Ecotoxicity CoR: bioaccumulation, ecotox testing, systems biology approaches

Break out session
Thursday March 12, Venice
Agenda

1. Revisit CoR scope
2. Co-chair rotation
3. Selected key research needs
4. Presentations
   ◦ Jason White:
   ◦ Claus Svendsen:
   ◦ Phil Sayre:
5. Discussion:
   ◦ can we provide guidance on what to report to ensure good quality of ecotoxicological data and the possibility to re-assess results once we have a better understanding of environmental fate and concentrations (Risk assessment = f(exposure, hazard).
Ecotox CoR scope

• To engage the scientific communities in Europe and the US currently conducting environmental research on nanomaterials, to connect similar efforts, and

• To encourage the evolution of hazard assessment methods and predictive models built on
  ◦ The foundations of fundamental research characterizing fate (including ageing) of nanomaterials in different environmental compartments and the interactions of nanomaterials with biota and ecosystems
  ◦ Communication among regulators, experimentalists, modelers (e.g., to make data available / useful data format) to help modelers, experimentalists and risk assessors
Selected key research needs

- **Exposure:**
  - Routine analytical techniques applicable for ecotox relevant doses and test systems
  - Characterization methods for complex samples/environmental samples that are robust, reliable and relatively easy to implement in a standard laboratory
  - Confirming exposure incl. agreeing on procedure for measuring body burden (e.g., w/wo depuration)
  - Exposure duration: indication that nano-related effects may not be captured using short-term test – i.e., more long-term tests
  - Endpoints: indication for different sensitivity for some NMs.
Dosing:
- Environmentally relevant dosing in addition to conventional approaches: e.g., to overlying water and let particles settle naturally in stead of spiking sediment.
- How to perform water/media exposures with NMs that settle
- Linking external dose and internal dose:
- Linking internal fate (bio-distribution) and toxicity: results suggest that internal mechanisms of uptake and internal fate differ between nano and non-nano metals. Need methods to analyze NMs in tissue.
Selected key research needs

- Toxicology:
  - NM characterization: environmental & tissue
  - Artifacts (handling, storage, experimental) may impact interpretation
  - Terrestrial
  - Bioaccumulation, kinetics
  - Trophic transfer
  - More?
What to report to ‘secure’ future use/revisit ecotoxicological data

- As the characterization techniques develops (incl fate models) it enables increasing our understanding of Fate and thus measurement and determination of Environmental concentrations in different compartments (water, sediment, soil, plants, tissue)

- Can we pinpoint key parameters that we should measure and report when conducting ecotoxicological studies to enable re-assessment of results when we know more about ENM fate and environmental exposure concentrations?

- Should be parameters that can be measured in a standard laboratory - i.e., not the scientific fate descriptors that require more sophisticated equipment BUT rather standard parameters that can easily be determined (pH, temp., salinity, CHN etc etc)

- Environmental drivers of ecotoxicology
What to report to ‘secure’ future use/revisit ecotoxicological data

- **Synthesis**
  - Sonication using reliable procedures e.g., how much power is delivered ….
  - Storage condition (time, Light/Dark, temperature…)

- **Characterization**
  - Before experimental use (in DI, test media..)
  - During/End of exposure:
    - Water?
    - Sediment/soil: desirable but challenging

- **Experimental**
  - All: pH, temp., salinity, natural vs artificial
  - Test media:
    - Water (???) / Test media (??)
    - Sediment (OM, CHN, black carbon, sediment particle size)
    - Soil