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EPFL

Section Sciences et Ingénierie de l'environnement
Design Project 2024 (semestre de printemps)

Proposition n°42

Assessing Bioavailability of Microplastics or Tire-Related Chemicals in Biological Fluids

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Descriptif du projet

Plastics have raised global concerns due to their devastating impact on ecosystems. Recent studies show the presence of microplastics in the human lungs. Microplastics, including tire residues, are found in the air and dust, indicating inhalation as a possible route of human exposure. During the manufacturing of plastics and tires, chemicals are incorporated into the polymer to enhance performance, functionality, durability, color, brightness, and homogeneous blending of the final product. These chemicals may also be present in the lungs when plastic and tire residues are inhaled. Furthermore, microplastics can adsorb environmental contaminants, such as acids, aliphatic and (polycyclic) aromatic organic compounds, metals, as well as allergens, pollen fragments, viruses, and endotoxins. This intricate interplay between microplastics, chemicals, and environmental contaminants raises critical questions about their bioavailability in the respiratory system and possible toxicity.

Objectif et buts

The primary aim of this project is to collect microplastics in the field and design a laboratory experiment to determine the bioavailability (kinetics) of the microplastic/tire-related chemicals in biological fluids present in the respiratory system.

Descriptif tâches

- Collect samples from field locations such as plastic recycling, 3D printing area, or high-traffic roads.
- Assess whether solid residues collected in the samples migrate into the liquid phase under specific lung conditions and fluids.
- Develop an experimental design to study the pulmonary metabolism of plastic or tire residues in biological fluids with enzymes.
- Perform concrete experiments using microplastics, plasticizers, and/or tire residues representative of those collected in the field.