Development and *In Vitro* Toxicity Evaluation of Alternative Sustainable Nanomaterials

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Novel nanomaterial types are rapidly being developed for the value they may add to consumer products without sufficient evaluation of implications for human health, toxicity, environmental impact and long-term sustainability. Nanomaterials made of metals, semiconductors and various inorganic compounds, have the potential to pose risks to human health and the environment post-use as they may be toxic to humans and other organisms. Sustainable, environmentally benign, novel nanomaterials are proactively being developed and engineered in academia and industry to serve as suitable alternatives (based on functionality) to existing potentially more toxic metal-based nanomaterials. Examples include biodegradable cellulose and lignin nanoparticles synthesized by an environmentally-friendly water-based process. Such particles, infused with various active components, could have potential applications as oral drug delivery systems, as foam and emulsion stabilizers, and as adsorption matrices for environmental remediation systems. They would become inert shortly after use and will rapidly degrade in the environment. Development of rapid methods to evaluate hazard of nanomaterial alternatives will be critical to inform this material design process. We will apply high throughput screening (HTS) assay technologies, which are currently being utilized in the ToxCast chemical prioritization project, to evaluate differences in bioactivities of conventional nanomaterials and the environmentally benign alternatives currently being developed. Methods will be developed to screen alternatives for potential hazard as new materials are being developed, well before these enter the marketplace. As such, this research takes an innovative and proactive approach to ensure safety of materials, inform risk assessment upstream, and move nanotechnology toward sustainability based on green chemistry and engineering practices. *This abstract may not necessarily reflect U.S. EPA policy*.