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Nanotechnology and Its Applications for Development of a New Generation of Environmental Sensing Systems

Tarun Vinnakota*

Dayananda sagar university, Bengaluru, India

***Corresponding author:** Anusha KJ, Department of Microbiology, Dayananda sagar university, Bengaluru, India
E-mail: tarunvinnakota@gmail.com

Abstract

In current years, the continuous occurrence of multi-drug resistance in the research has made physician pay more attention to the transporter. Changes in the expression and activity of transporters can cause corresponding changes in drug kinetics. The drug-drug interactions (DDI) caused by transporters can seriously affect drug toxicity. In the enhancement of pharmaceutical preparations, people have increasingly concerned about the effects and regulation of transporters in drug effects.

Short Communication

Nanotechnology

Research and technology development at the atomic, macromolecular levels, in the length scale of approximately 1 - 100 nanometer range is nanotechnology. Creating and using structures, devices and systems that have novel therapeutic properties and functions because of their small and intermediate size [1].

Ability to control or manipulate on the atomic scale

Applications-Sensors

More efficient use of materials and more data on wastes for sensors on the atomic scale. Real-time, accurate sensing of many drug compounds simultaneously at very low concentrations frequently in hostile environments.

Applications-Treatment

Cleaning up waste streams of contaminants, particularly those substances that are highly toxic, persistent within the environment, or difficult to treat.

Applications-Remediation

Cleanup of contaminated sites with problems which brought about by prior technologies and past practices.

Implications-Nano-Geochemistry

Knowledge of formation of atmospheric aerosols and the movement of natural nano particles in air and soil can help inform the solutions to man-made problems.

Implications-Toxicity

Very much important for risk analysis for human health and ecosystem.

Implications-Fate, Transport, Transformation

Determine exposure ways for both the natural organisms in a variety of ecosystems and for humans in the environment.

Implications-Exposure, Bioavailability, Bioaccumulation

Determine where the lifecycle of a nano materials may cause impact to the environment, examine materials flow changes and its environmental effects; use DfE, MFA, LCA tools

NNI Grand Challenges for Research in Nanotechnology

Nanostructured Material by Design

Manufacturing at the Nanoscale

Chemical-Biological-Radiological-Explosive

Detection and Protection

Nanoscale Instrumentation and Metrology

Microcraft and Robotics

Nano-Electronics, -Photonics and –Magnetics

Healthcare, Therapeutics, and Diagnostics

Efficient Energy Conversion and Storage

Applications for Measurement in the Environment

The properties of nanoscale materials will enhance the development of a new generation of environmental sensing systems. Measurement science and technology will enable the development of the interaction and fate of natural and anthropogenic nanoscale and nanostructured materials in the environment [2] .

2. Applications for Sustainable Materials and Resources

A society that uses nanotechnology to transform the way it extracts, develops, uses and dissipates materials and the flow, recovery, recycling of valuable resources in the use of energy, transportation of people and goods, availability of clean water and the supply of food.

3. Applications for Sustainable Processes

Sustainable manufacturing processes are based on the use of nanoscale science and nanotechnology – integrated processes and bottom-up assembly which can serve human needs and are very much compatible with the surrounding ecosystems and human population.

4. Implications in natural and global processes

The ability to understand and quantify nanoparticles in Earth system processes which can anticipate their impacts and thus helps to optimize and integrate the environmental sustainability and nanotechnology [3].

Research challenges and needs include:

Develop high throughput/multi-analyte toxicological methodologies which focus on the mechanism and fundamental science of particles toxicity and access to well-characterized nanomaterials for conducting the risk assessment research [4].

Better understand the diversity of anthropogenic nanoparticles through the development of a nanomaterial inventory.

Gain information on exposure to nanomaterial results from medical, occupational, environmental, and accidental release of nanomaterial with regard to the concentration as well as what form(s) the nanoparticles may assume upon release into the environment.

Predict biological properties of nanomaterials through toxicological assessment of nanomaterials which includes relevant and scientifically appropriate acute, chronic toxicokinetics and pharmacokinetic studies [5].

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