Institute for the Advancement of Food and Nutrition Sciences

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Request for Proposals:

Exposure Characterization of Micro- and Nanoplastics in Foods

The Institute for the Advancement of Food and Nutrition Sciences (IAFNS; www.iafns.org) is a non-profit, 501(c)(3) scientific organization that pools funding from industry collaborators and advances science through the in-kind and financial contributions from public and private sector participants. IAFNS adheres to strict procedures to maintain scientific integrity in all work we support. These requirements are described further in the attached TOP Guidelines and Guiding Principles for Scientific Integrity addendums.

Issue to be Addressed:

The volume of plastics produced globally every year has steadily increased over the last few decades and shows no signs of tapering. As of 2017, an estimated total of 8.3 billion tons of resins and fibers had been produced globally with the most common use being in packaging. Plastic is highly desirable because of its low cost, physico-chemical characteristics such as their gas barrier properties, malleability and light weight. These properties, however, make plastics less prone to environmental degradation, which leads to their accumulation in environmental matrices such as oceans, soils, and even the atmosphere. The presence of whole and partially degraded plastic particles in the environment poses potential, though yet uncharacterized, consequences for food safety and public health[1,2]. Some published studies have reported potential adverse effects from exposure to micro- and nanoplastics including neurotoxicity, oxidative stress and immunotoxicity; however, direct evidence for adverse human health effects remains lacking.

The FDA has identified research gaps[3], including a need for qualitative (types and attributes) and quantitative (concentrations) data of plastic particles found in various foods and in water to help narrow/prioritize the scope of plastic substrates to be addressed by research and regulatory decision-making.[4] This project will address these needs and assess kinetics of plastics adsorption and transport into cells focusing on physical characteristics at realistic concentrations. In a broader sense, the project will address a critical knowledge gap that is needed to assess the potential impacts to human health from exposure to micro- and nanoplastics via ingestion and support regulatory agencies' decision making.

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[1] Thompson RC, Courtene-Jones W, Boucher J, Pahl S, Raubenheimer K, Koelmans AA. Twenty years of microplastics pollution research-what have we learned? *Science*. 2024 Sep 19:eadl2746. doi: 10.1126/science.adl2746. Epub ahead of print. PMID: 39298564.

[2] Garrido Gamarro, E. & Costanzo, V. 2022. Microplastics in food commodities – A food safety review on human exposure through dietary sources. *Food Safety and Quality Series* No. 18. Rome, FAO. https://doi.org/10.4060/ cc2392en (and references within)

[3] https://www.fda.gov/food/environmental-contaminants-food/microplastics-and-nanoplastics-foods

[4] Duncan, T. V.; Khan, S. A.; Patri, A. K.; Wiggins, S. Regulatory Science Perspective on the Analysis of Microplastics and Nanoplastics in Human Food. *Anal. Chem.* **2024**, *96* (11), 4343–4358, DOI: 10.1021/acs.analchem.3c05408

Objective:

Characterize the Physico-chemical properties of Micro- and Nanoplastics Relevant to Food

a. Critically assess the literature for information on source and presence of resins in foods, focusing on relevant methodology (analytical, QC measures). This will inform subobjective "b" below.

b. Characterize relevant micro and nano-plastics including shape, resin type, surface charge, density, hydrophobicity, hardness, crystal structure, and aspect ratio. Focus on pristine (first pass) and/or weathered resins.

c. Develop a framework for assessing the mechanism of Adsorption/Absorption kinetics based on physico-chemical properties.

Scope:

Food-relevant resins. Out of scope: Toxicological assessment and contaminants. Polystyrene *per se* should not be a focus of the exposure assessment; however, we recognize it can be a reference compound.

Deliverables:

- The primary deliverable is 1-2 high-impact publications in a peer-reviewed journal. Additional deliverables:
    - Quarterly updates to the IAFNS Food & Chemical Safety Committee.
    - One to two presentations at appropriate scientific conferences.

Proposal Content:

1. **Approach:** Please provide your approach to the research design elements. Identify key research questions, outcomes, methodology, and analysis plan. Where appropriate, please reference the validation of proposed methods.
2. **Anticipated Challenges:** Please include proposed solutions to the anticipated challenges.
3. **Research Team:** Please indicate the primary (and secondary) investigators, plus any additional contributors or collaborators.
4. **Investigator Credentials and CV**
5. **Potential Conflicts of Interest:** List potential conflicts of interest for investigators, co-investigators and collaborators. We suggest using the Conflict of Interest Guide in the American Society for Nutrition guide for authors: https://legacyfileshare.elsevier.com/promis_misc/asn-guide-for-authors.pdf
6. **Budget:** Please provide a budget summary. IAFNS has a target maximum of $65,000 for this project. Deviations from this target can be considered if justified by the proposed research. Indirect costs of up to 10% of total direct costs will be considered for the management of the project by the sponsoring institution and should be included in the total budget. IAFNS will cover costs of open access publication fees.

7. **Timeline of Key Deliverables:** IAFNS endeavors to complete projects in an aggressive yet timely manner.
8. **Page Limit:** No more than 3-4 pages excluding references and investigator CVs.

Deadline: November 25, 2024

Please submit completed proposals to:

Neal Saab, PhD
Senior Science Program Manager
nsaab@IAFNS.org

Proposal Review Process:

a) Proposals will be reviewed promptly by a joint subcommittee of IAFNS' Food & Chemical Safety Committee and Packaging Safety & Sustainability Committee.

b) The review process will consider investigator credentials, fit with objectives, timeliness of deliverables, fit for budget and expected research impact.

c) Applicants will be notified by email if additional information is needed.

d) Once the review process is over, all applicants will be notified of the disposition of their proposals in a timely manner.