LRI-B25: ESTABLISHING OF A DERMAL UPTAKE THRESHOLD AS A POTENTIAL ROUTE OF EXPOSURE FOR MICROPLASTIC PARTICLES

Background

Dermal Exposure of Micro-and Nanoplastics (MNP) on a mass basis is presumed to be very low based on size limited uptake. MNP are defined as plastic particles with a size less than 5 mm. It is quite evident that uptake at 5 mm would not be possible through intact skin. From the previously conducted research on nanomaterials there is literature that indicates that 40 nm is a generalized upper cut-off value where dermal uptake was observed. Although it is challenging to determine where the upper cut-off level will be for microplastics given the diversity of their particle physical-chemical properties, it is presumed that this limit is primarily biologically dependent based upon a size cut-off and not material dependent, although factors such as charge or surface groups may play a contributing role.

Objectives

This project is looking to investigate if dermal uptake is a route that could contribute to significant MNP exposure

The project's objectives are to:

1. Determine if dermal uptake of MNP has a size limited threshold
2. Investigate if polymer type or shape/form plays a role in the dermal uptake of the material
3. Propose a method for screening polymer types for future safety assessments as the ability to isolate smaller and more discrete fractions of MNP continues to evolve.

Scope

In order to assess the limitations of dermal uptake the researchers should propose human relevant dermal translocation studies (preferred *in vitro*) to assess the ability of MNP to penetrate the dermal barrier. The researcher will need to investigate dosing regimen, such as sample preparation, carrier/vehicle, exposure duration to simulate end uses. Several polymer types and shape/form should be proposed by the researcher, starting with the smaller sizes, at least one size range targeting ~100 nm (0.1 um) to cover the upper range of nanoplastic and the lower limit of microplastic. If generation of the particles at this range is likely not possible then another size range should be provided with justification. Researchers should not use only commercially available polystyrene spheres, relevant test materials could come from industry and other ongoing projects, but other proposals by the researchers would be highly valued. Ideally; the proposal would include a table of the polymer types and sizes proposed to be investigated in the research proposal as well as some indication if the particles are already available or would need to be generated.

All types of synthetic solid plastic polymeric materials are in scope. The RfP is not restricted to certain type of microplastics e.g. polyolefin origin.

Out of scope (optional)

The model to be used should already be validated or have significant peer reviewed publication supporting its use. This RfP is not supporting the validation of a dermal exposure model but is aimed specifically at the investigation into the dermal uptake of micro- and nanoplastics (MNP).

Deliverables

The final report shall contain an executive summary (2 pages max), a main part (max. 50 pages) and a detailed bibliography. It is expected that the findings will be developed into at least one peer reviewed publication, following poster(s) and presentation(s) at suitable scientific conference(s).

Participation in activities of the "Microplastics Advanced Research and Innovation Initiative" (MARII) is requested.

Partnering / Co-funding

Applicants should provide an indication of additional partners and funding opportunities that can be appropriately leveraged as part of their proposal. Partners can include, but are not limited to industry, government/regulatory organizations, research institutes, etc. Statements from potential partners should be included in the proposal package.

Fit with LRI objectives / Possible regulatory and policy impact involvements / Dissemination

Applicants should provide information on the fit of their proposal with LRI objectives and an indication on how and where they could play a role in the regulatory and policy areas. Dissemination plans should also be laid down.

DEADLINE FOR SUBMISSIONS: September 1st, 2023

Timing: Start in Q4 2023, 18 months

LRI funding: €200.000

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