

Plastic Additives and their Unknown Dangers to Human Health

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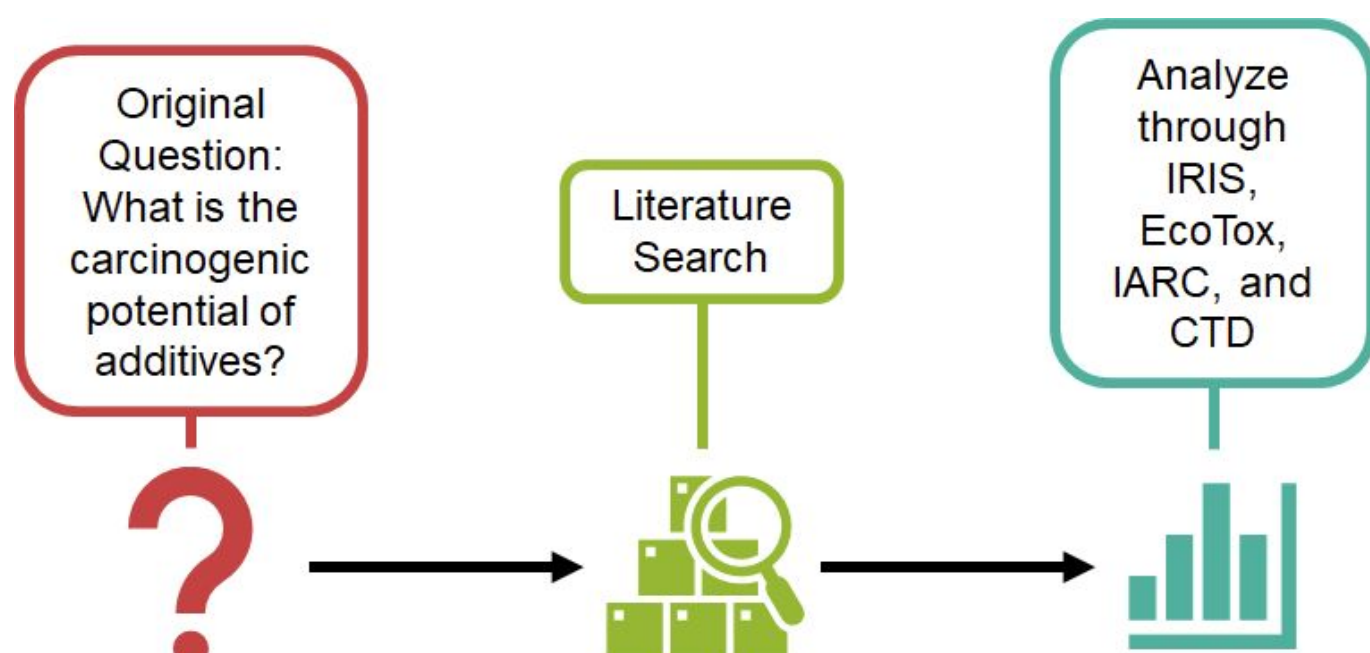
Background

- Plastic production is expected to **double** in the next 20 years.
- Plastic products are ubiquitous in our daily routines.
- Humans in the U.S. **consume between 39,000 and 52,000 microplastic particles per year** from food and beverages alone.
- Chemicals, known as plastic additives, are added to plastic to improve functionality, but their impacts on human health are **not well understood**.

Objectives

- Compile a comprehensive list of commonly used plastic additives.
- Use the IRIS, IARC, and EcoTox databases to:
 - 1) Determine the carcinogenicity or potential carcinogenicity of the plastic additives.
 - 2) Characterize which plastic additives are associated with the seven main types of plastic.
 - 3) Analyze the additives to determine whether those with unknown carcinogenicity activate carcinogenic gene pathways

Procedure



Results

Figure 1 represents the progress of our literature search of plastic additives after finding 19 papers. Below are donut charts representing the classification of the additives in IRIS (2A), IARC (2B), and EcoTox (2C).

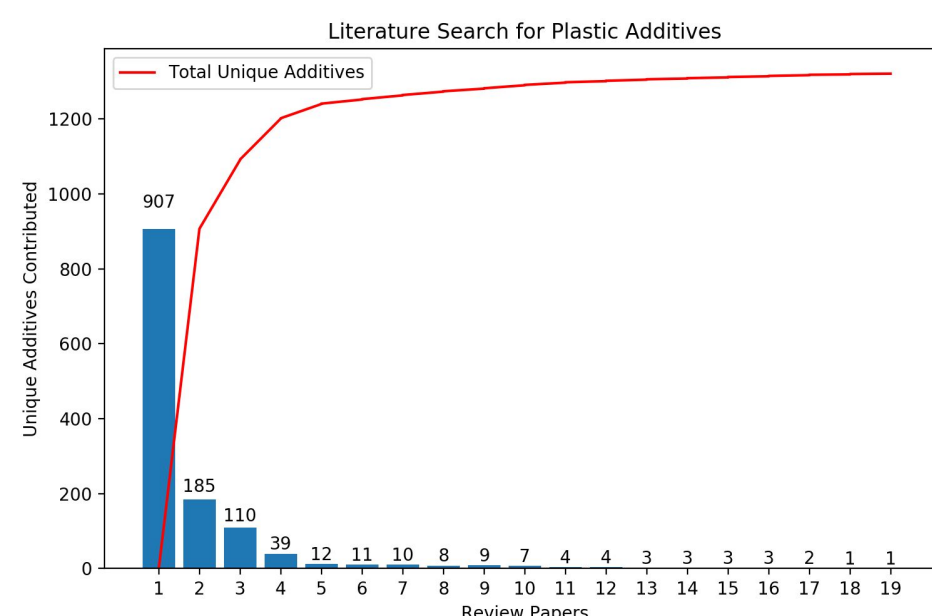


Figure 1: The number of unique additives provided by each subsequent review article in our literature search (total: 1322). The graph reaches an asymptote, showing that beyond 19 papers, the number of unique additives may not substantially increase.

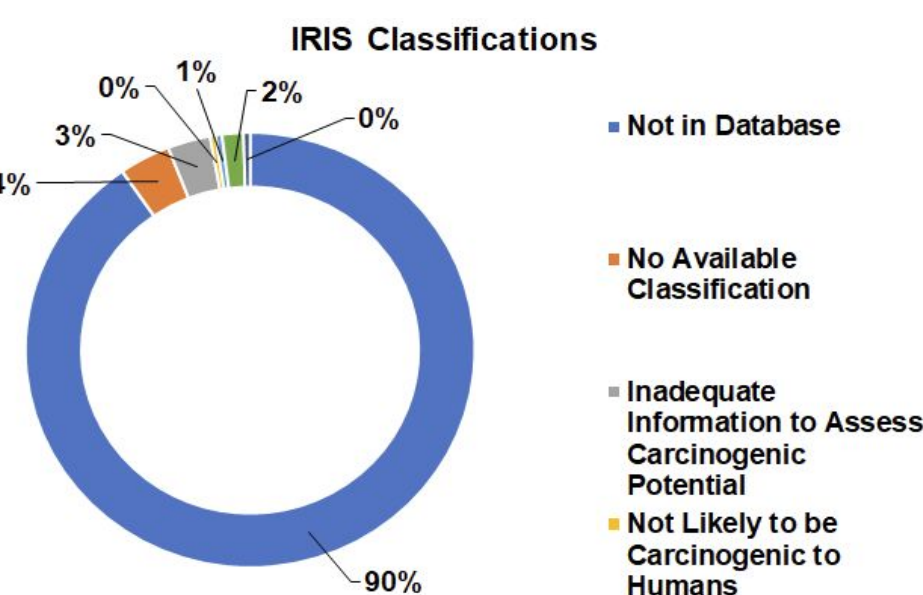


Figure 2A. Classifications of the 1322 plastic additives in the IRIS database.

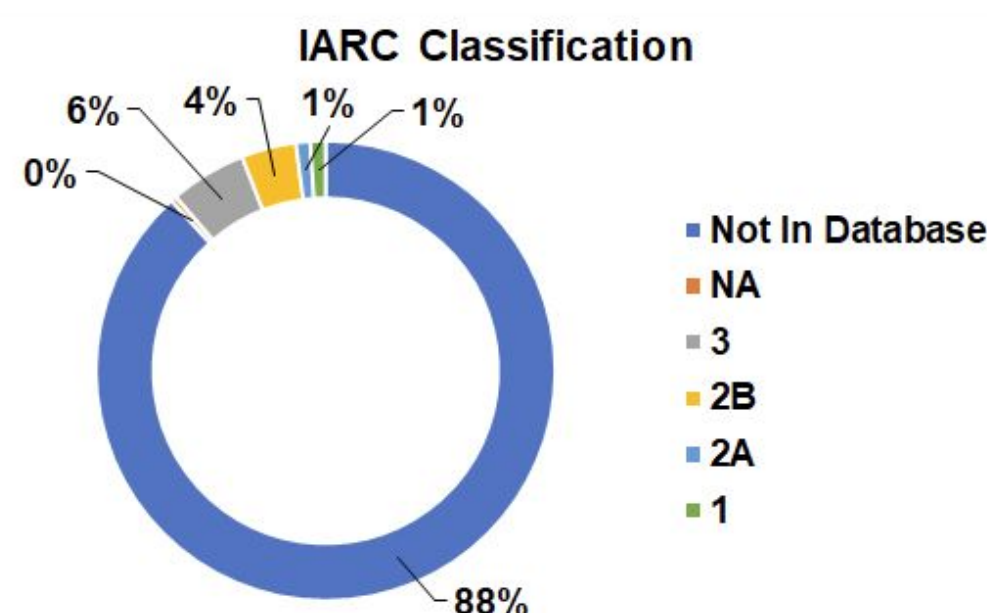


Figure 2B. Classifications of the 1322 plastic additives in the IARC database. NA: No Classification, 3: Not classifiable as to its carcinogenicity to humans, 2B: Possibly carcinogenic, 2A: Probably carcinogenic, 1: Carcinogenic

2C. EcoTox Presence

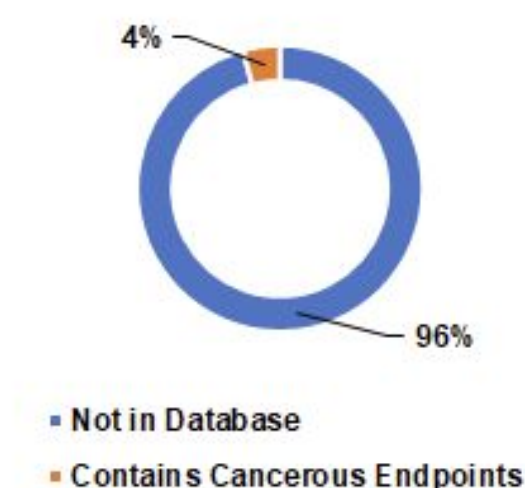
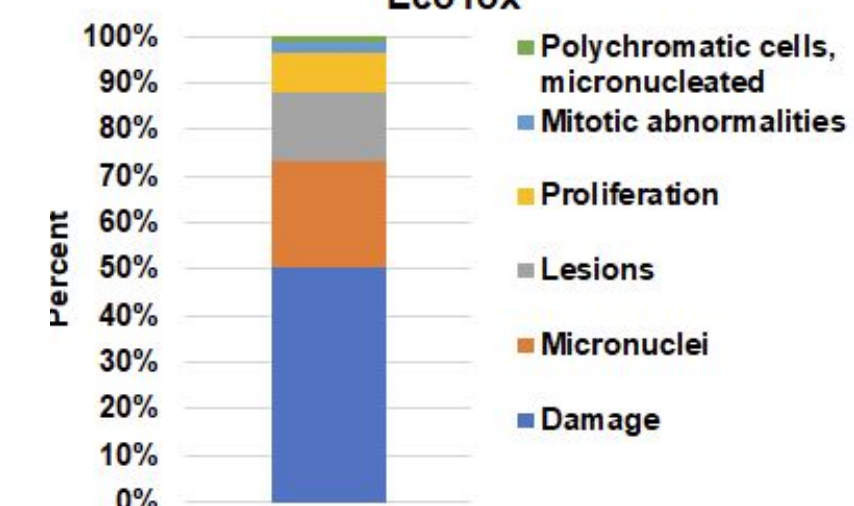


Figure 2C. Classifications of the 1322 plastic additives in the EcoTox database. Containing cancerous endpoints does not mean the additives are known carcinogens. **Figure 2D.** Endpoint data for the additives in EcoTox.

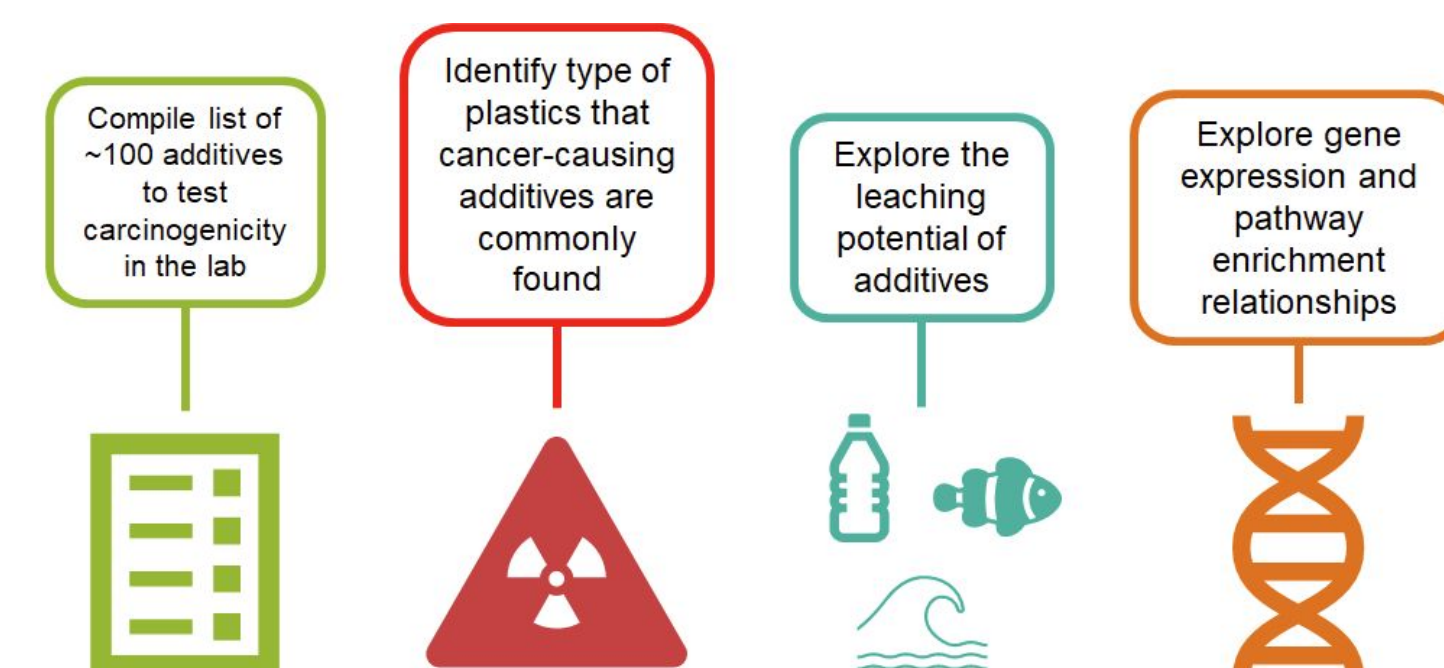
2D. Cancerous Endpoints of Additives in EcoTox



Conclusions

- There is a dearth of knowledge about plastic additives and their toxicity or carcinogenicity in the IRIS, EcoTox, and IARC databases.
- Of the additives in the databases, many are cancerous. This gap in knowledge of plastic additives is a significant threat to human and marine health.
- Without further testing and identification of carcinogens commonly used in plastic, humans could be unknowingly exposed to toxic and/or carcinogenic additives through plastic packaging and other plastic products.

Next Steps



References

