ACS National Meeting, paper id 4326415, "Wrong and Very Wrong: Even Very Wrong Results Don’t Get Corrected Quickly" presented at the Fall (Washington, D.C.) meeting on 21 August 2025 in Convention Center East Salon C at 10:45AM

MJPhD

Wrong and Very Wrong:
Even Very Wrong Results Don’t Get Corrected Quickly

Mark Jones
Creative Director
MJPhD, LLC

21 August 2025

Picasso, 1955

Toxic-Free FUTURE

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PRESS ROOM

First-ever study finds cancer-causing chemicals in black plastic food-contact items sold in the U.S.

October 1, 2024

Highest levels of toxic flame retardants found in a spatula, sushi tray, and beaded necklace—likely the result of dirty plastic recycling

Toxic-Free Future urges the U.S. and states to ban poison plastics and harmful chemical additives through the Global Plastics Treaty and state policy

SEATTLE, WA — A new peer-reviewed study in *Chemosphere* finds, for the first-time, certain toxic chemicals in black plastic food-contact items sold in the United States. Led by scientists from Toxic-Free Future and Vrije Universiteit Amsterdam, the testing uncovered high levels of cancer-causing, hormone-disrupting flame retardant chemicals in a variety of household products made with black plastics including food serviceware, kitchen utensils, and toys.

Press Contact

Stephanie Stohler,
sstohler@toxicfreefuture.org

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> "testing uncovered high levels or cancer-causing, hormone-disrupting flame retardants chemicals in a variety of household products made with black plastics..... Toxic flame retardant chemicals were found in 85% of analyzed products"

Chemosphere
Volume 365, October 2024, 143319

From e-waste to living space: Flame retardants contaminating household items add to concern about plastic recycling

Megan Liu [a], Sicco H. Brandsma [b], Erika Schreder [a]

https://doi.org/10.1016/j.chemosphere.2024.143319

Refers to

Response to the letter to the editor
Chemosphere, Volume 385, September 2025, Pages 144547
Megan Liu, Sicco H. Brandsma, Erika Schreder

Letter to the editor
Chemosphere, Volume 385, September 2025, Pages 144542
Mark E. Jones

Referred to by

Corrigendum to 'From e-waste to living space: Flame retardants contaminating household items add to concern about plastic recycling'...
Chemosphere, Available online 3 July 2025, Pages 144552
Megan Liu, Sicco H. Brandsma, Erika Schreder

Corrigendum to 'From e-waste to living space: Flame retardants contaminating household items add to concern about plastic recycling'...
Chemosphere, Volume 370, February 2025, Pages 143903
Megan Liu, Sicco H. Brandsma, Erika Schreder

Harmful flame retardants (FRs) used in electronics were found in **black plastic household products**—including toys and kitchen utensils—likely due to recycled content.

Presumed FR Source

TBBPA, BDE-209, 2,4,6-TBP, DBDPE, TTBP-TAZ, BDP, RDP, & TPHP are or have been intentionally used in electronics.

FRs Detected

This study found ΣFR concentrations up to 22,790 mg/kg in food serviceware, hair accessories, kitchen utensils, and toys.

- 17 out of 20 products analyzed contained brominated and/or organophosphate FRs. 85%
- Most frequently detected compounds included TBBPA, BDE-209, 2,4,6-TBP, RDP, BDP, and DBDPE.
- Items containing polymers used in electronics had significantly higher FR levels.

Toxic-Free FUTURE VU VRIJE UNIVERSITEIT AMSTERDAM A-I-LIFE Amsterdam Institute for Life and Environment

ABSTRACT

Brominated flame retardants (BFRs) and organophosphate flame retardants (OPFRs) are commonly used in electric and electronic products in high concentrations to prevent or retard fire. Health concerns related to flame retardants (FRs) include carcinogenicity, endocrine disruption, neurotoxicity, and reproductive and developmental toxicity. Globally, a lack of transparency related to chemicals in products and limited restrictions on use of FRs in electronics have led to widespread use and dissemination of harmful FRs. Despite the lack of transparency and restrictions, plastics from electronics are often recycled and can be incorporated in household items that do not require flame retardancy, ~~resulting in potentially high and unnecessary exposure~~. This study sought to determine whether black plastic household products sold on the U.S. market contained emerging and phased-out FRs and whether polymer type was predictive of contamination.

ABSTRACT - CONTINUED

A total of 203 products were *screened* for bromine (Br), and products containing >50 ppm Br were *analyzed* for BFRs, OPFRs, and plastic polymers (e.g. acrylonitrile butadiene styrene, high impact polystyrene, polypropylene). FRs were found in 85% of analyzed products, with total FR concentrations ranging up to 22,800 mg/kg.

"Screened" versus "analyzed" is a distinction without merit.

22,800 mg/kg = necklace

ABSTRACT - CONTINUED

A total of 203 products were analyzed ~~*screened*~~ for bromine (Br), and products containing >50 ppm Br were further *analyzed* for BFRs, OPFRs, and plastic polymers (e.g. acrylonitrile butadiene styrene, high impact polystyrene, polypropylene). FRs were found in 8.4% ~~85%~~ of analyzed products, with a maximum FR concentration of ~~total FR concentrations ranging up to~~ 22,800 mg/kg.

22,800 mg/kg = necklace

Abstract - Continued

FRs detected include the restricted compound deca-BDE, which was used widely in electronics casings, as well as its replacements decabromodiphenyl ethane (DBDPE) and 2,4,6-Tris(2,4,6-tribromophenoxy)-1,3,5-triazine (TBPP-TAZ) along with associated compound 2,4,6-tribromophenol (2,4,6-TBP), recently detected in breast milk. Plastic typically used in electronics (styrene-based) contained significantly higher levels of ∑FRs than plastics less typically used for electronics (polypropylene and nylon).

ABSTRACT - CONTINUED

Estimation of exposure to BDE-209 from contaminated kitchen utensils indicated users would have a median intake of 34,700 ng/day, exceeding estimates for intake from dust and diet. The detection of FRs in collected household products indicates that recycling, without the necessary transparency and restrictions to ensure safety, is resulting in unexpected exposure to toxic flame retardants in household items.

Abstract – Reworded, Continued

Estimation of exposure to BDE-209 from contaminated kitchen utensils indicated most do not contain significant amounts of BDE-209. Users would have a median intake of less than 15 ng/day, far below estimates for intake from dust and diet. The low potential for exposure to FRs in collected household products indicates that recycling is not resulting in significant, unexpected exposure to toxic flame retardants in household items. When BDE-209 is present, it is present at levels that make significant exposures unlikely.

CONCLUSION

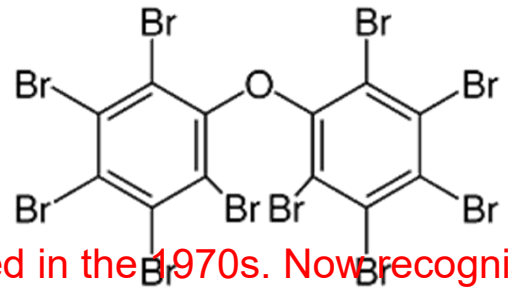
These results show that when toxic additives are used in plastic, they can significantly contaminate products made with recycled content, that do not even require flame retardancy. Products found in this study to contain hazardous flame retardants included items with high exposure potential, including food-contact items as well as toys. Regulatory bodies have begun to address the use of certain classes of flame retardants but more regulation is needed to end the use of hazardous additives and ensure that replacements are made with safer materials and chemicals.

CONCLUSION

These results show that when ~~toxic~~ additives are used in plastic, they can ~~significantly~~ contaminate products made today with recycled content, ~~that do not~~ even when those products do not require flame retardancy. Products found in this study to contain hazardous flame retardants ~~included items with high exposure potential~~, included food-contact items as well as toys. ~~Regulatory bodies have begun to address the use of certain classes of flame retardants but more regulation is needed to end the use of hazardous additives and ensure that replacements are made with safer materials and chemicals.~~ Most products did not contain significant levels and those that did are unlikely to result in a significant additional exposure. This study shows that current practice is responsibly keeping flame retardant chemicals out of applications where exposure is likely.

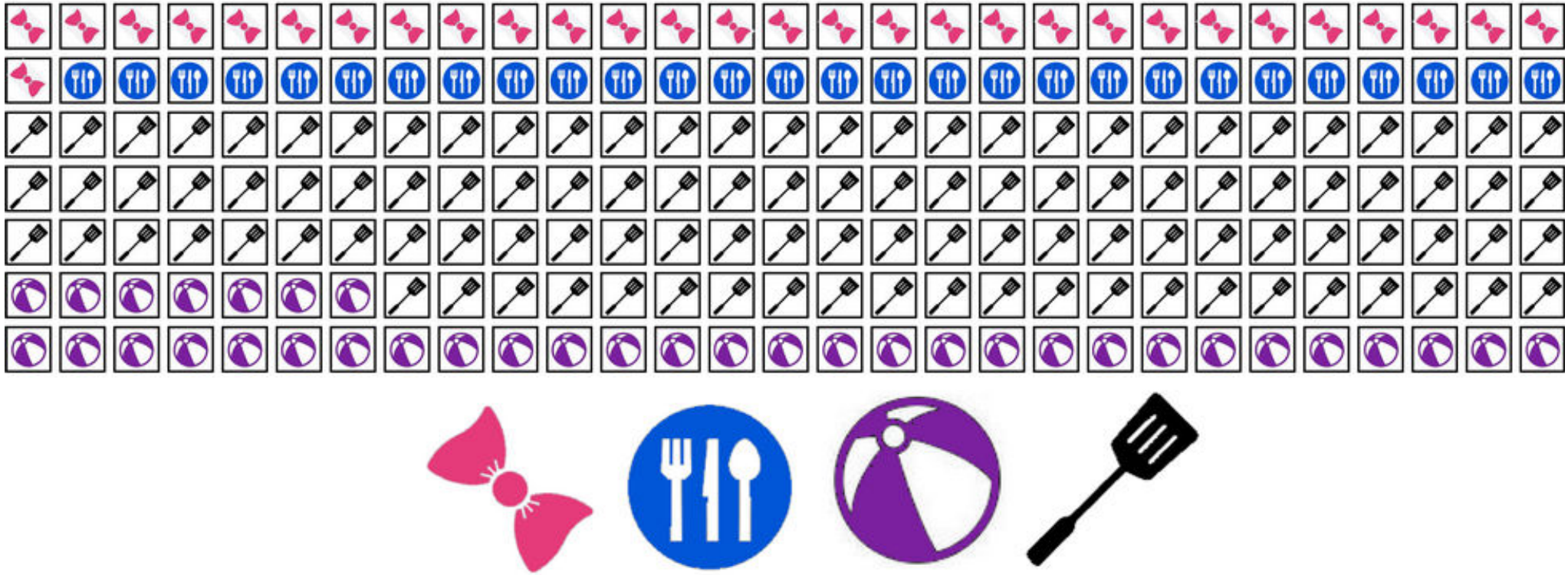
Calculation of Exposure to Brominated Flame Retardants

- Measure concentration present in object
- Use correlation to estimate exposure
- Compare exposure to some "safe" level, such as EPA reference dose
- BDE-209, one of the earliest banned flame retardants, became a focus



BDE-209

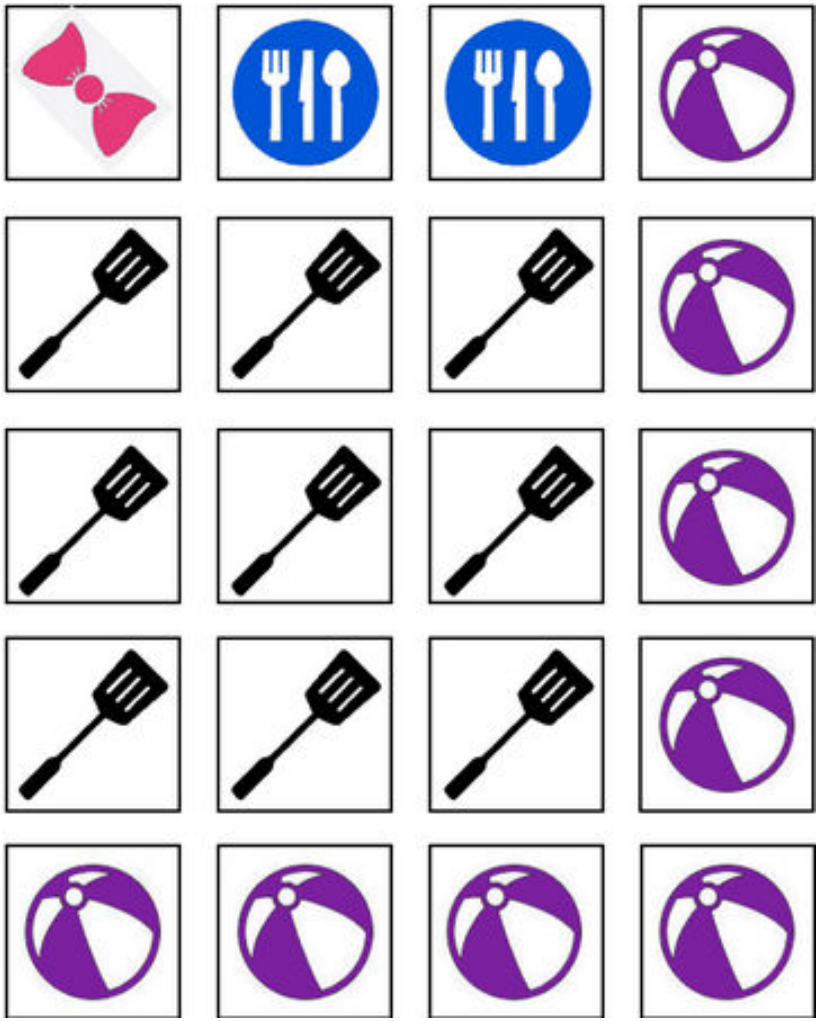
BDE-209 – decabromoether - commercialised in the 1970s. Now recognised as a hazardous and persistent pollutant under 2017 Stockholm Convention on Persistent Organic Pollutants meaning that treaty members must eliminate its production and use.



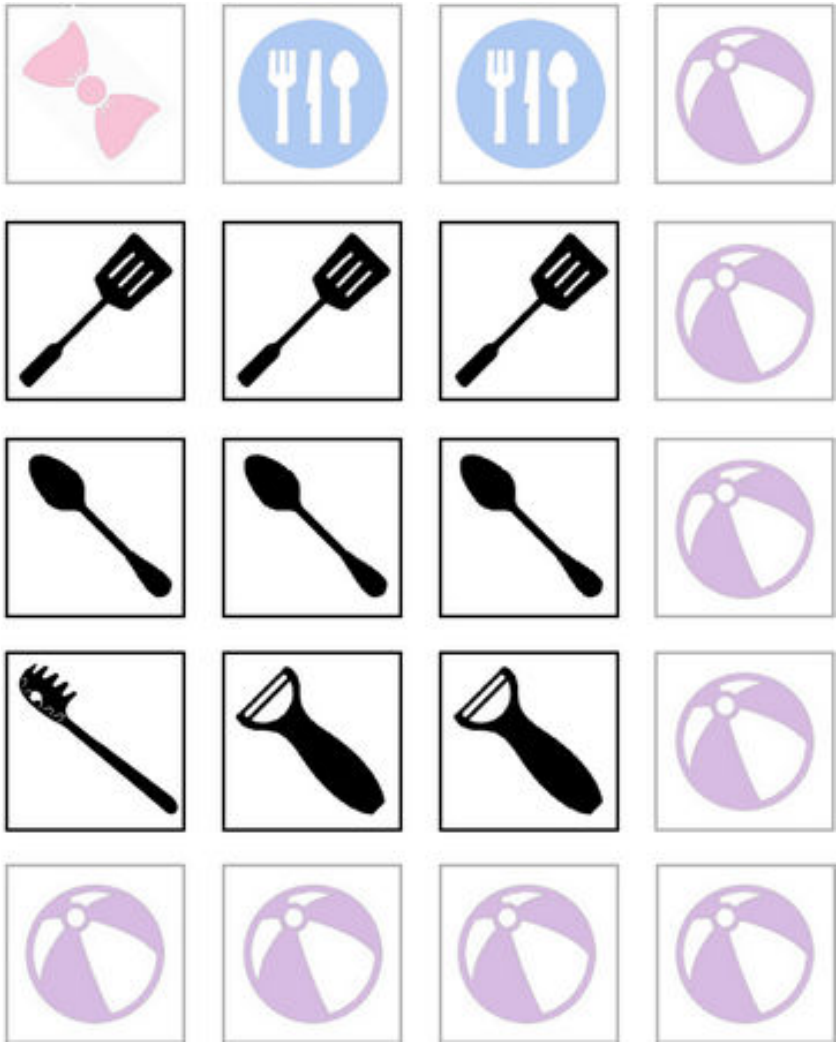
203 total items: 30 hair accessories, 28 food service, 36 toys, 109 kitchen items

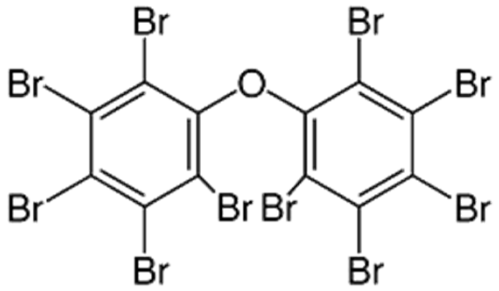
XRF analysis

retain only top 20 highest Br levels



Compound-sensitive LC-MS method used to analyze compositions and concentrations present in 20 of the 203 items in the collected cohort, only those with highest Br levels measured by XRF.





BDE-209

reported median value of 34.7μg/day for kitchen items

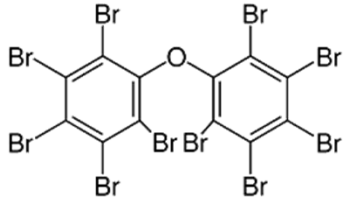
concluded too close to 42μg/day EPA reference dose

but they got it wrong - twice

CORRIGENDUM 1

- Miscalculated the reference dose by 10X
  - reported typical exposure as 42 μg/day rather than the correct value, 420 μg/day
  - last line of the abstract is “estimation of exposure to BDE-209 from contaminated kitchen utensils indicated users would have a median intake of 34,700 ng/day, exceeding estimates for intake from dust and diet.” was never true; now even more not true
- Authors stand by the paper’s conclusions

showing BDE-209 in ug/day



BDE-209

reported median value of 34.7μg/day

actual median 4.1 μg/day

average is 16 μg/day (24 ignoring BDL

reference dose is 420 μg/day

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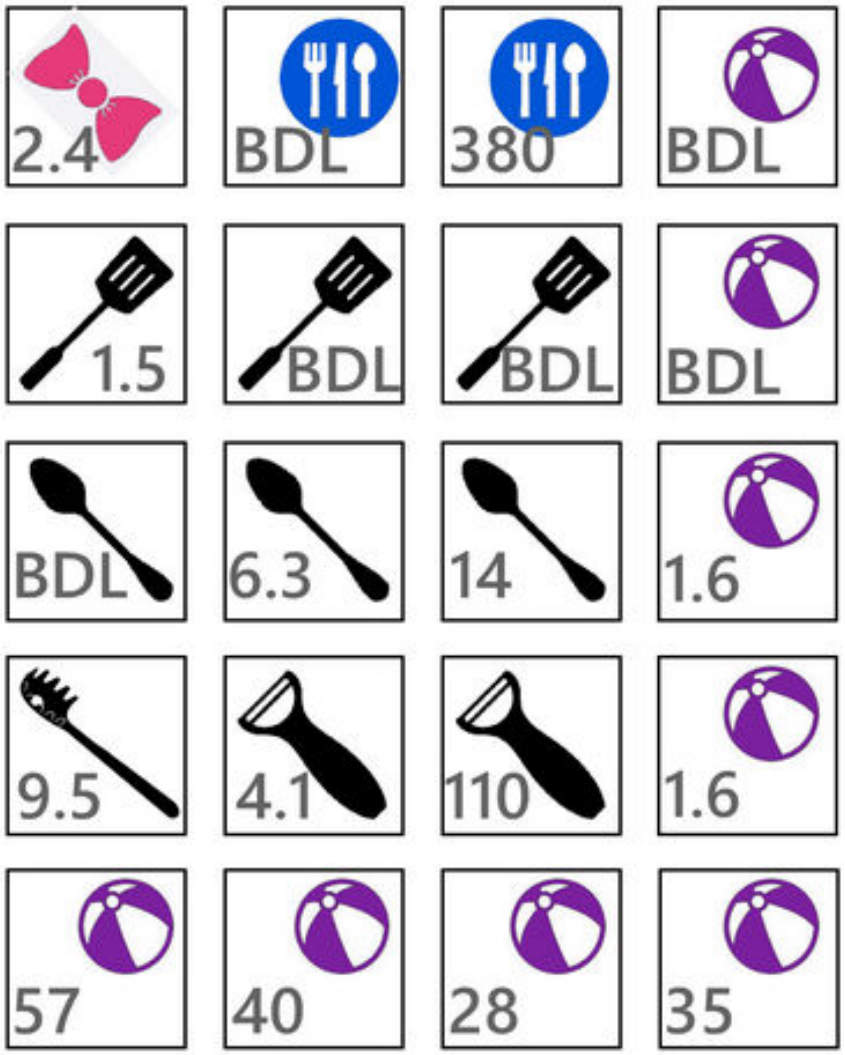
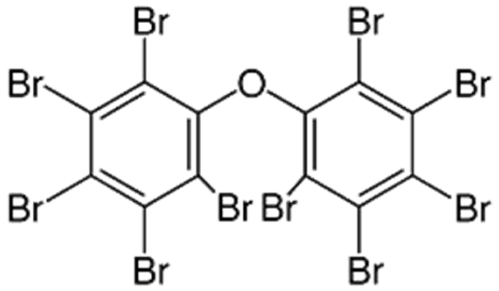


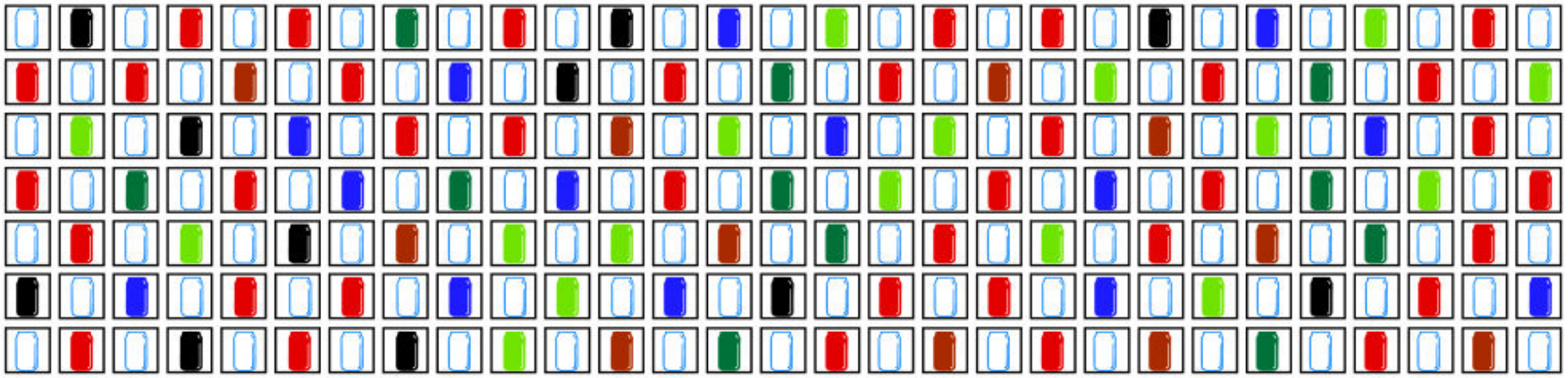


BDE-209

34.7μg/day is actually the average of all 20 measured samples with BDLs entered as zero

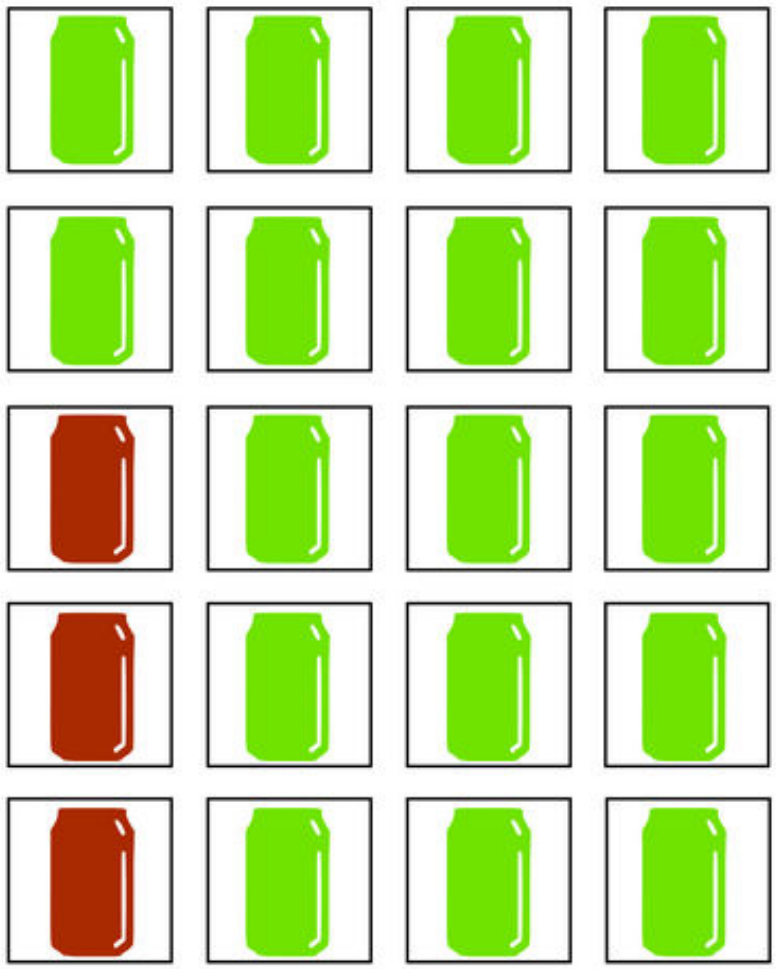
showing BDE-209 in ug/day

What Was Wrong: Analogy Using Sugar in Soda



diet regular

Screen for calories.
Keep top 20.



average = 3.77 g/fl oz

85% would be >3.5 g/fl oz

It Gets Worse

CORRIGENDUM 2

concentration → correlation → exposure

correlation from Kuang et al. $f(C) = E$

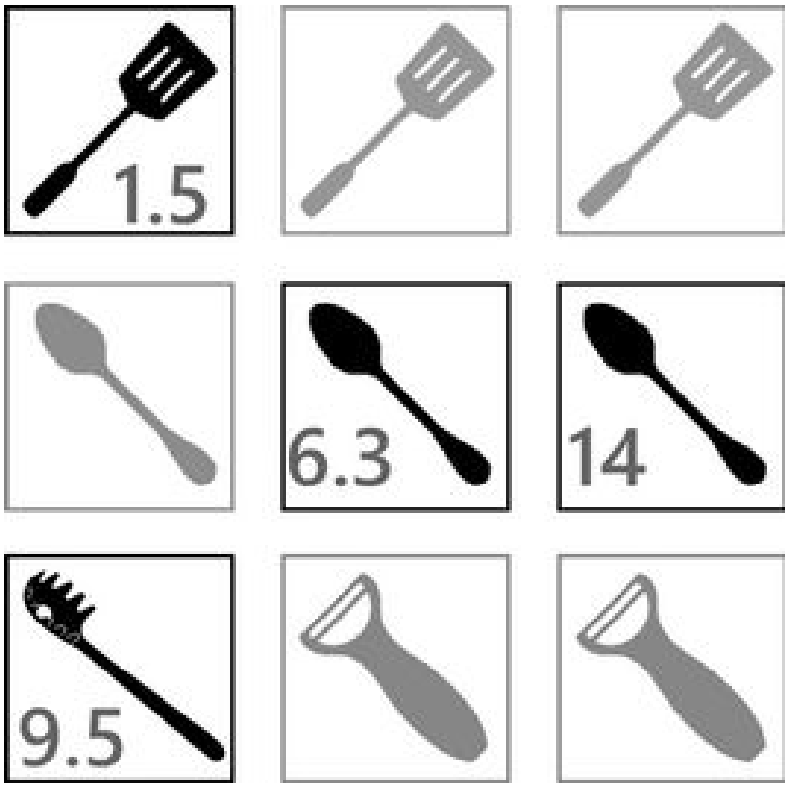
$$E \propto C$$

for immersion in hot oil for 15 minutes

conclude simple touching creates no exposure

Kuang J, Abdallah MA, Harrad S. Brominated flame retardants in black plastic kitchen utensils: Concentrations and human exposure implications. Science of The Total Environment. 2018 Jan 1;610:1138-46. doi.org/10.1016/j.scitotenv.2017.08.173.

author's treatment

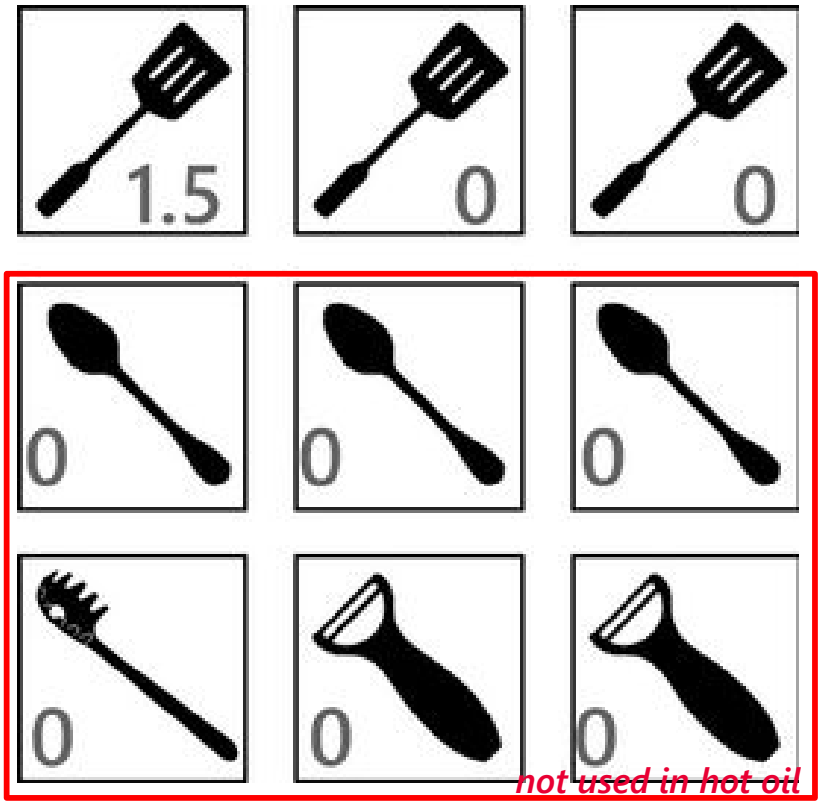


average = 7.9 μg/day (was 34.7)

= 4.5 μg/day ex. peelers

showing BDE-209 in ug/day

more correct



0.17 μg/day = 1.5/9

reference dose is 420 ug/day

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would be 4.5 excluding only peelers

even more correct

$$\text{average exposure} = \frac{1.5 \text{ ug/day}}{109 \text{ samples}}$$

$$= 14.5 \text{ ng/day}$$

reference dose is 420,000 ng/day

It Gets Even Worse

In Corrigendum 2, state they only sampled handles.

The KitchenAid spatula shown in the paper has a nylon blade and ABS handle.

average exposure ~0

EGREGIOUS ERRORS

- Incorrectly converted concentration to exposure
  - used an incorrect correlation to determine exposure
    - correlation for leaching when submerged in hot oil used for all items
  - overstated exposure by at least a factor of 800X
- How did they mess up the math?
  - collected 203 items and analyzed by XRD retaining only the 20 highest for their analysis
    - "FRs were found in 85% of analyzed products" while analysis ignored 183 items
  - incorrectly reported median value for kitchen items (only 9 of 20) when the value was average value for all 20 subjected to more thorough analysis
  - second correction ignores all samples below the detection limit
- Authors stand by the paper's conclusions

R&D WORLD

Pull those black plastic spatulas out of the trash

https://www.rdworldonline.com/pull-those-plastic-spatulas-out-of-the-trash/

By Mark Jones, Ph.D. | January 23, 2025

2024 was the year of spatulageddon. Plastic spatulas were trashed due to reports of dangers lurking within. The journal article that raised concern contained an error, **an obvious error**. A **correction was made** but there is more to the story.

[Adobe Stock]

How a recycling study spawned spatula hysteria

The study causing spatulageddon is "**From e-waste to living space:**

GUIDELINES FOR RETRACTION

- Retraction Watch responded that *Chemosphere* was such a discredited journal that didn't warrant their efforts
  - *Chemosphere* dropped by Web of Science
- Pointed me to Committee on Publication Ethics, *Guidlelines: Retraction Guidelines* (2019). www.councilscienceeditors.org/assets/docs/retraction-guidelines.pdf
  - mostly addresses ethical reasons
  - retraction warranted if "clear evidence that the findings are unreliable, either as a result of **major error** (eg, miscalculation or experimental error), or as a result of fabrication (eg, of data) or falsification (eg, image manipulation) [**emphasis mine**]

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https://www.elsevier.com/en-gb/about/policies-and-standards/article-withdrawal

ELSEVIER GUIDELINES FOR RETRACTION

- They have clear evidence that the findings are unreliable, either as a result of major error (e.g., miscalculation or experimental error), or as a result of fabrication (e.g., of data) or falsification (e.g., image manipulation).
- It constitutes plagiarism.
- The findings have previously been published elsewhere and the authors have failed to provide proper attribution to previous sources or disclosure to the editor, permission to republish, or justification (i.e. redundant publication).
- It contains material or data that the authors were not authorised to publish.
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- There is evidence of any other breach of the journal's publishing policies and the editor has therefore lost confidence in the validity or integrity of the article.

Chemosphere 385 (2025) 144542

Contents lists available at ScienceDirect

Chemosphere

journal homepage: www.elsevier.com/locate/chemosphere

Check for updates

Letter to the editor

Dear Chemosphere Editors,

The two corrections born by the paper "From e-waste to living space: Flame retardants contaminating household items add to concern about plastic recycling" (Liu et al., 2024), still fail to completely correct the math and methodological errors present in the study. The restated median potential exposures in the second corrigendum are still overstated. The errors are sufficient to warrant a restating of the abstract, sections of the paper and conclusions, if not a retraction. The results show that, while there is potential for contamination coming from recycled content, the levels of phased-out flame retardants are low and the chance for significant exposure is similarly low.

The paper states that the reason for the study was "to determine whether black plastic household products sold on the U.S. market contained emerging and phased-out flame retardants (FRs) and whether polymer type was predictive of contamination." The abstract and math work. Calculated exposure was only 80 % of the reference does. Corrigendum 1 reduced the exposure to only 8%, deemed insufficient to retract the study. The value reported for exposure, 34,700 ng/day has layers of errors. It is reported as the median intake from kitchen utensils. It is, in fact, the mean of all 20 samples subjected to MS analysis. These samples include hair care, toy and serving ware. The second correction lowers this dose to 7.9 μg/day, less than 2 % of the expected intake from dust and diet. These errors were again deemed insufficient to retract the study. Analysis presented here show the value is 527 ng/day or lower, over 65 times lower than the original report and approximately 0.1 % of the intake from dust and diet. The measured value is now 800 times lower than the expected intake. This constitutes a major methodological and mathematical error. A major restatement of the abstract, conclusions and several sections of the paper is required, if not a full retraction of the study.

Chemosphere
Volume 365, October 2024, 143319

From e-waste to living space: Flame retardants contaminating household items add to concern about plastic recycling

Megan Liu [a], Sicco H. Brandsma [b], Erika Schreder [a]

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From e-waste to living space: Flame retardants contaminating household items add to concern about plastic recycling

Chemosphere (2024) - 4 Comments
doi: 10.1016/j.chemosphere.2024.143319 issn: 0045-6535 pubmed: 39271080 issn: 1879-1298

Megan Liu, Sicco H. Brandsma, Erika Schreder

#1 ***Actinopolyspora biskrensis*** comment accepted December 2024

Some concerns: https://nationalpost.com/news/canada/black-plastic

Correction apparently pending, although I'm not sure I agree with the author's statement:

"However, it is important to note that this does not impact our results," Liu told National Post. "The levels of flame retardants that we found in black plastic household items are still of high concern, and our recommendations remain the same."

Retraction Watch

Viral paper on black plastic kitchen utensils earns second correction

The authors of a paper that went viral with attention-grabbing headlines urging people to throw out their black plastic kitchen tools have corrected the work for a second time.

But a letter accompanying the correction suggests the latest update still fails "to completely correct the math and methodological errors present in the study," according to Mark Jones, an industrial chemist and consultant who has been following the case. "The errors are sufficient to warrant a restating of the abstract, sections of the paper and conclusions, if not a retraction."

CONCLUSION - REWORDED

These results show that previously used additives used in plastic can contaminate products made today with recycled content, even when those products do not require flame retardancy. Products were found in this study to contain hazardous flame retardants, including food-contact items as well as toys. Most products did not contain significant levels and those that did are unlikely to result in a significant additional exposure. This study shows that that current practice is responsibly keeping flame retardant chemicals out of applications where exposure is likely.

Papers with severe errors in method and math can get through peer review.

Retractions are hard to get even when math is in error. *No one is rewarded*.

Science appears to be failing at self-correction.

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