Abstract

[Project Information]

Project Title :	Evaluation of Lung Toxicity of Micro / Nano Plastics by Inhalation Exposure and Investigation of Lung Toxicity Caused by Different Surface Functional Groups
Project Number :	JPMEERF20221R04
Project Period (FY) :	2022-2024
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[Abstract]

Environmental pollution caused by microplastics has become a growing concern in recent years. Studies have reported the presence of microplastics in the air, and evidence suggests that they can accumulate in the lungs through inhalation, raising concerns about their potential biological effects. The primary reason for this concern is the high stability of plastic materials, which allows them to persist in the lungs for extended periods without being broken down by the body.

We investigated the potential effects of inhaling microplastics by conducting a four-week, short-term inhalation exposure study using polypropylene. In addition to that, we performed intratracheal instillations using polypropylene and three types of polystyrene with different surface functional groups (unmodified, carboxyl-modified, and amino-modified) to examine how surface modifications affect their impact on the lungs.

The study produced three main findings:

1. Feasibility of Inhalation Testing:

The inhalation exposure with polypropylene was shown to be technically feasible. The minimum toxic dose causing acute effects was determined to be 2 mg/m^3. This finding provides a solid foundation for conducting future long-term inhalation exposure studies.

2. Establishing a Screening Method:

Results from both methods using polypropylene were compared to assess whether intratracheal instillation could be used to predict the effects of inhalation exposure. While there were differences in the degree of inflammation observed, acute inflammatory responses were found in both cases. By identifying a pathological condition common to both methods, the study established a basis for using intratracheal instillation as a screening tool to evaluate the health risks of inhaling

microplastics.

3. Effects of Surface Modifications:

Intratracheal instillation using polystyrene with different surface functional groups revealed that all types caused only transient lung inflammation. The differences in surface modification had little effect on the severity of lung disorders. Compared to polypropylene, polystyrene-induced inflammation was milder, indicating that surface modifications do not significantly influence the extent of lung inflammation caused by polystyrene microplastics.

In conclusion, this research lays the groundwork for future long-term inhalation studies and introduces a promising method for screening microplastic-induced lung disorders. These are pioneering findings in advancing our understanding of the potential health risks associated with inhaling airborne microplastics.

[References]

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This study was supported by the Environment Research and Technology Development Fund of the ERCA ({JPMEERF}) funded by the Ministry of the Environment.