How well can standard soil tests provide the needed evidence for risk assessment of nanomaterials?

**Introduction:** What is so difficult about Nano RA? – The fact that the testable exposures do not reflect real world exposures

**Nano RA – What would we like to do?**
- Rank toxicities: e.g. Ag NP > ZnO NP > TiO2 NP or SnAg GM > < 50nm Ag NM?
- Do basic Environmental Risk Assessment: (PEC/PNEC ≥ 1?)
- Apply “basic Environmental Risk Assessment” to “real world” exposures: i.e. include: - real world exposure form - real world media - bioavailability effects

**Long term exposure, ageing & transformations:** Standard tests with “pristine” NMs may be under & over-estimate toxicity

**Earthworm test with silver:**
- Nano aged and aged before standard OECD Earthworm test
- Ag “age” as exposed with EC50 increasing with soil age
- Unaged ZnO forms age as exposed browning less toxic
- Coated ZnO is more toxic and aging is delayed 4x months

**Conclusions:**
- Toxic Ag > Ag NM > sulfidised AgNM
- > 20% of mobility in NM treatment attributed to free Ag in experiments without feeding

**Earthworm Silver body concentration**
- Reproduction follows Silver body concentration
- Reproduction follows Silver body concentration

**Effect of transformations on particle toxicity**
- Particles artificially aged to mimic post WWTP specification
- Standard e.g. tests:
  - In moderately hard, reconstituted water
  - 24h Mortality test without food
- Treatments:
  - Control
  - Ionic control Ag/Pristine PVP Ag NP
  - “Artificial” sulfidised Ag NP

**What is different about the NP metals?**
- Question: What “difference” caused the SS metals to be more toxic?
- Synchrotron spectroscopy with Dr Bob Sales and Dr Alan Olliff groups

**What is different about the NP metals?**
- Questions: What “difference” caused the SS metals to be more toxic?
- Spectroscopy: Synchrotron with Dr Bob Sale and Drs Alan Olliff groups

**Reproduction + Earthworm Zn body concentration**
- Reproduction follows Silver body concentration
- Reproduction follows Silver body concentration

**Conclusions:** We need to test exposure relevant NM forms, at levels and under durations relevant to NM fate processes