate methods, conventional risk assessment should be performed**





- ***In vitro* tests not yet validated. Provide screening and initial understanding of biological effects.**
  - Genotoxicity and mutagenicity tests
- ***In vivo* test**
  - ADME
  - 90-day rodent repeat oral toxicity, considering extended endpoints (e.g. endocrine activity and immuno- and reproductive toxicity)
- **Additional tests triggered by initial results**

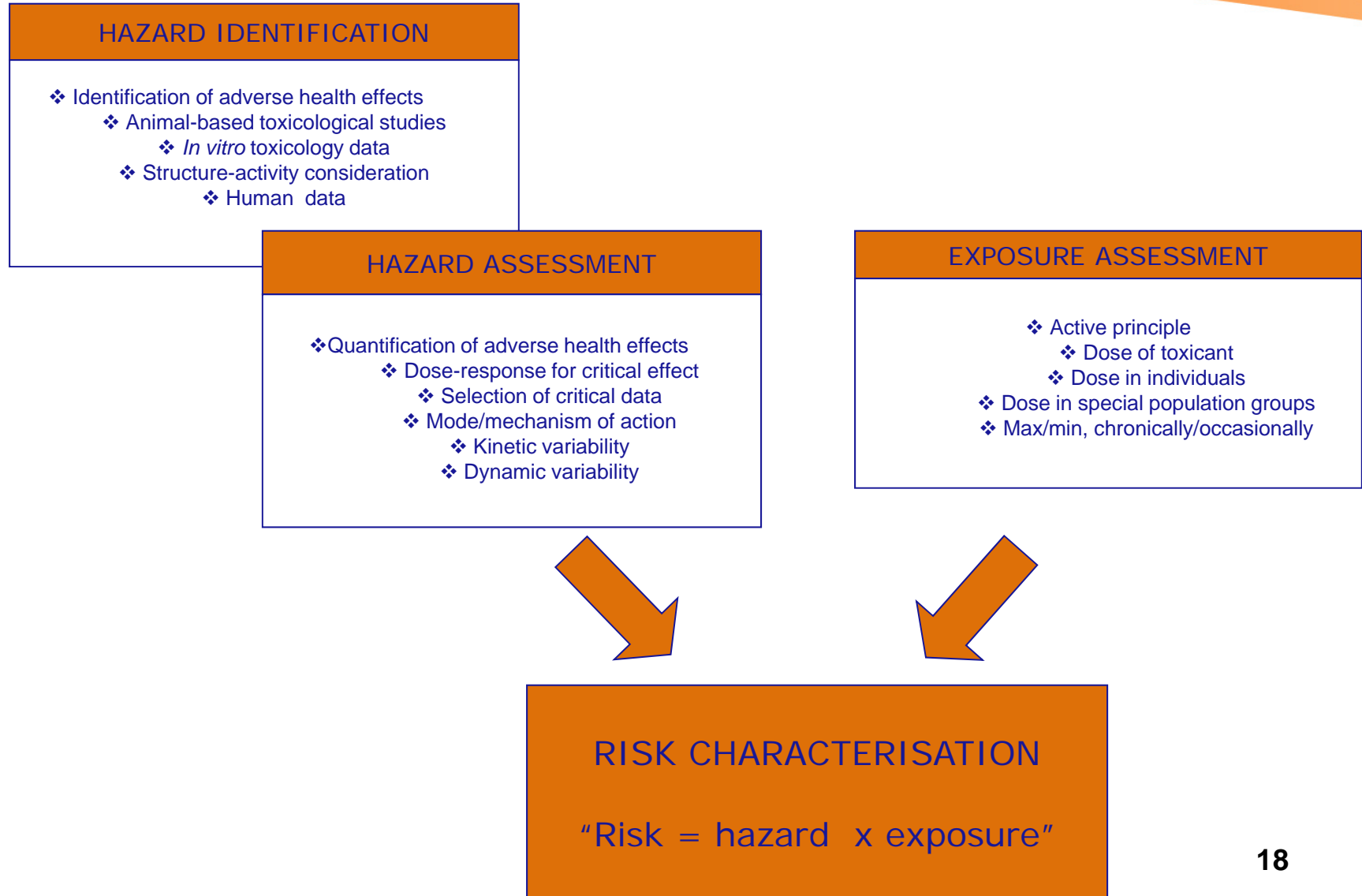
- **Openness and public involvement**
- **Scientific comments are addressed by the experts**
- **Comments enhance the scientific quality and clarity**
  - **All comments are published**



- **Complications**
  - **Information gaps**
  - **Scientific publications not designed to answer risk assessment questions**
  - **Lack of guidance documents**



# Benchmark with the Risk Assessment Paradigm



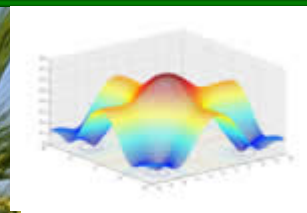
- **Analytical limitations in the measurement of nanomaterials in various matrices make assessment of toxicity and exposure data difficult.**
- **More testing experience with nanomaterials is needed to establish optimal approaches.**
- **Long term oral exposure information is missing and extrapolation from shorter exposure is not yet reliable.**
- **Bioaccumulating and persistent nanomaterials are likely to end up in the food/feed chain as contaminants.**

- 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.





- Risk assessment of nanomaterials needs to be on a case-by-case basis.
- The information requirements to perform a risk assessment will vary depending on the properties and intended use, and less data is expected where no significant exposure is shown to take place.
- Exchange of data and evaluation criteria as well as cooperation over sectors and preventive approaches are beneficial.



- 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.



**Thank you**