



# Potential Developmental and Early-Life Health Effects of Nanomaterials: Data Gaps and Research Needs for Risk Assessment

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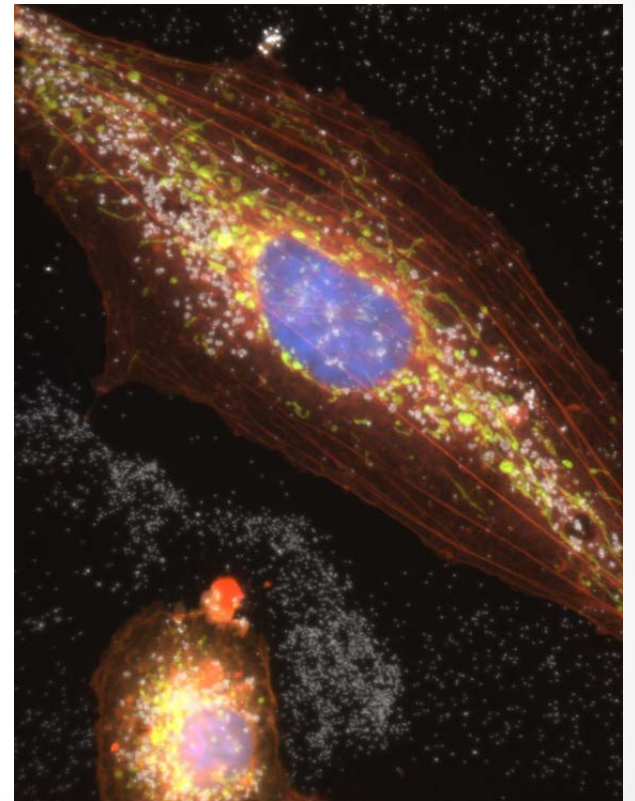
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## Conflict of Interest Disclosures

***I have no actual or potential conflict of interest to disclose in relation to this presentation.***

- **Chemicals, including emerging (and nano) materials are a lynchpin of innovation in today's economy.**
- **Sustainable innovation requires designing, producing, and using chemicals in safer ways.**
- **Information and methods are needed to make better-informed, more-timely decisions about chemicals, many of which have not been thoroughly evaluated for potential risks to human health and the environment.**
- **Scientific understanding is required to anticipate potential for adverse impacts on human health or wildlife populations based on knowledge from data rich chemicals.**

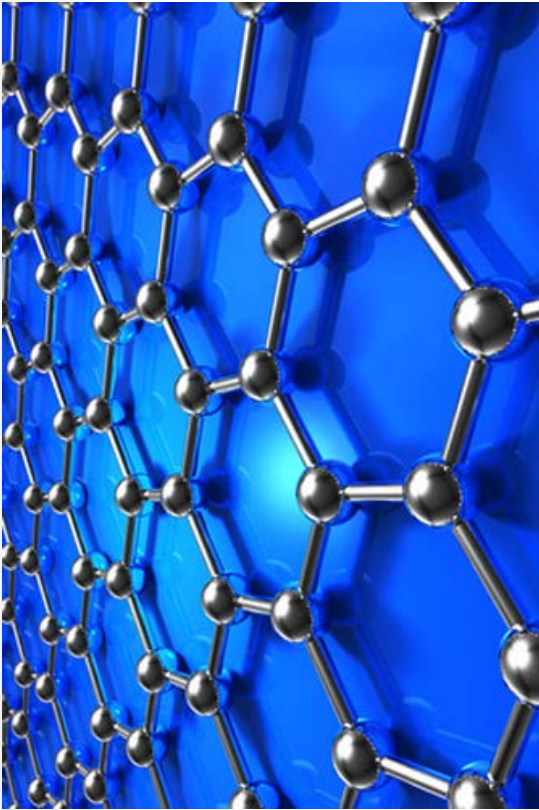


## The Great Chemical Unknown

*[Scientific American October 28, 2010]*

- Only a tiny fraction of the compounds around us have been tested for safety
- Chemicals used by U.S. consumers and industry: 50,000 (80,000)
  - Tested: 300
- What is different about nanomaterials?





- **The rate that new engineered nanomaterials (ENMs) are being developed makes it impossible to evaluate materials individually and traditional testing approaches may be inappropriate for nanomaterials**
- **Understand how the physical/chemical properties of nanomaterials influence their behavior in complex environments**
- **Identify intermediate properties of nanomaterials that can predict exposure and/or hazard**

- **Identify/develop methods to characterize ENM in complex media**
  - **Release from consumer products along the product life cycle**
  - **Fate, transport and transformation in environmental media**
  
- **Develop alternative testing approaches to evaluate adverse outcome pathways**
  - **Potential for adverse human health effects**
  - **Potential to impact sensitive environmental species**



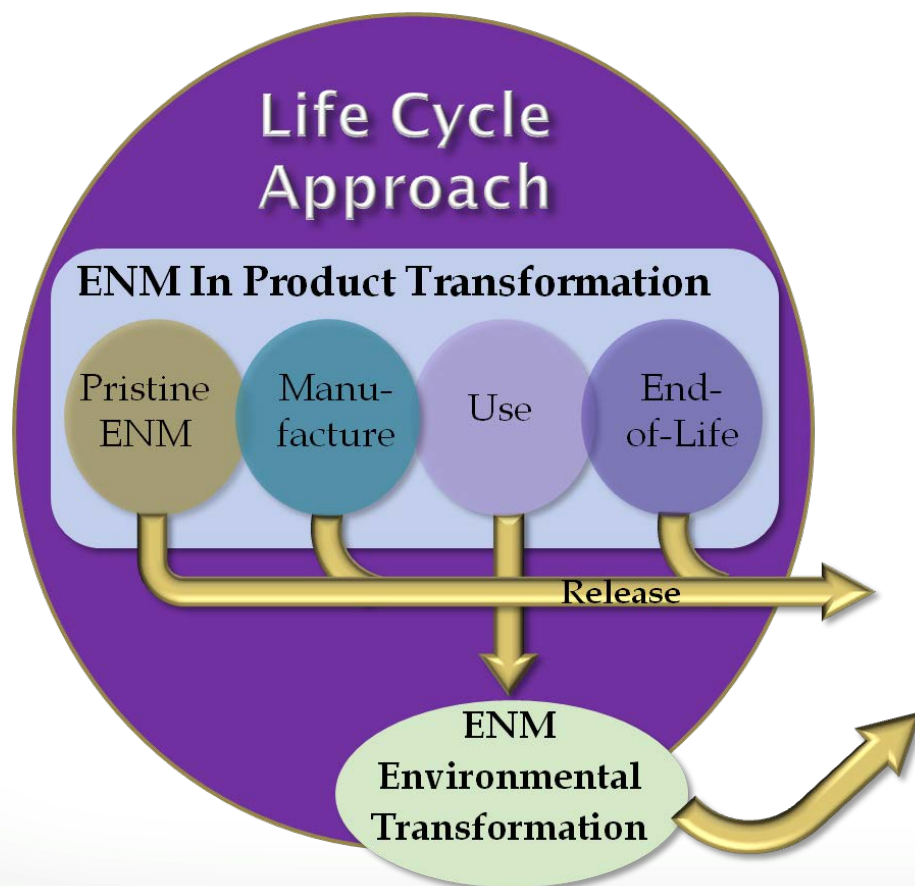
## Data Gaps for Risk Assessment of Nanomaterials

- **Exposure research needs related to understanding and controlling exposures to nanomaterials**
- **Integrate life cycle considerations into risk assessment and management, including stakeholders' values, communication needs, and additional decision makers' input**
- **Incorporating relevant risk characterization information, hazard identification, exposure science and risk modeling and methods into the evaluation of nanomaterials**

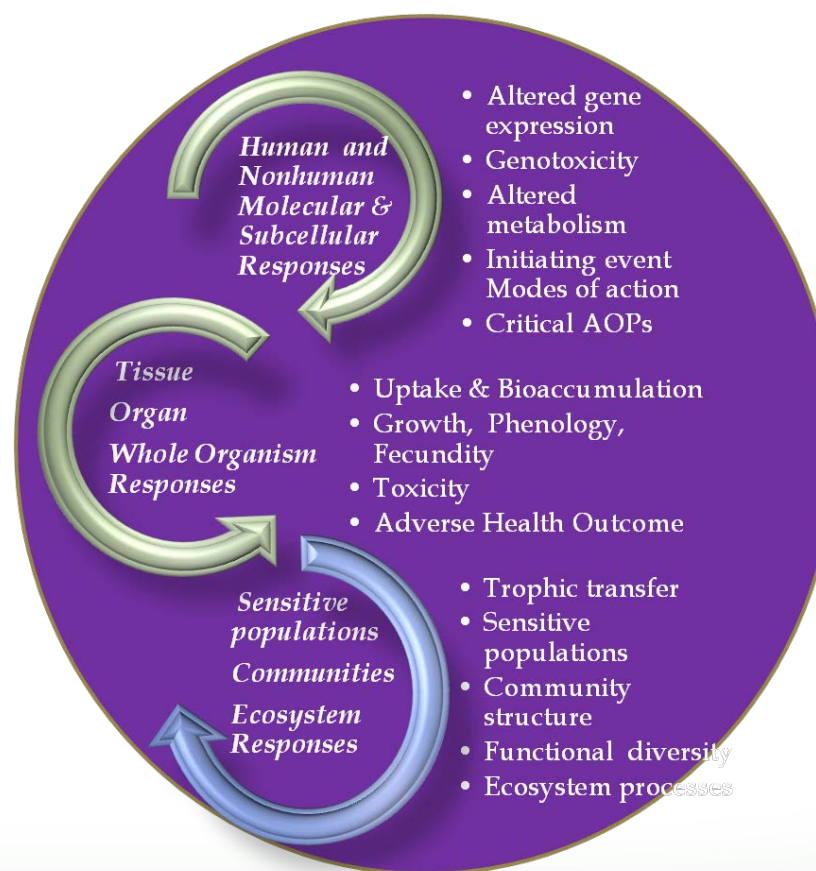


# Proposed Research Approach

## Release, Transformation & Exposure



## Human and Ecological Health





- **Exposure and Nanomaterials Properties**
  - **Research on methods to better detect, quantify and describe nanomaterials**
- **Data to inform an integrated systems approach to assess and predict the toxicity of engineered nanomaterials and their applications**
- **Guidance on best available methods and approaches for eco-testing of select nanomaterials**
- **Develop alternative testing approaches to evaluate adverse outcome pathways**
  - **Potential for adverse human health effects**
  - **Potential to impact sensitive environmental species**

- **Possible direct and indirect effects of maternal exposure on the fetus:**
  - **Embryonic Development**
  - **Neurotoxicity**
  - **Fertility**
  - **Inflammatory effects**



- **Potential health effects needing further investigation:**
  - **Cardiovascular**
  - **Allergy**
  - **Metabolism**
  - **Genotoxicity**

- **Looking beyond ‘pristine’ nanomaterials**
- **Greater understanding of nanomaterials in complex media**
- **Greater understanding of the physicochemical properties of nanomaterials that lead to their translocation and potential effects**
- **Determine sensitive endpoints for reproductive and developmental effects**





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- **iCSS Chemistry Dashboard**
- **AOP Wiki**
- **EDSP21 Dashboard**
- **EnviroAtlas**
- **Biomass Furnace System**
- **Approaches to measure subtle physiological responses to air pollution**
- **SeqAPASS**
- **CPCat- Chemical and Product Categories Database**

### Meet the Directors Sessions

- EPA Lab, Center and Office Directors
- Informal- 1 Hour Sessions

**[epa.gov/research/sot](http://epa.gov/research/sot)**

For full list of events and materials