Navigating the Microplastics and Nanoplastics (MNPs) Challenge with a Product Stewardship Framework

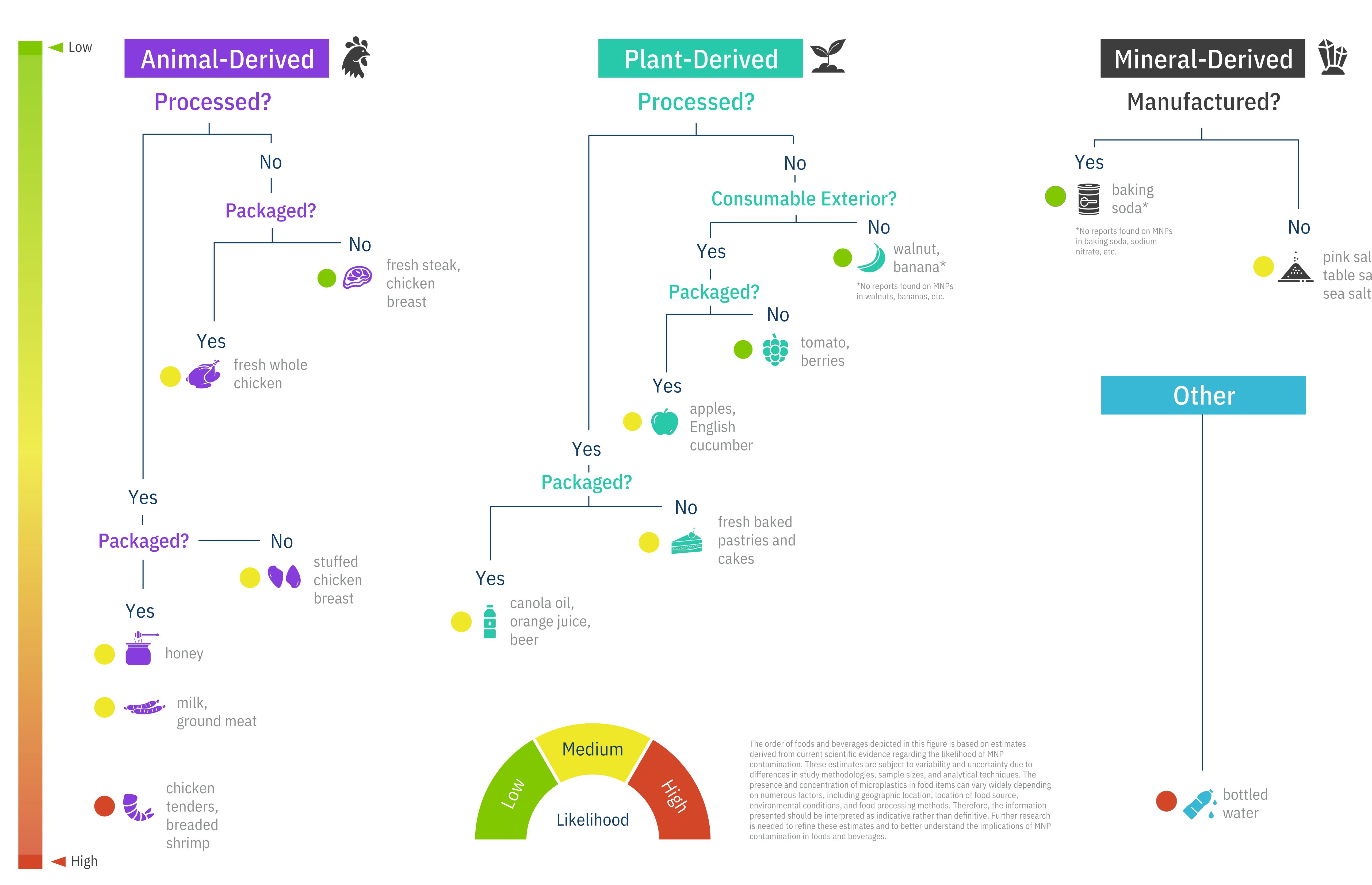
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Are MNPs likely present?

A comprehensive literature review conducted by scientists revealed a clear pattern: MNPs are reported in foods and beverages with higher levels of processing and packaging. These MNPs likely originate from the shedding, shearing, and abrasion of plastic food contact surfaces, including packaging materials such as plastic containers, bottles, and wraps. Variations in detection methods among publications permit only an estimated comparison of probabilities. The listed items are meant to serve as general examples and do not refer to any specific products within their respective categories.

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Novel approaches to MNPs for the food and beverage industry

Primary Issue

The presence of MNPs in foods and beverages is undesirable for consumers.

Present Approach

Conduct vulnerability assessments of supply chains, manufacturing conditions, and packaging materials for processed foods.

Vulnerability assessments enable industry to prioritize the potential substitution of materials with the highest likelihood of MNPs. Conducting a human health risk assessment is the next logical step for cases where the elimination of MNPs from the supply chain is unachievable. However, there is still a lack of comprehensive safety data on MNPs.

Outstanding Issues

MNPs vary in shape, size, and composition and can carry adsorbed co-contaminants.

The presence of MNPs in different products represents different exposure scenarios depending on ingested quantities (e.g., salt vs. beer).

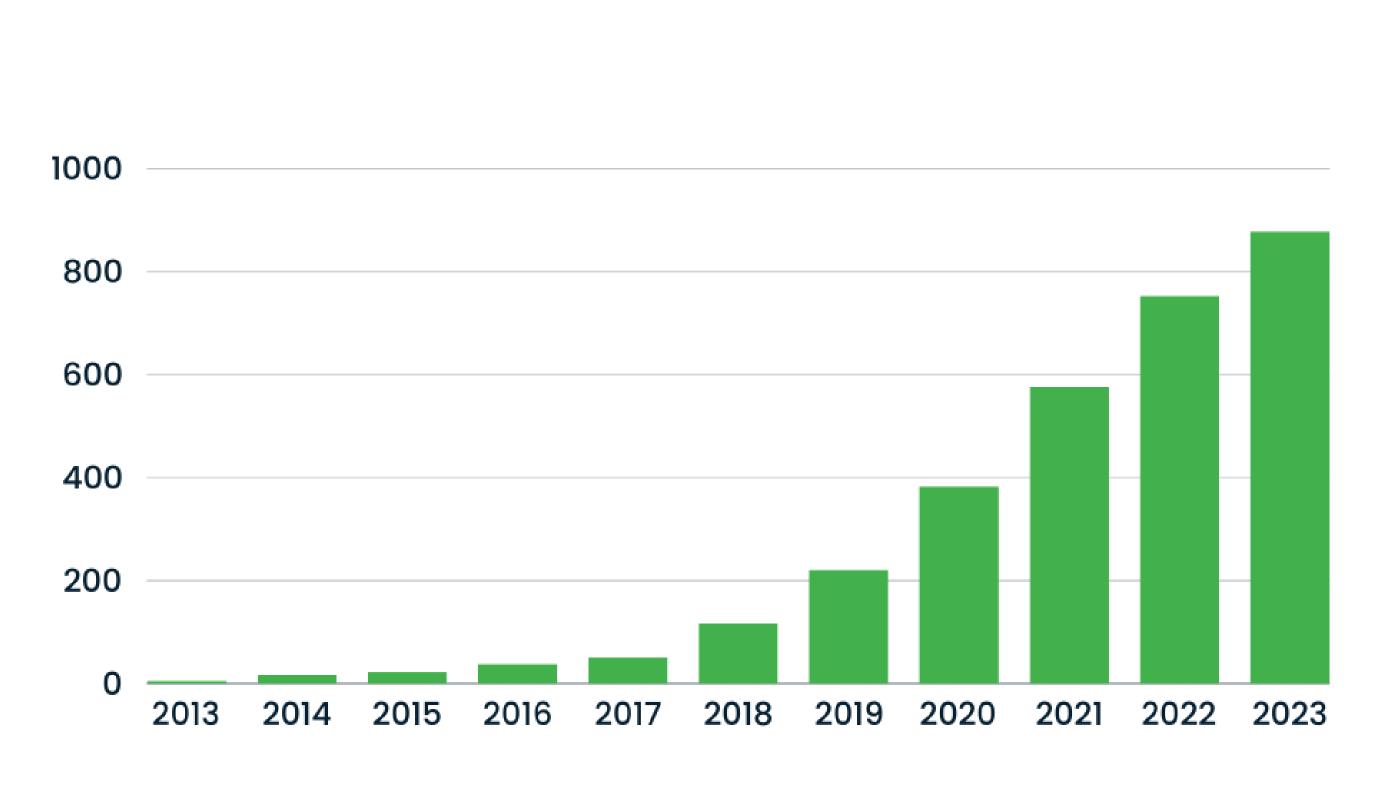
Recommended Next Steps

Conduct chemical analyses and physical characterizations of MNPs, and identify or generate respective hazard and dose-response data.

Conduct product-specific and aggregate exposure assessments to adequately characterize risk to human health in the context of hazard and dose.

Visualizing Emerging Research Trends

MNPs are gaining significant media attention due to their environmental prevalence and presence in foods and beverages. The number of scholarly publications on MNPs has also surged, with recent studies increasingly focusing on detecting, characterizing, and analyzing these particles in various consumables.



Web of Science Core Collection (2013–2023):

(a) Annual trend in research output related to MNPs in the context of foods and beverages.

(b) Keyword co-occurrence map generated using VOSviewer, based on the same set of publications as (a).

