

## NIEHS Signature Project

### Evaluating the Safety of Engineered Nanomaterials

Engineered nanomaterials (ENM) represent a significant breakthrough in material design and development for medicine, industry, and consumer products. Global demand for nanomaterials and nano-enabled devices is expected to exceed \$1 trillion by 2015. This increased production provides increased opportunities for unanticipated exposures with unknown health consequences. The unique physicochemical properties that make engineered nanomaterials so useful also make their interactions with biological systems difficult to anticipate and critically important to explore. Recent studies have shown conflicting results from the traditional assays, methods, and models that are used to assess interaction of ENM with biological systems. This inconsistency in findings between different laboratories significantly impedes the integration of research data for risk assessment and public health protection.

This signature project will provide much needed data in the areas of toxicity profiles for nanomaterials, biochemical/molecular characterization of toxic effects in model systems, biomarkers for nanomaterials exposure, identification of susceptibility issues for nanomaterials health effects, and intervention strategies for prevention of public health episodes due to environmental nanomaterial exposures. During this two-year period, researchers will greatly expand the base of knowledge on nanomaterials safety and how it relates to structural aspects of the materials and develop informatics tools for integrating, assessing, and sharing these data. In addition, this project will develop reliable and reproducible methods and models to assess exposure, exposure metrics, and biological response to nanomaterials. The coordinated research effort will include diverse routes of exposure to nanomaterials and *in vitro* and *in vivo* models of exposure and response. This research is essential for the harmonization of research results, a scientifically sound basis for hazard assessment, and the safe design and development of ENM.

We will combine awards from three different activities to create our overall nanosafety program signature program. These include RC-2 awards from the Grand Opportunities RFA topic entitled "Engineered\_Nanomaterial Safety", RC-1 awards made from the Challenge Grants topic (13-ES-101) "Methods to evaluate the health and safety of nanomaterials," and those additional R01 awards selected from a previous RFA entitled "Manufactured nanomaterials: Physical, Chemical Principles of Biocompatibility and Toxicology in order to extend the pay line. NIEHS has committed \$5 million dollars to the GO program and requests an additional \$5 million from NIH/OD to co-fund this signature program. We also expect to supplement existing grantees doing nanotoxicology and nanotechnology research to allow for additional summer students and post-doctoral fellows to join their laboratories. This program is expected to engage investigators, post-doctoral fellows, and research staff from a wide array of scientific disciplines in both the academic and small business communities.

This initiative supports the goals identified by the National Nanotechnology Initiative, *Strategy for Nanotechnology-related Environment, Health, and Safety Research*. Once awards are made, the grantees will participate in a consortium which will meet regularly, either by conference call or face-to-face. The purposes of these meetings will be to share the results from the different labs to determine next steps, such as cross-laboratory evaluations of reproducibility and robustness of the new methods.