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BEYOND THE VISIBLE THREAT: A CUTTING-EDGE PROTOCOL FOR UNRAVELING ECOTOXICITY OF MICROPLASTICS AND NANOPLASTICS

In «Nature Protocols» published the study of the University of Padua that provides guidelines revealing the ecotoxicity of plastics

In the battle against plastic pollution's ecological and human health repercussions, a groundbreaking protocol emerges as a beacon of precision and progress. This analytical paper illuminates an unprecedented protocol, destined to reshape the landscape of microplastics and nanoplastics research.

Plastic pollution has emerged as a pressing global issue with far-reaching consequences for both the environment and human health. This analytical paper delves into the intricate subject of plastic pollution, focusing on microplastics (particles ranging from 1 µm to 5 mm) and nanoplastics (particles smaller than 1 µm), which have garnered significant attention in recent years.

One pivotal aspect highlighted in the paper is the inherent distinction between microplastics and nanoplastics. Nanoplastics, due to their minute size, exhibit distinctive behaviors, including the potential to penetrate cellular membranes and interact with subcellular components. However, the study of nanoplastics is impeded by analytical challenges stemming from their size and the limitations of existing instrumentation, posing complexities in environmental tracking and characterization.

While research underscores the potential adverse effects of these plastic particles, inconsistencies and varying conclusions persist across studies. This variance can be attributed in part to differences in testing methodologies, which often lack a standardized approach for assessing microplastic and nanoplastic toxicity. Recognizing this imperative, the paper introduces a pioneering exposure protocol tailored specifically for ecotoxicity testing of nanoplastics.

The protocol

The protocol encompasses the entire analytical spectrum, including innovative methods for producing nanoparticles from plastic sources, generating exposure matrices that mimic real-world scenarios, and executing meticulous toxicity tests employing a diverse array of model organisms.

- At the forefront is Procedure 1, ingeniously tailored to production of microplastics and nanoplastics from plastic items using a pioneering “top-down” strategy. A game-changing aspect is its capability to transform diverse plastics, even those retrieved from the environment, into microplastics and nanoplastics.
- Procedure 2 ushers in a paradigm shift by crafting exposure matrices tailored for microplastics and nanoplastics toxicity tests. Acknowledging the heterogeneity of polymer types and particle characteristics, the protocol pioneers the creation of exposure matrices designed to mimic real-world scenarios, encompassing both terrestrial and aquatic systems.
- Procedure 3 focuses on finely-tuned ecotoxicity tests for microplastics and nanoplastics, carefully designed to enhance precision. This section introduces the intricate art of conducting toxicity tests using model organisms selected from various environmental settings

The presented protocol aims to fill gaps in current knowledge and enhance the comparability of research findings. It offers a framework for researchers, institutions, and regulatory bodies to conduct more consistent and standardized assessments of nanoplastic toxicity. By providing a unified

approach to assessing the environmental and health risks associated with nanoplastics, this protocol contributes to informed decision-making and policy formulation. Ultimately, this analytical paper underscores the urgency of addressing plastic pollution and calls for collaborative efforts to advance our understanding, mitigate risks, and safeguard our ecosystems and well-being.

Link to the article: https://www.nature.com/articles/s41596-023-00886-9
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