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Nanomaterials: EPA Research to Inform Environmental Decisions

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Strategic Directions, 2010 - 2014

- Continued focus on 5 material types (Ag, C, CeO, Fe, TiO_2)
- Continued emphasis on exposure, fate & transport – "Source to dose"
  - Continue research in soil, water, biota, and extend research to air medium
  - Develop exposure models
- Increased emphasis on targeted effects, based on source-to-dose findings
- Integration of ToxCast into in-house program
- Increased emphasis on green nanotechnology from a life-cycle perspective
- Continued development of risk assessment methods, including comprehensive environmental assessment and decision analytic approaches.

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Program Integration – Multi-walled Carbon Nanotube (MWCNT) Example

Frame the question to focus on the goal: "Are humans or ecosystems likely to be exposed in the environment to MWCNT, and do MWCNT have unique properties that may result in harmful effects? If so, how can we avoid or mitigate potential risks from MWCNT?"

Overarching Goal is **Minimizing Environmental Impacts**

Risk Management Approaches	Research to Investigate Potential Impacts
Property modifications	*Chemists and material scientists* detect & characterize materials.
Process controls	*Toxicologists* identify properties associated with hazard concerns.
Exposure mitigation	*Exposure researchers* describe environmental fate, transport & transformation.
Waste management	Risk Assessors investigate methods to characterize potential impacts.
	Modelers predict stressor & receptor activity across life cycle.
	Chemists and engineers devise management options.

Key considerations:

- *Information continuously moves between disciplines.*
- *All disciplines look at nanomaterials from a life-cycle perspective.*

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Anticipated Products – 2014

- Determine the major processes that govern environmental fate, transport, and transformation of the 5 nanomaterial types.
- Source-to-dose exposure models for the 5 nanomaterial types.
- Approaches to screen, rank, and predict *in vivo* toxicity.
- Identification of key physical-chemical characteristics to inform development of predictive modeling.
- Comprehensive environmental assessments of selected nanomaterials, based on progress in prerequisite areas of research.
- Green nanotechnology and other risk management approaches for priority applications of the 5 nanomaterial types.