Applied Sciences

Nearly 200 Potential Breast Carcinogens Detected in Food Packaging

The majority of the chemicals were found in food packaging and tableware made from plastic.

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speaking with
Lindsey Parkinson

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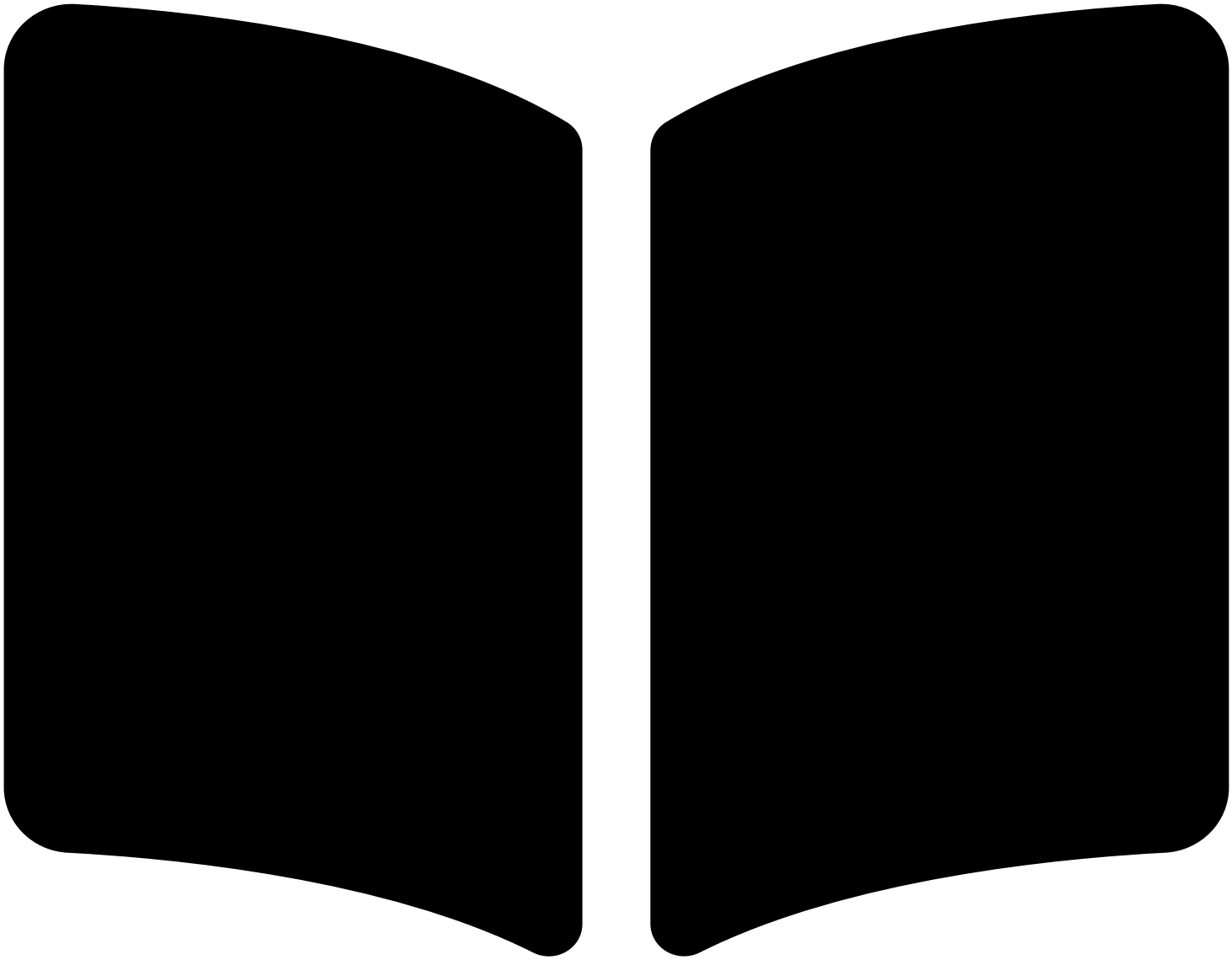

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A new study from the Food Packaging Forum has identified the presence of 189 potential or confirmed mammary carcinogens in food contact materials (FCMs) available on the global market.

The majority of these compounds were found in plastic packaging and tableware, though paper, cardboard and other multi-material packagings were also found to contain potential carcinogens.

These findings highlight gaps in current food safety regulations, the researchers say, which could represent a significant opportunity for improving the prevention of human exposure to breast cancer-causing compounds. The research is published in *Frontiers in Toxicology*.

Breast carcinogens in food packaging

By comparing a list of more than 900 potential and confirmed breast carcinogens that had recently been published in *Environmental Health Perspectives* with entries in the Food Packaging Forum's Database on Migrating and Extractable

Food Contact Chemicals (FCCmigex), the authors confirmed a significant crossover between the two groups.

The FCCmigex database maps the scientific evidence of food contact chemicals (FCCs) that have been measured in migration and extraction studies conducted on different types of food packaging found on the market.

"My colleagues at the Food Packaging Forum have, as of the last update, analyzed 1,355 scientific studies into the FCCMigex," the study's first author Lindsey Parkinson, a data scientist and scientific editor at the Food Packaging Forum, told *Technology Networks*. "In total, the database contains more than 4,000 food contact chemicals and over 24,000 database entries – each entry representing essentially a single experiment."

By cross-referencing their database entries with the recently published list of carcinogens and chemicals that may increase breast cancer risk, the researchers hoped to identify whether any of these cancer-causing compounds might be present in food packaging.

"At its most basic, the overlap between these two datasets means that there are chemicals known to cause, or that have characteristics linked to, breast cancer that are in food contact materials," Parkinson said.

Potential breast carcinogens found in food packaging worldwide

The authors found a total of 189 compounds were present in both lists – 143 detected in plastic FCMs and 89 in paper or cardboard.

"Three-quarters of the breast cancer-relevant food contact chemicals were detected in packaging, tableware or other articles made with plastic, but nearly all material groups had some of these potential carcinogens," Parkinson said, adding that this is likely because plastics are incorporated into the linings and coatings of many materials.

"I think this demonstrates how complex our food packaging materials have become," Parkinson continued. "This isn't always a bad thing, it's great to be able to preserve, protect and store food, but we need a regulatory system that can handle the literally thousands of food contact chemicals that are on the market. And the chemicals with known hazards, such as cancer-causing properties, need to be addressed with high priority."

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As the FCCmigex covers a considerable date range and includes both migration and extraction studies, the authors decided to repeat their analysis but this time limited to only the most recently available studies included in FCCmigex (2020-2022) that used migration experiments. These constraints should reflect the most realistic conditions that mimic normal usage, they say.

"One of the strengths of the FCCmigex is that it encompasses the entirety of the evidence on the transfer of food contact chemicals. But that breadth can also be used to cast doubt on the findings – extraction studies are a worst-case scenario, regulations change and material formulations change," Parkinson explained.

Under these new limitations, the team still found 76 FCCs that overlapped both lists, of which 61 were from plastics. The FCMs that they were detected in were purchased from markets all over the globe, including Brazil, Canada, China, the United States, India and several countries in the European Union.

Study highlights the gaps in current regulations

While regulations do exist today that aim to limit human exposure to potential carcinogens, these findings suggest that regulations may not be preventing exposures as effectively as they intend to.

"The 'tolerable daily intake' or 'reference dose' or various other ways of regulating the amount of a chemical allowed doesn't change very often. Some are set at a generic level or others by the amount at which a single health endpoint becomes affected – generally the response of the male reproductive system," Parkinson explained.

Regulators do take action to address limits when they are shown to be ineffective – as demonstrated by the European Food Safety Authority's recent re-evaluation of bisphenol A (BPA) to set levels 20,000 times lower than before. But closing off individual gaps in protections is likely to be a Sisyphean task for regulators.

"The trouble is that it's simply impossible to do detailed studies and major regulatory reports for every single chemical on the market. There are thousands used in food contact materials alone," Parkinson said. "There are extra complexities in trying to understand which mixtures of these exposures may be a problem. In some cases they may have 'non-monotonic dose responses' where the effect is seen at low doses but not at high doses – which the current regulatory testing system doesn't deal with very well."

"Using common characteristics among chemicals and being able to regulate groups instead of one-at-a-time could make the process more efficient," Parkinson suggested.

Reference: Parkinson LV, Geueke B, Muncke J. Potential mammary carcinogens used in food contact articles: implications for policy, enforcement, and prevention. *Front Toxicol*. 2024;6:1440331. doi: 10.3389/ftox.2024.1440331

Meet the Author

Alexander Beadle

Science Writer & Editor

Alexander Beadle is a science writer and editor for Technology Networks. He holds a masters degree in Materials Chemistry from the University of St Andrews, Scotland.

Interviewing

Lindsey Parkinson
Data Scientist and Scientific Editor

Lindsey earned a BSc in environmental science and BA in environmental education from Western Washington University and her MSc in biology from the University of Alaska Fairbanks. She studied data science at Propulsion Academy in Zurich, Switzerland.

With the Food Packaging Forum, she combines her roles as scientific editor and data scientist to review and report on the latest scientific research and governmental policies related to the safety of chemicals used in food packaging, and connects it to the development and application of datasets to answer open questions about the chemicals in food contact materials.

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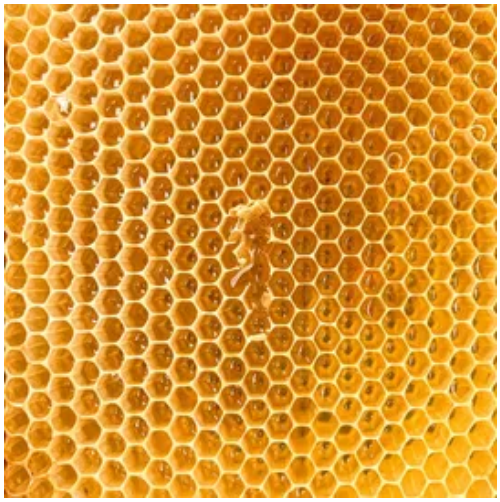

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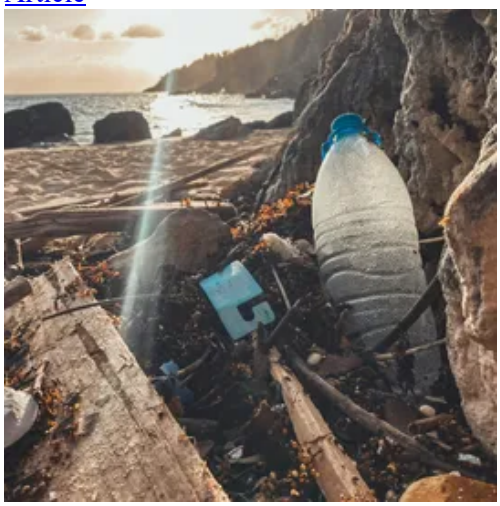

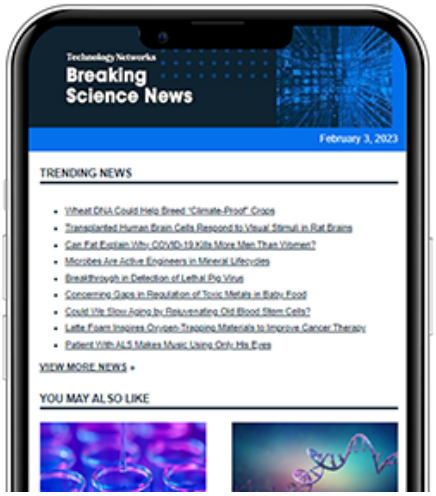

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