MJPHD

SCIENCE IN THE MEME AGE: FLAWED STUDIES, ZOMBIE FACTS AND WHAT CAN BE DONE

MARK JONES
CREATIVE DIRECTOR
MJPHD, LLC

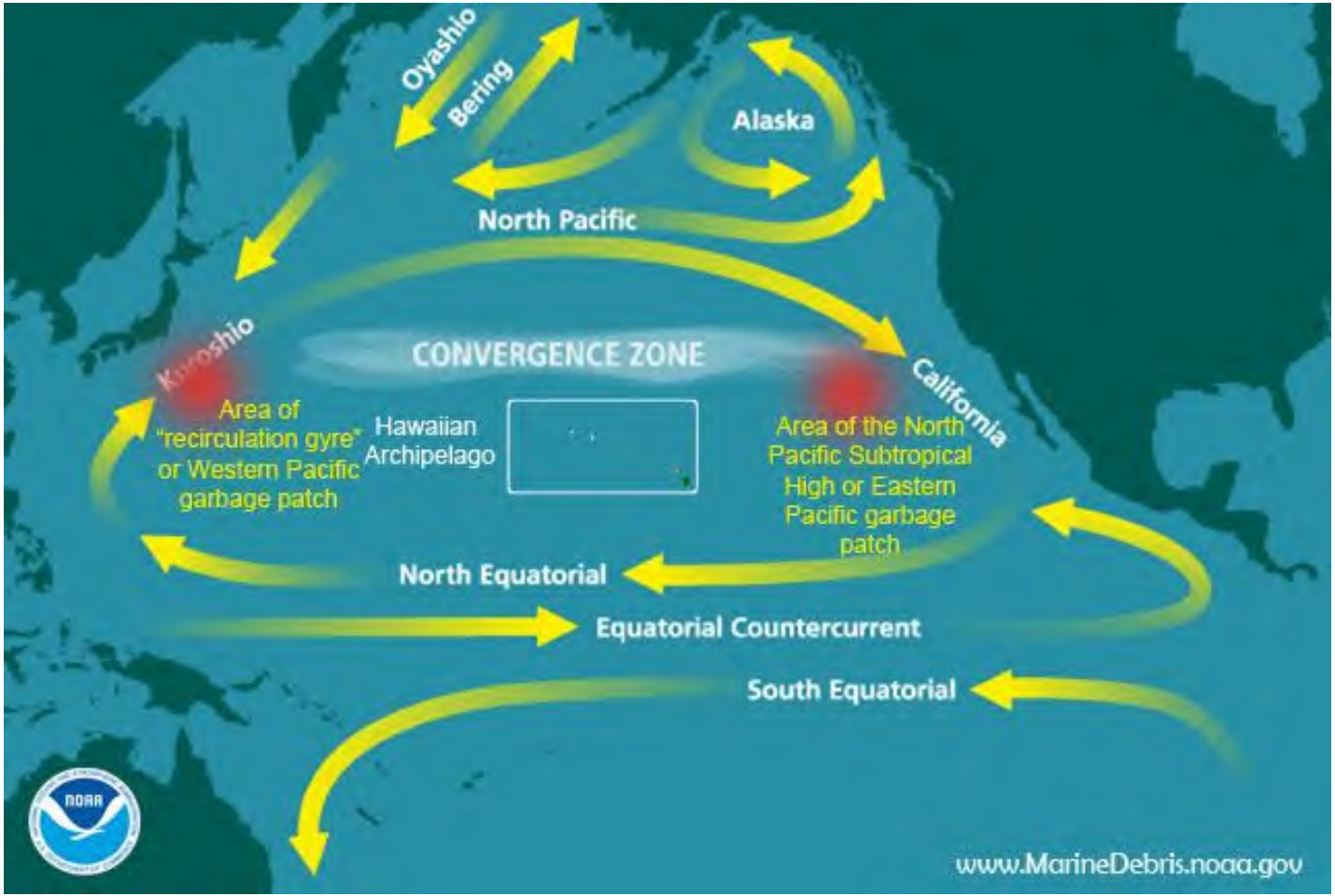
27 May 2026

AIChE
The Global Home of Chemical Engineers
VLS *Virtual Local Section*

The Great Pacific Garbage Patch

http://b.parsons.edu/~pany468/parsons/political_website/source2/index.html

Caption:
A Part of the Great Pacific Garbage Patch


Oyashio
Bering
Alaska
North Pacific
Kuroshio
CONVERGENCE ZONE
California
Area of "recirculation gyre" or Western Pacific garbage patch
Hawaiian Archipelago
Area of the North Pacific Subtropical High or Eastern Pacific garbage patch
North Equatorial
Equatorial Countercurrent
South Equatorial
NOAA
www.MarineDebris.noaa.gov

The Great Pacific Garbage Patch

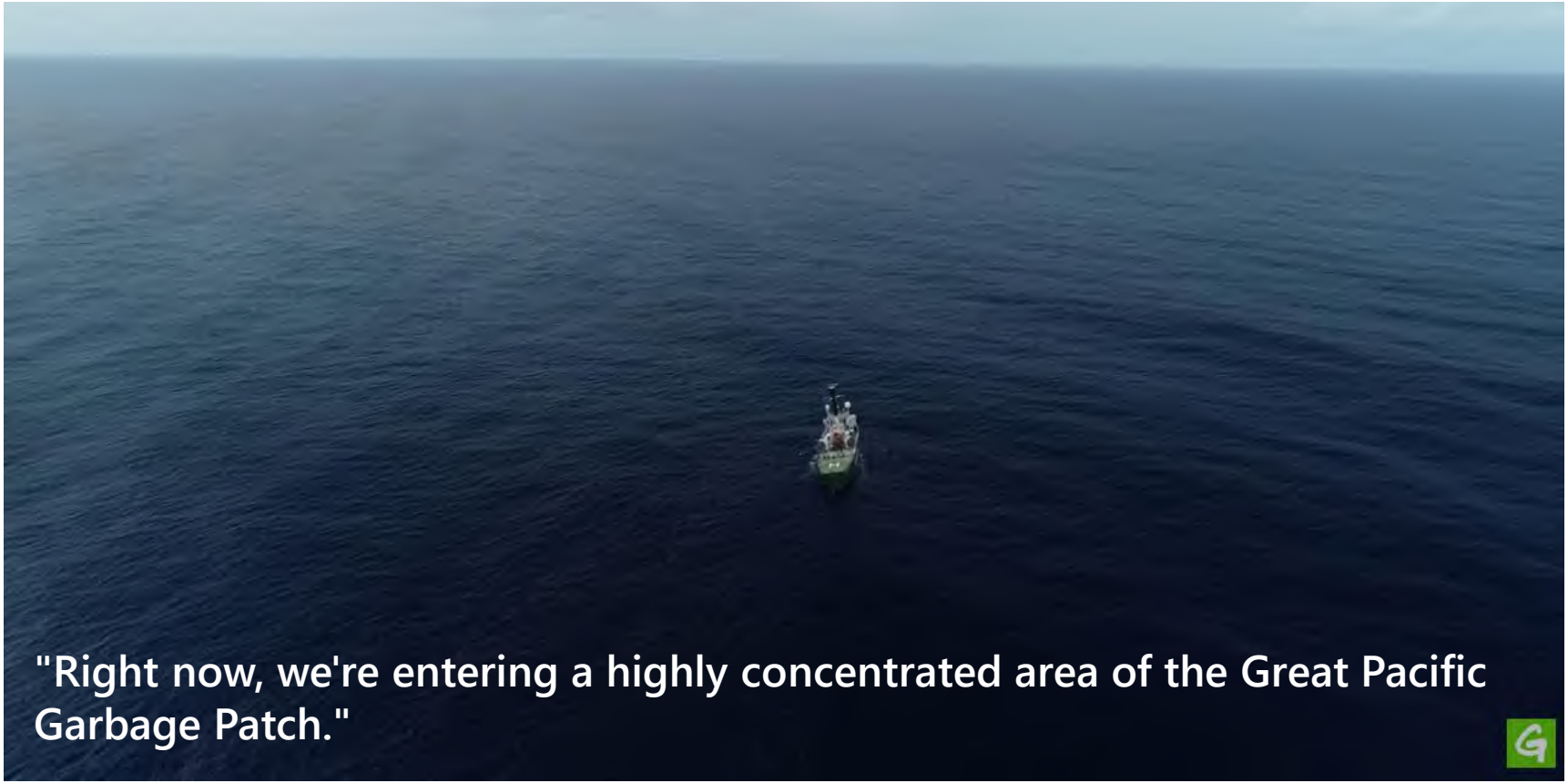
Caption:
A Part of the Great Pacific Garbage Patch

Article text:
"these patches are almost entirely made up of tiny bits of plastic, called microplastics."

Hills in background: Honduras

http://b.parsons.edu/~pany468/parsons/political_website/source2/index.html

Greenpeace's Arctic Sunrise In The Great Pacific Garbage Patch



https://www.youtube.com/watch?v=DcpEcngTrOQ

Widely reported facts about plastics and microplastic are wrong.

Correction in the scientific literature is slow; correcting public perception even slower.

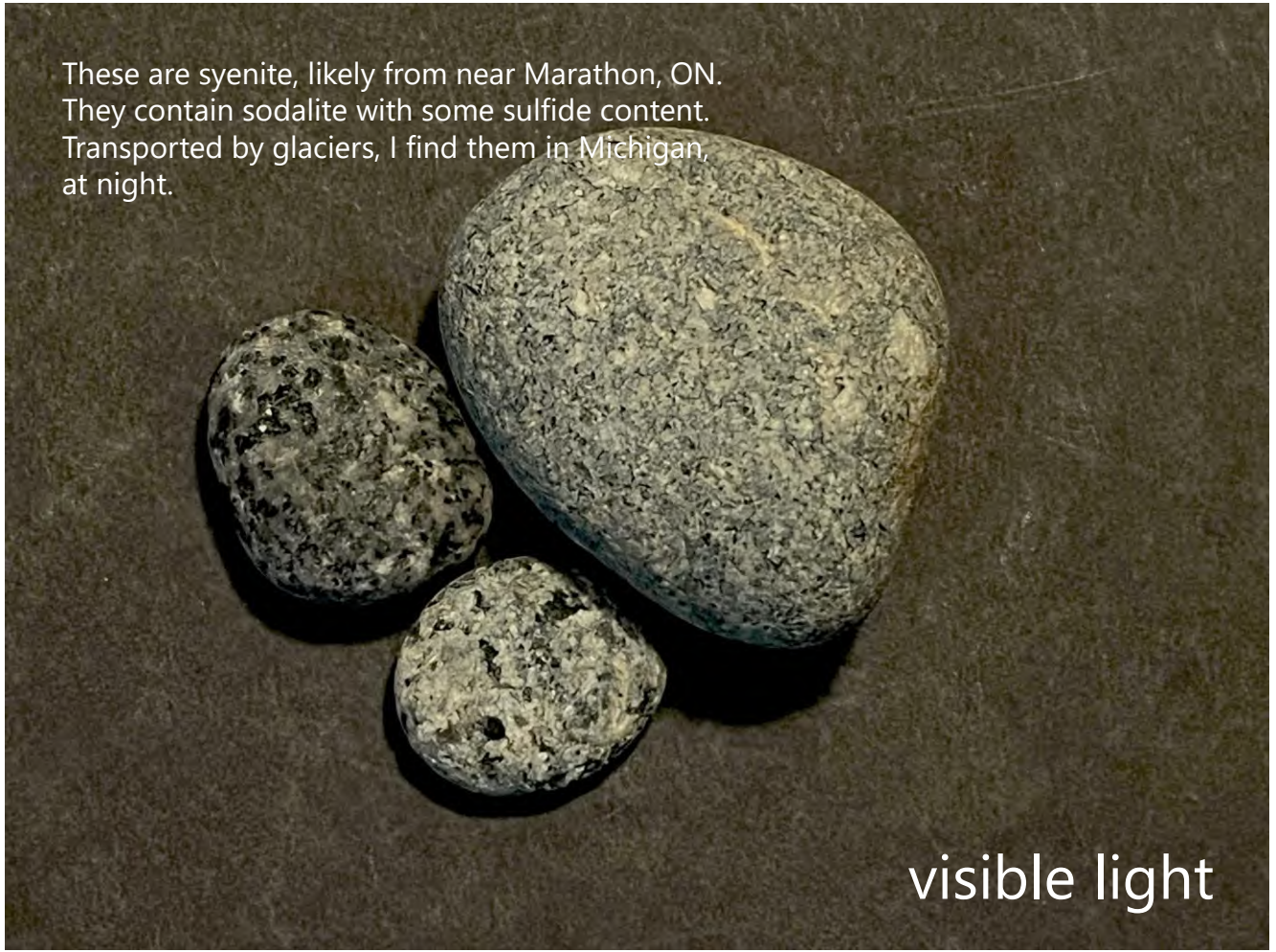
There are things you can do.

Focus on Two Memes

https://wwf.panda.org/wwf_news/?348337/Revealed-plastic-ingestion-by-people-could-be-equating-to-a-credit-card-a-week

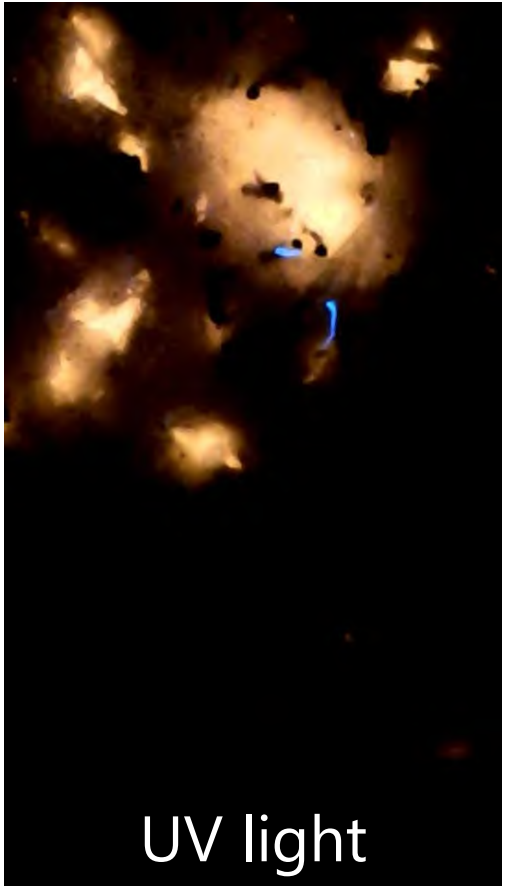
~31 years

~5 years

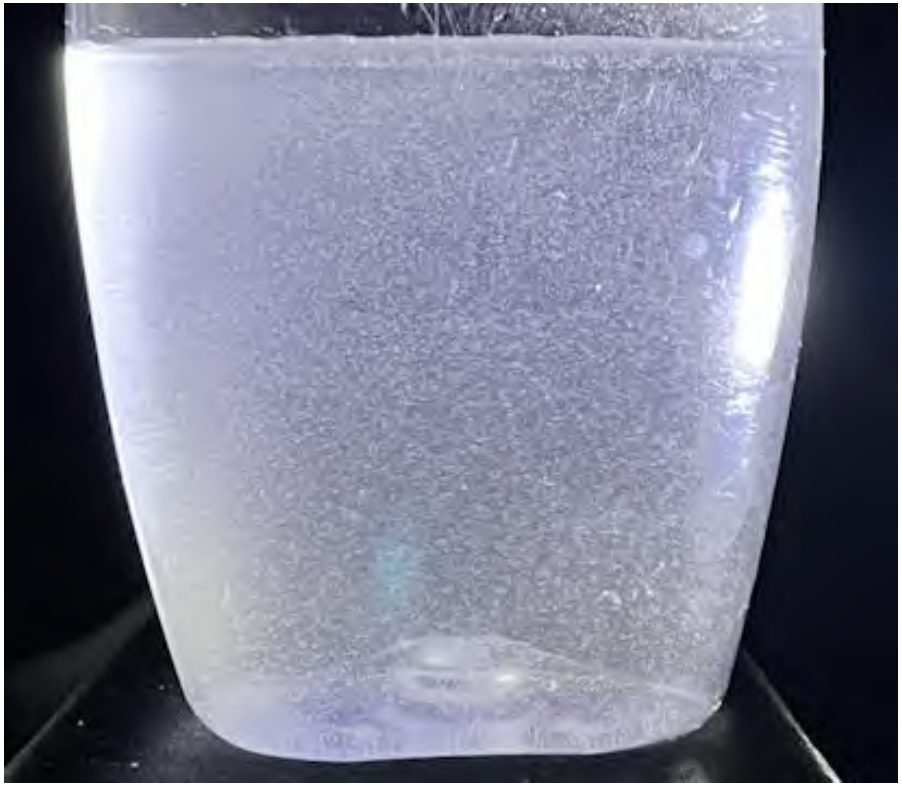

These are syenite, likely from near Marathon, ON.
They contain sodalite with some sulfide content.
Transported by glaciers, I find them in Michigan,
at night.
visible light


These are syenite, likely from near Marathon, ON.
They contain sodalite with some sulfide content.
Transported by glaciers, I find them in Michigan,
at night.
UV light
(365 nm filtered)


visible light


UV light

Homemade Microplastic Suspension



initial estimate ~0.17 g/L 200 mesh
measured <0.05 g/L

wwf.panda.org/wwf_news/?348337/Revealed-plastic-ingestion-by-people-could-be-equating-to-a-credit-card-a-week

"A new study by the University of Newcastle, Australia suggests that an average person could be ingesting approximately 5 grams of plastic every week. The equivalent of a credit card's worth of microplastics. This summary report highlights the key ways plastic gets into our body, and what we can do about it."

wwfint.awsassets.panda.org/downloads/plastic_ingestion_web_spreads.pdf

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Newsroom

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- Research and Innovation
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- College of Health, Medicine and Wellbeing
- College of Human and Social Futures
- Pathways and Academic Learning Support Centre
- Sustainable Development Goals

Plastic ingestion by people could be equating to a credit card a week

Wednesday, 12 June 2019 Tweet LinkedIn

A new study finds on average people could be ingesting approximately 5 grams of plastic every week, which is the equivalent weight of a credit card.

Dr Thava Palanisami

The analysis *No Plastic in Nature: Assessing Plastic Ingestion from Nature to People* prepared by Dalberg, based on a study commissioned by WWF and carried out by University of Newcastle, Australia, suggests people are consuming about 2000 tiny pieces of plastic every week. That's approximately 21 grams a month, just over 250 grams a year.

The University of Newcastle is the first to combine data from over 50 studies on the ingestion of microplastic by people. The findings are an important step towards understanding the impact of plastic pollution on humans. It also further confirms the urgent need

www.newcastle.edu.au/newsroom/featured/plastic-ingestion-by-people-could-be-equating-to-a-credit-card-a-week

REUTERS

World Business Markets Sustainability More

World

You may be eating a credit card's worth of plastic each week - study

Reuters

June 11, 2019 9:29 PM EDT · Updated 5 years ago

Aa

www.reuters.com/article/us-environment-plastic/you-may-be-eating-a-credit-cards-worth-of-plastic-each-week-study-idUSKCN1TD009/

www.cnn.com/2019/06/11/health/microplastics-ingestion-wwf-study-scn-intl/index.html

Journal of Hazardous Materials 404 (2021) 124004

Contents lists available at ScienceDirect

Journal of Hazardous Materials

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

Research paper

Estimation of the mass of microplastics ingested – A pivotal first step towards human health risk assessment

Kala Senathirajah [a], Simon Attwood [b], Geetika Bhagwat [c], Maddison Carbery [c], Scott Wilson [d], Thava Palanisami [a,*]

[a] Global Innovative Centre for Advanced Nanomaterials(GICAN), Faculty of Engineering and Built Environment, The University of Newcastle, Callaghan, NSW 2308, Australia
[b] The World Wide Fund for Nature (WWF), 354 Tanglin Road, Singapore, Singapore
[c] School of Environmental and Life Sciences, The University of Newcastle, Callaghan, NSW 2308, Australia
[d] Department of Environmental Science, Macquarie University, Sydney, Australia

ARTICLE INFO

Keywords:
Exposure pathways
Human health
Ingestion
Microplastics
Plastic pollution
Risk

ABSTRACT

The ubiquitous presence of microplastics in the food web has been established. However, the mass of microplastics exposure to humans is not defined, impeding the human health risk assessment. Our objectives were to extract the data from the available evidence on the number and mass of microplastics from various sources, to determine the uncertainties in the existing data, to set future research directions, and derive a global average rate of microplastic ingestion to assist in the development of human health risk assessments and effective management and policy options. To enable the comparison of microplastics exposure across a range of sources, data extraction and standardization was coupled with the adoption of conservative assumptions. Following the analysis of data from fifty-nine publications, an average mass for individual microplastics in the 0–1 mm size range was calculated. Subsequently, we estimated that globally on average, humans may ingest 0.1–5 g of microplastics weekly through various exposure pathways. This was the first attempt to transform microplastic counts into a mass value relevant to human toxicology. The determination of an ingestion rate is fundamental to assess the human health risks of microplastic ingestion. These findings will contribute to future human health risk assessment frameworks.

> “humans may ingest 0.1-5 g of microplastics weekly through various exposure pathways”

https://doi.org/10.1016/j.jhazmat.2020.124004

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Table 6
Summary of the annual average number of microplastics (particles) ingested (particles), and global average rate of microplastics ingested (g) per person per year.

Source of particles	$ANMP_{ingested}$ (particles)	GARMI (0–1 mm) Scenario 1 (g)	GARMI (0–1 mm) Scenario 2 (g)	GARMI (0–1 mm) Scenario 3 (g)
Shellfish	9,445	26.4	0.0	0.0
Salt	565	1.6	7.4	14.2
Beer	523	1.46	0.3	0.5
Drinking water	91,994	257.5	0.0	0.0
Total (per year)	**102,527**	**287.0**	**7.7**	**14.7**
TOTAL (PER WEEK)	*1,972*	*5.5*	*0.1*	*0.3*

https://doi.org/10.1016/j.jhazmat.2020.124004


5 g
0.1 g
PLASTIC PARTICLES
0.02 credit cards worth
one model
another model

Errors

> an average person could be ingesting approximately 5 grams of plastic every week.

- got diameter wrong
  - weight even more wrong
- reported as if statistical when actually different models

wwfint.awsassets.panda.org/downloads/plastic_ingestion_web_spreads.pdf

3 mg/particle

For PET, 1.6 mm diameter particle

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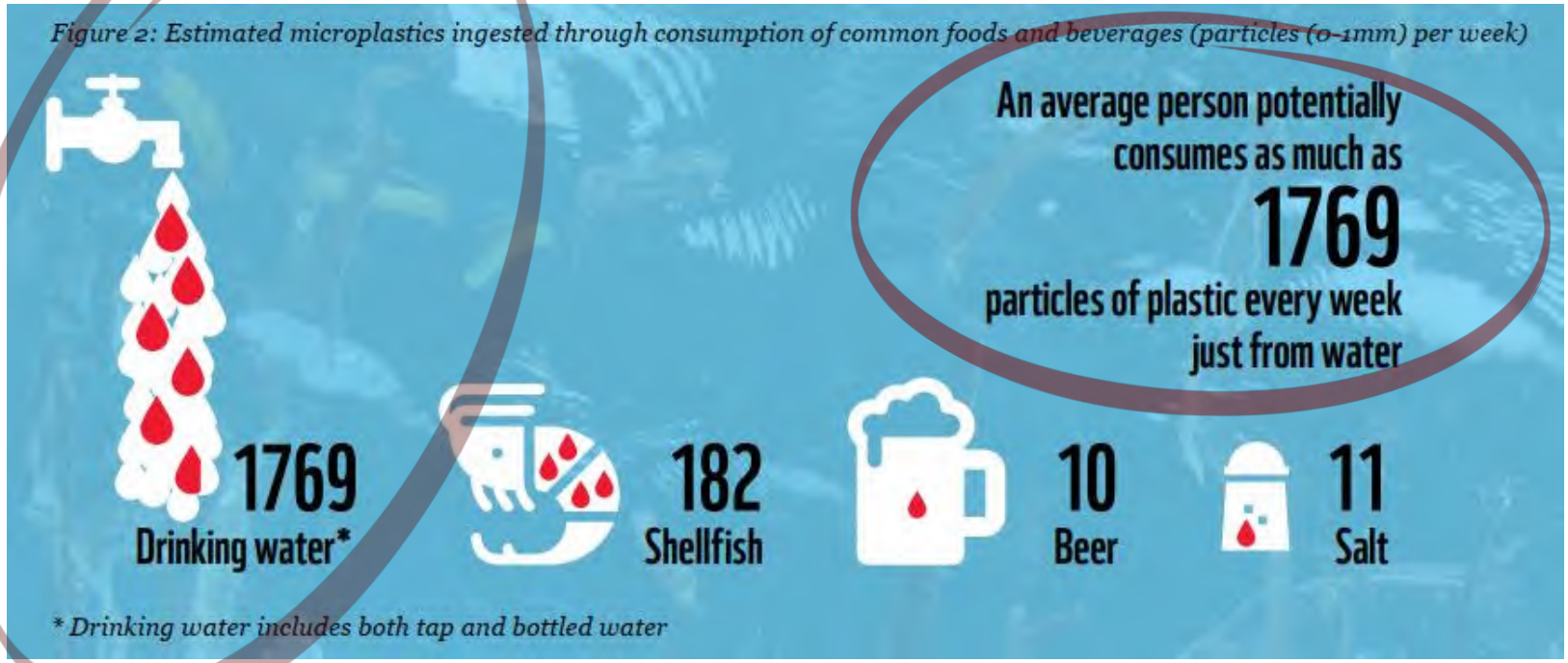
https://doi.org/10.1016/j.jhazmat.2020.124004

2.5 mg average particle to reach 5 grams.



Observable
1769 particles/ 7L

253 particles/L

Calculated
~4.5 g/ 7L

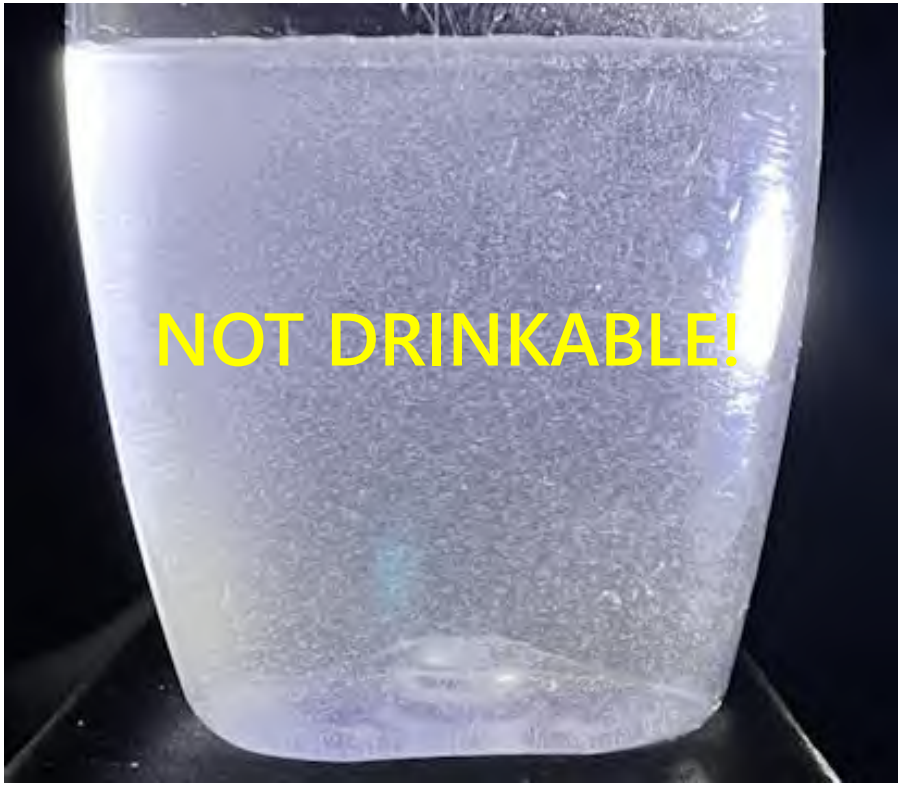
~0.6 g/L

~1.5 mm diameter PET sphere

Average 2.5 mg particles.

Plastic microparticles, 0.65 grams consisting of 523 particles, in a liter of water equaling the concentration in order to ingest 5 grams per week. Such a high concentration is easily seen both in water and upon drying. The particles are cut from 1.5 mm plastic monofilament.

Homemade Microparticle Suspension



measured <0.05 g/L

Environmental Science & Technology

pubs.acs.org/est

Article

Lifetime Accumulation of Microplastic in Children and Adults

Nur Hazimah Mohamed Nor,* Merel Kooi, Noël J. Diepens, and Albert A. Koelmans

Cite This: *Environ. Sci. Technol.* 2021, 55, 5084−5096

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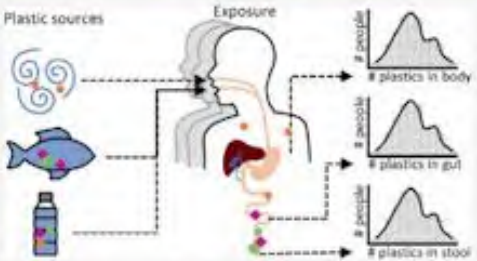
ABSTRACT: Human exposure to microplastic is recognized as a global problem, but the uncertainty, variability, and lifetime accumulation are unresolved. We provide a probabilistic lifetime exposure model for children and adults, which accounts for intake via eight food types and inhalation, intestinal absorption, biliary excretion, and plastic-associated chemical exposure via a physiologically based pharmacokinetic submodel. The model probabilistically simulates microplastic concentrations in the gut, body tissue, and stool, the latter allowing validation against empirical data. Rescaling methods were used to ensure comparability between microplastic abundance data. Microplastic (1−5000 μm) median intake rates are 553 particles/capita/day (184 ng/capita/day) and 883 particles/capita/day (583 ng/capita/day) for children and adults, respectively. This intake can irreversibly accumulate to 8.32×10^3 (90% CI, 7.08×10^2−1.91×10^6) particles/capita or 6.4 (90% CI, 0.1−2.31×10^3) ng/capita for children until age 18, and up to 5.01×10^4 (90% CI, 5.25×10^3−9.33×10^6) particles/capita or 40.7 (90% CI, 0.8−9.85×10^3) ng/capita for adults until age 70 in the body tissue for 1−10 μm particles. Simulated microplastic concentrations in stool agree with empirical data. Chemical absorption from food and ingested microplastic of the nine intake media based on biphasic, reversible, and size-specific sorption kinetics, reveals that the contribution of microplastics to total chemical intake is small. The as-yet-unknown contributions of other food types are discussed in light of future research needs.



883 particles per person per day

583 ng/person/day

4 μg per week

https://pubs.acs.org/doi/full/10.1021/acs.est.0c07384

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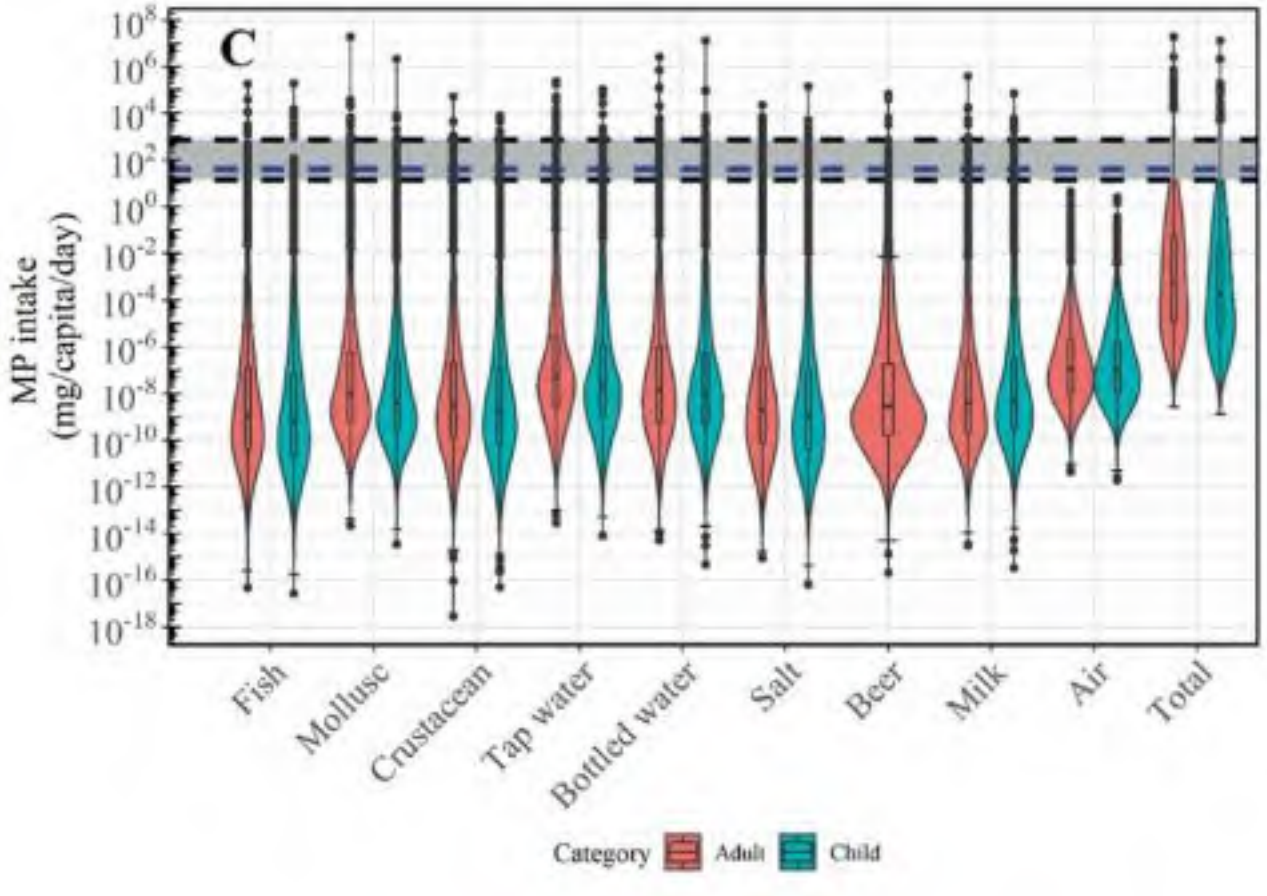


https://pubs.acs.org/doi/full/10.1021/acs.est.0c07384

Bert Koelmans makes point that a week's ingestion is like a grain of salt between chopsticks – mere micrograms.

Journal of Hazardous Materials Letters 3 (2022) 100071

Contents lists available at ScienceDirect

Journal of Hazardous Materials Letters

journal homepage: www.sciencedirect.com/journal/journal-of-hazardous-materials-letters

ELSEVIER

Ingested microplastics: Do humans eat one credit card per week?

Martin Pletz

Designing Plastics and Composite Materials, Department of Polymer Engineering and Science, Montanuniversitaet Leoben, Austria

ARTICLE INFO

Keywords:
Microplastics
Size distribution
Ingestion
Human health

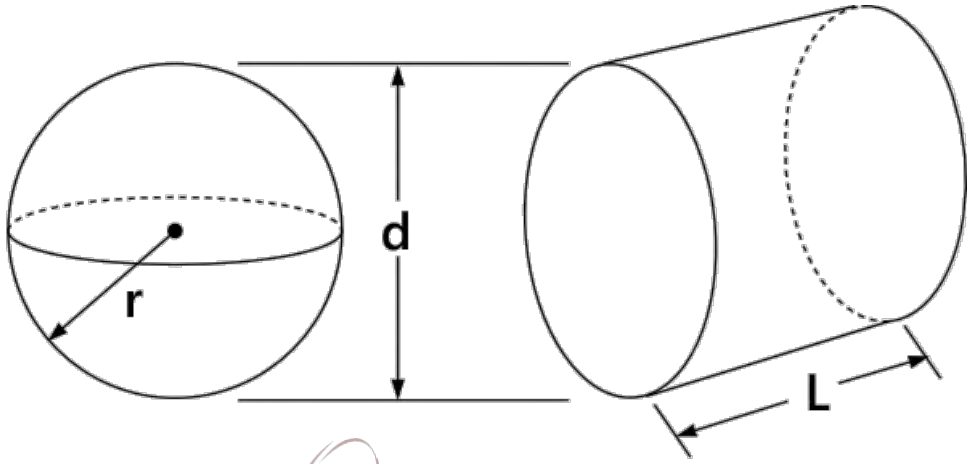
ABSTRACT

Ingested Microplastic (MP) particles can harm the human body. Estimations of the total mass of ingested MP particles correspond to 50 plastic bags per year (Bai et al., 2022), one credit card per week (Gruber et al., 2022), or a median value of 4.1 μg/week for adults (Mohamed Nor et al., 2021). The first two estimations are based on an analysis (Senathirajah et al., 2021) that predicts a total ingested mass of MP particles $m_{i,MP}$ of 0.1–5 g/week. This work revisits and evaluates this calculation and compares its results and methods to Mohamed Nor et al. (2021). Senathirajah combines data of averaged MP particle masses $\bar{m}_{MP}$ from papers that reported MP particle sizes and MP particle counts n_{MP} in shellfish, salt, beer, and water based on other papers that detected MP particles. Combined with the estimated weekly consumption of those consumables, they compute $m_{i,MP}$. This work raises some serious issues of Senathirajah in the way they combine data and they obtained particle sizes. It concludes that Senathirajah overestimates $m_{i,MP}$ by several orders of magnitude and that $m_{i,MP}$ can be considered as a rather irrelevant factor for the toxic effects of MP particles on the human body.

> a human eats a credit card worth of MPs not every week but every 23 thousand years.

https://www.sciencedirect.com/science/article/pii/S2666911022000247?via%3Dihub

Guessing Particle Mass



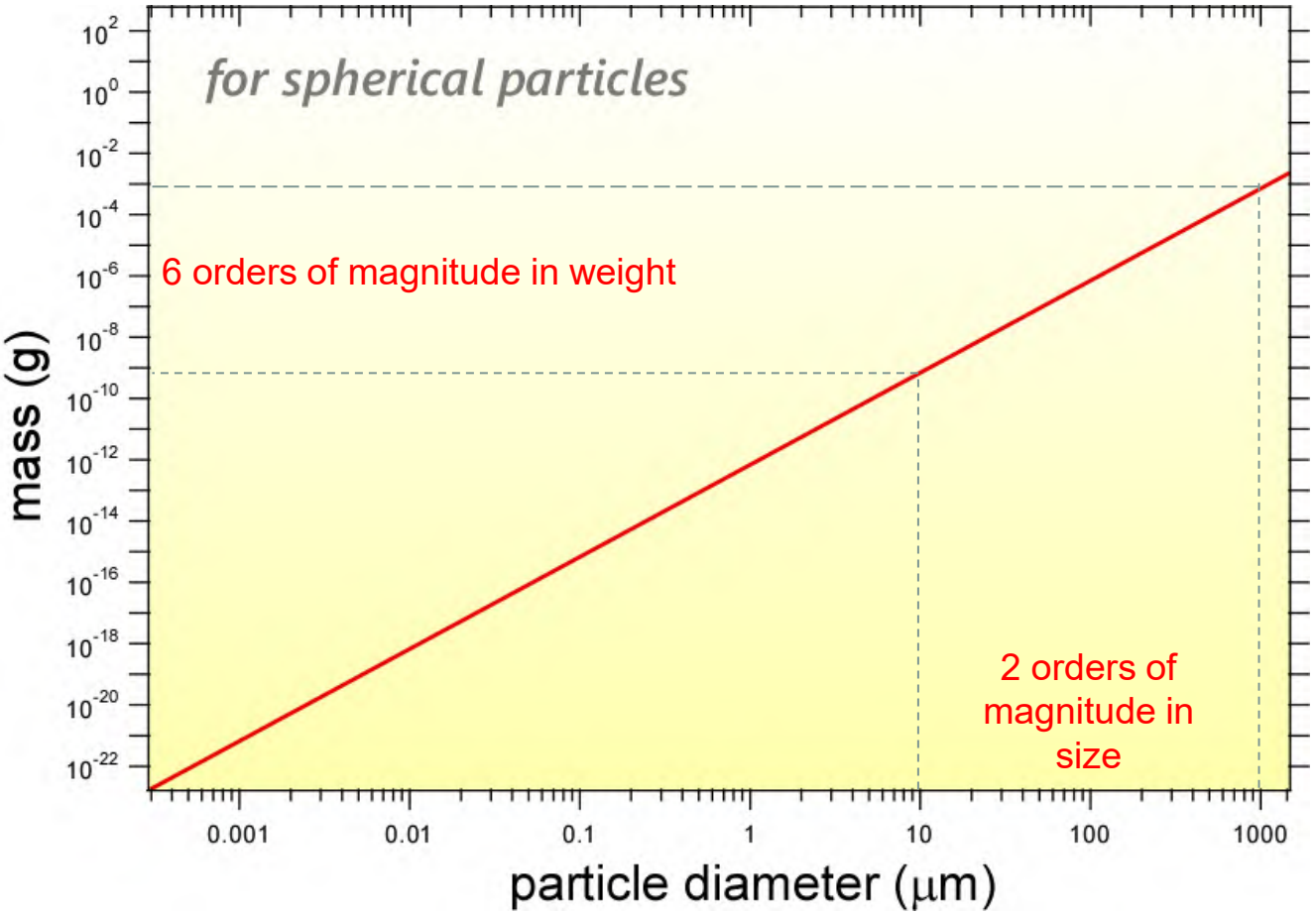
$$m = \rho V = \frac{\pi \rho d^3}{6}$$

$$m = \frac{\pi \rho d^2 L}{4}$$

$$\text{let } A = \frac{L}{d}$$

$$m = \frac{\pi \rho d^3 A}{4}$$

polymer	density(g/cc)
PE	0.92-0.97
PP	0.88-0.91
PET	1.30-1.40


for spherical particles
6 orders of magnitude in weight
2 orders of magnitude in size
mass (g)
10^{2}
10^{0}
10^{-2}
10^{-4}
10^{-6}
10^{-8}
10^{-10}
10^{-12}
10^{-14}
10^{-16}
10^{-18}
10^{-20}
10^{-22}
0.001
0.01
0.1
1
10
100
1000
particle diameter (μm)

Exposure and Health (2023) 15:33–51
https://doi.org/10.1007/s12403-022-00470-8

REVIEW PAPER

To Waste or Not to Waste: Questioning Potential Health Risks of Micro- and Nanoplastics with a Focus on Their Ingestion and Potential Carcinogenicity

Elisabeth S. Gruber[1] · Vanessa Stadlbauer[2,3] · Verena Pichler[4] · Katharina Resch-Fauster[5] · Andrea Todorovic[5] · Thomas C. Meisel[6] · Sibylle Trawoeger[7] · Oldamur Hollóczki[8] · Suzanne D. Turner[9,10] · Wolfgang Wadsak[3,11] · A. Dick Vethaak[12,13] · Lukas Kenner[3,14,15,16]

Received: 8 October 2021 / Revised: 30 December 2021 / Accepted: 11 February 2022 / Published online: 22 March 2022

Abstract
Micro- and nanoplastics (MNPs) are recognized as emerging contaminants, especially in food, with unknown health significance. MNPs passing through the gastrointestinal tract have been brought in context with disruption of the gut microbiome. Several molecular mechanisms have been described to facilitate tissue uptake of MNPs, which then are involved in local inflammatory and immune responses. Furthermore, MNPs can act as potential transporters ("vectors") of contaminants and as chemosensitizers for toxic substances ("Trojan Horse effect"). In this review, we summarize current multidisciplinary knowledge of ingested MNPs and their potential adverse health effects. We discuss new insights into analytical and molecular modeling tools to help us better understand the local deposition and uptake of MNPs that might drive carcinogenic signaling. We present bioethical insights to basically re-consider the "culture of consumerism." Finally, we map out prominent research questions in accordance with the Sustainable Development Goals of the United Nations.

Keywords Microplastic · Nanoplastic · Carcinogenesis · Human health · Bioethics issue

"Translated into more imaginable numbers, on average we ingest five grams of MPs per week per person (roughly corresponding to the mass of a credit card)."

https://link.springer.com/article/10.1007/s12403-022-00470-8

Exposure and Health (2023) 15:33–51
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https://link.springer.com/article/10.1007/s12403-022-00470-8

MEDICAL UNIVERSITY OF VIENNA

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Menu

Health risk due to micro- and nanoplastics in food

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All News

2022-03-24 – MEDICINE & SCIENCE

(Vienna, 24-03-2022) Five grams of plastic particles on average enter the human gastrointestinal tract per person

> Five grams of plastic particles on average enter the human gastrointestinal tract per person per week

www.meduniwien.ac.at/web/en/ueber-uns/news/default-0f889c8985-1/gesundheitsrisiko-durch-mikro-und-nanoplastik-in-lebensmitteln/

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SD Health Tech Enviro Society Quirky

Science News *from research organizations*

Health risk due to micro- and nanoplastics in food

Date: March 24, 2022

Source: Medical University of Vienna

Summary: Five grams of plastic particles on average enter the human gastrointestinal tract per person per week. This is roughly equivalent to the weight of a credit card. Whether ingested micro- and nanoplastics pose a health risk is being investigated in numerous studies but is largely unknown to date. A research team has now summarized the current state of scientific knowledge.

> Five grams of plastic particles on average enter the human gastrointestinal tract per person per week

www.sciencedaily.com/releases/2022/03/220324130253.htm

NEW YORK POST
READ THE LATEST ON Page Six

HEALTH

You're eating a credit card's worth of plastic a week — and it's killing your gut

By Brooke Kato

Published March 30, 2022 | Updated March 30, 2022, 4:47 p.m. ET

nypost.com/2022/03/30/youre-eating-a-credit-cards-worth-of-plastic-a-week-and-its-killing-your-gut/

Junk Food and Tainted Water: People Ingest a Credit Card Worth of Nanoplastics Weekly, Study Says

Mar 31, 2022 at 5:09 PM EDT

Bottled water or tap?

How you answer that question could have some major implications for your long-term health, a new study into the health effects of ingested plastic particles shows.

That study also contained this startling fact: People are eating the equivalent of one plastic credit card every week in their diet. The plastic particles enter the human food chain through plastic waste contained in fish, sea salt and drinking water, the study shows.

Scientists say such nanoplastics disrupt the human gut bacteria and can lead to killer diseases like cancer and diabetes.

www.newsweek.com/junk-food-tainted-water-people-ingest-credit-card-worth-nanoplastics-weekly-study-says-1693970

COOK

You Probably Eat A Credit Card's Worth Of Plastic Every Week

BY GILLIE HOUSTON / UPDATED: OCT. 19, 2022 6:53 PM EST

www.tastingtable.com/1062298/you-probably-eat-a-credit-cards-worth-of-plastic-every-week/

Chapter 10

Emerging Aquatic Contaminants

One Health Framework for Risk Assessment and Remediation in the Post COVID-19 Anthropocene

ook • 2023

Sources, consequences, and control of nanoparticles and microplastics in the environment

A. Guhananthan [a], Aswin Kuttykattil [b], Thavamani Palanisami [b] and Selvakumar Rajendran [a,b]

[a] *Department of Nanobiotechnology, PSG Institute of Advanced Studies, Coimbatore, Tamil Nadu, India,* [b] *Environmental Plastic and Innovation Cluster (EPIC), Global Innovation Centre for Advanced Nanomaterials (GICAN), University of Newcastle, Callaghan, NSW, Australia*

10.1 Introduction

Nanoparticles (NP) and microplastics (MPs) are the most recent anthropogenic contaminants which pose threat to the environment and health. Both NPs and MPs from various sources interact with water, air, and soil in a complex way affecting aquatic and terrestrial ecosystems (Fred-Ahmadu et al., 2020). Their bioaccumulation leads to, cytotoxicity, genotoxicity, organ failure, and sometimes death in living organisms. Nanoparticles can be classified into different types based on their origin (natural nanoparticles (NNPs) and engineered nanoparticles (ENPs)), dimension, size, and chemical composition (Ealia and Saravanakumar, 2017). Fig. 10.1 illustrates various sources of nanoparticles.

“Senathirajah and Palanisami (2019) estimated that on average, humans may consume 5 g of MPs per week”

ACS ES&T Water

pubs.acs.org/estwater

Review

Strategies to Reduce Risk and Mitigate Impacts of Disaster: Increasing Water Quality Resilience from Microplastics in the Water Supply System

Kala Senathirajah* and Thava Palanisami

Cite This: ACS EST Water 2023, 3, 2816−2834

Read Online

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ABSTRACT: Microplastics contaminating the water supply system qualifies as a disaster. This has major far-reaching implications, posing significant threats to economic growth and human livelihoods, as well as environmental and human health and well-being. Thus, we need to reduce the risk and mitigate against the effects of microplastics to build resilience and ensure continuity and efficiency of water supply system functions. To date, microplastics in the water supply cycle have not been considered in the context of disaster management. Hence, we provide an understanding of the disaster risk that microplastics pose using a conceptual mathematical framework. Additionally, we enhance understanding of the resilience of the social and physical infrastructure by highlighting hazards that people and infrastructure in the community face. Insights of the social, economic, and other human factors that make them vulnerable highlights capacities required to reduce risk and mitigate impacts. By evaluating the social and physical infrastructure resilience to microplastics in the water supply system and recommending multidisciplinary strategies to build resilience over time, we aim to catalyze action to address the problem. This will also contribute toward achieving targets of the Sendai Framework for Disaster Risk Reduction 2015−2030 and UN Sustainable Development Goals.

1. INTRODUCTION

Plastics are versatile, synthetic, widely used, persistent materials found in all aspects of our lives, in all sectors, and as pollution all around the globe. The plastic pollution crisis meets all criteria to qualify as a slow-onset disaster.[1] Microplastics are ubiquitous plastic fragments, spheres, fibers, filaments, and films, viz., plastic particles greater than 100 nm and less than 5 mm in size. Nanoplastics are particles less than 100 nm.[2] Microplastics have been detected in the air, water, and terrestrial environments, found from Mount Everest to the Marianna trench.[3] Microplastics have been found in plants,[4] animals, and humans,[5] in human placenta,[6] lungs, blood, and even breastmilk.[7] A recent study estimated that we could be ingesting cumulatively 0.1 to 5 g of microplastics a week[8] from a combination of sources, including from drinking water which is a fundamental need for survival. Microplastics have been detected in water supply sources, tap water, and bottled water around the world.[8,9]

Microplastics contaminate the water supply system (WSS) due to numerous reasons, including the existing social systems' policies and consumptive behaviors, and limitations in treatment. The fate and transport of microplastics through the water supply cycle (WSC) are varied, and thus the timeframes and implications also range greatly depending on the entry and exit points. For example, microplastics exiting via ingestion by a human has different implications to microplastics exiting via biosolids application for agriculture, although notably both instances impinge on the health and well-being of humans[5] and ecosystems.[10] The transport and fate of microplastics are a function of numerous factors including polymer type, size, shape, specific surface area, density, crystallinity, molecular structure, formation of biofilm and additives, among others. These also influence the vulnerability of the WSS and its sensitivity to the microplastic contamination.

Access to safe drinking water and wastewater services (W&WWS) are a human right,[11,12] and are essential to ensure health and well-being, good hygiene practices, economic prosperity, and minimize the spread of water borne diseases.[13] There are many disruptive events that impact W&WWS. Key to the continuity of service is water quality (WQ). From a

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> A recent study estimated that we could be ingesting cumulatively 0.1 to 5 g of microplastics a week

https://pubs.acs.org/doi/abs/10.1021/acsestwater.3c00206

MJPhD

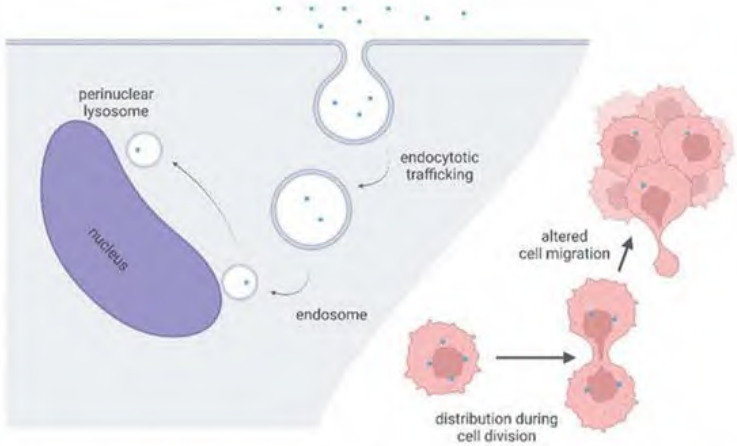
Medical Xpress Topics Conditions

Home / Oncology & Cancer
Home / Gastroenterology

MARCH 6, 2024 Editors' notes

Micro- and nanoplastics in the body are passed on during cancer cell division, finds study

by Medical University of Vienna



Credit: *Chemosphere* (2024). DOI: 10.1016/j.chemosphere.2024.141463

> Plastic particles up to the weight of a credit card (approx. 5 grams) enter the gastrointestinal tract every week.

medicalxpress.com/news/2024-03-micro-nanoplastics-body-cancer-cell.html

Picasso, 1955


UN Global Plastics Treaty

Streamed live on Apr 28, 2022

California Attorney General Rob Bonta makes a major announcement on the California Department of Justice's efforts to protect the environment from plastic pollution.

https://www.youtube.com/watch?v=fhaURS9U04s

https://yourplasticdiet.org/

A credit card a week?

On average people could be ingesting around 5 grams of plastic every week, which is the equivalent weight of a credit card. Our study suggests people could be consuming on average over 100,000 microplastics every year. That's approximately 21 grams a month, just over 250 grams a year.

TAKE ACTION!

R&D WORLD

Microplastics are bad, but ignoring science is worse

By Mark Jones | March 20, 2024

We all know that 98.6° F is human body temperature … only it isn't. A new **study** reconfirms something extensively covered during the COVID pandemic: Normal human body temperature falls between 97.3° and 98.2° F — with 97.9° F as today's average.

And 5 grams per week is the amount of plastic every person consumes … only it isn't. Like outdated body-temperature assertions, this 5-g value (widely reported in many science and news circles) is flawed. The difference is that data manipulation and memes didn't give us the 98.6° F value … but they did help propel the 5-g-of-plastic assertion. It has shaken my faith in the scientific community.

Now, the world widely accepts the average person consumes 5 g of plastic per week — the weight of a credit card. Thanks to one now-quite-famous picture of a credit card between two chopsticks, a credit card's worth of plastic is now widely quoted unit for measuring microplastic exposure. In a 2023 article, National Geographic authors parrot the refrain: **Researchers estimate we unwittingly consume a credit card's weight in plastic each week**. Likewise, California Attorney General Rob Bonta (currently driving a lawsuit against the plastics industry) has stated, "**Every week, we consume the**

This is a World Wildlife Federation graphic from 2019 promoting a faulty assertion. Image: Grey.

"Models need to be tested to see if the results match the inputs. Checking the model results against the inputs shows the model giving 5 g per week is impossible."

Journal of Hazardous Materials 404 (2021) 124004

Contents lists available at ScienceDirect

Journal of Hazardous Materials

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

Research paper

Estimation of the mass of microplastics ingested – A pivotal first step towards human health risk assessment

Kala Senathirajah [a], Simon Attwood [b], Geetika Bhagwat [c], Maddison Carbery [c], Scott
Thava Palanisami [a,*]

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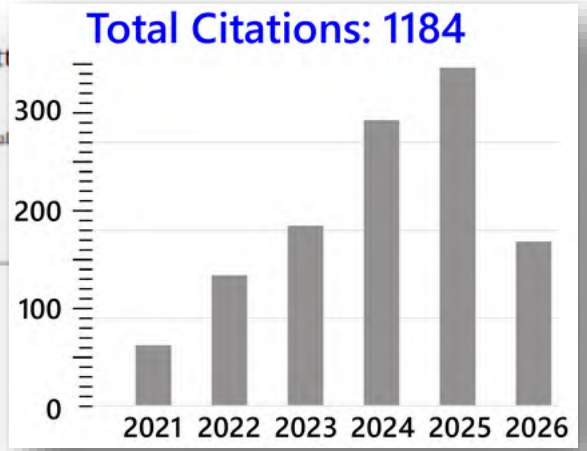
[c] School of Environmental and Life Sciences, The University of Newcastle, Callaghan, NSW 2308, Australia
[d] Department of Environmental Science, Macquarie University, Sydney, Australia



https://doi.org/10.1016/j.jhazmat.2020.124004

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

To receive timely press releases and statements to your inbox, members of the media can request to be added to our press list.

> "testing uncovered high levels of 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"

MJPhD

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.L.I.F.E.

ELSEVIER

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

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Chemosphere, Volume 385, September 2025, Pages 144547

Megan Liu, Sicco H. Brandsma, Erika Schreder

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

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Megan Liu, Sicco H. Brandsma, Erika Schreder

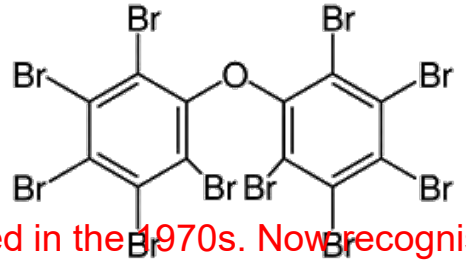
Corrigendum to 'From e-waste to living space: Flame retardants contaminating household items add to concern about plastic recycling'...

Chemosphere, Volume 370, February 2025, Pages 143903

Megan Liu, Sicco H. Brandsma, Erika Schreder

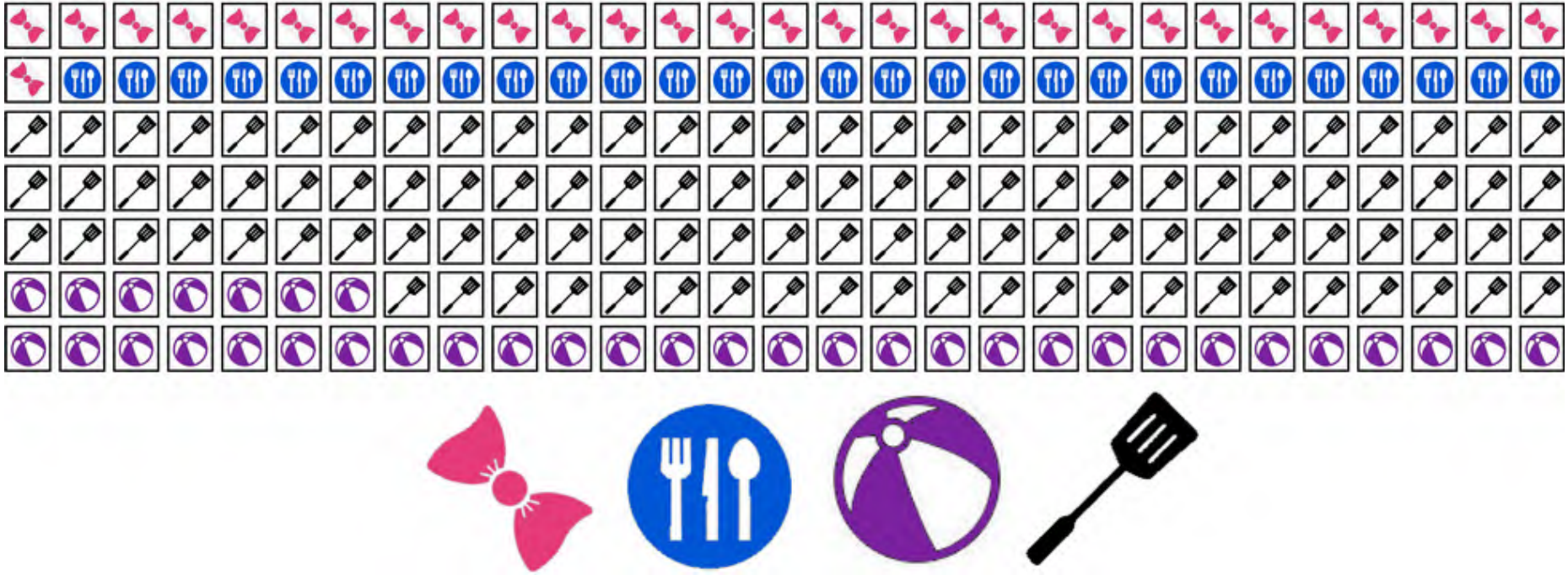
Calculation of Exposure to Brominated Flame Retardants

- 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

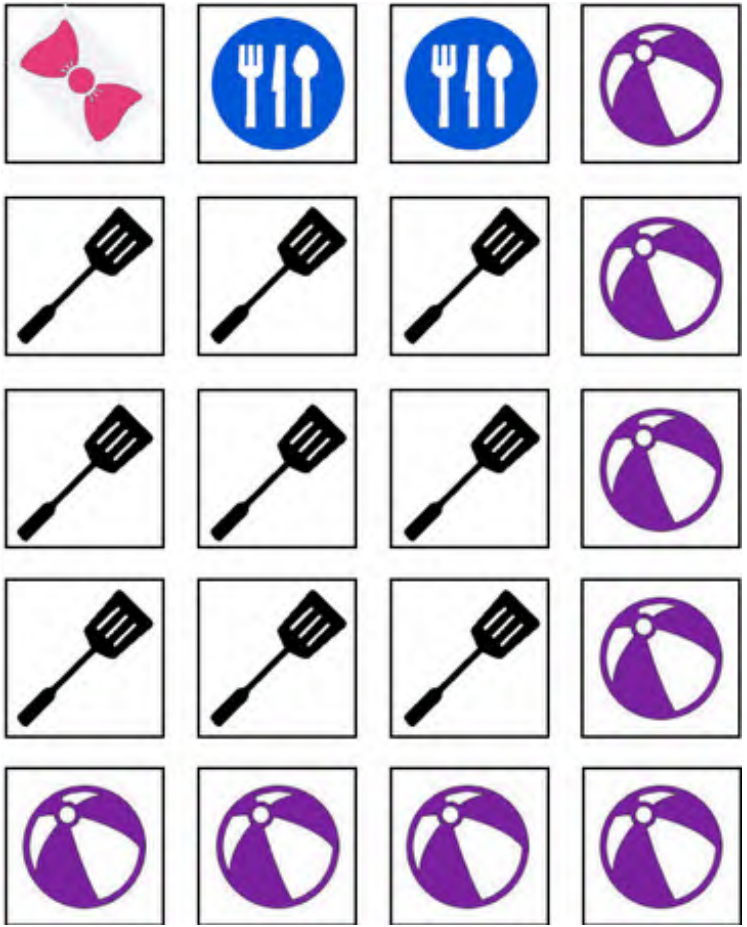
BDE-209 – decabromoether - commercialised in the 1970s. Now recognised as a hazardous and persistent pollutant under 2017 Stockholm Convention on Persistent Organic Pollutants meaning that treaty members must eliminate its production and use.



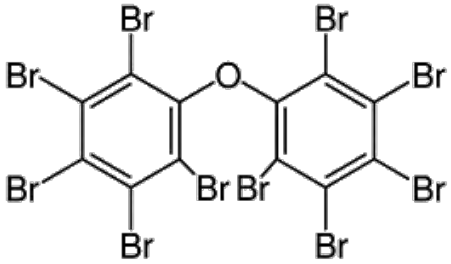
203 total items: 30 hair accessories, 28 food service, 36 toys, 109 kitchen items

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

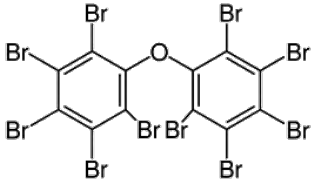
concluded too close to 42μg/day EPA reference dose

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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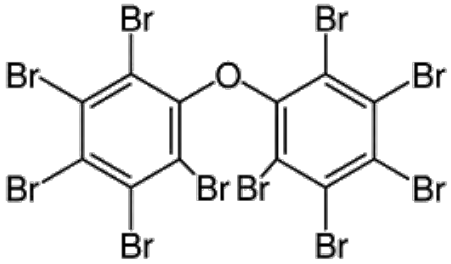


BDE-209

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

showing BDE-209 in ug/day

MJPhD

It Gets Worse

CORRIGENDUM 2

concentration → correlation → exposure

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

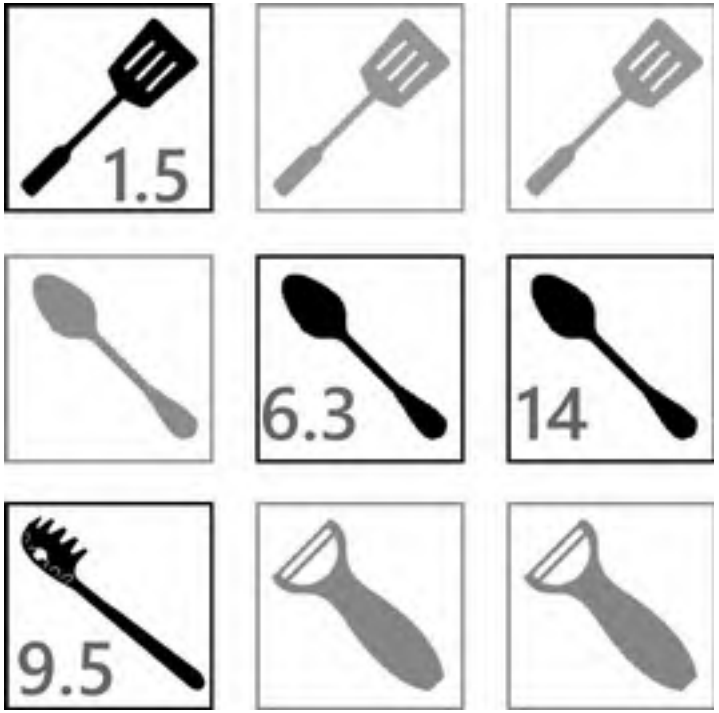
$E \propto C$

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

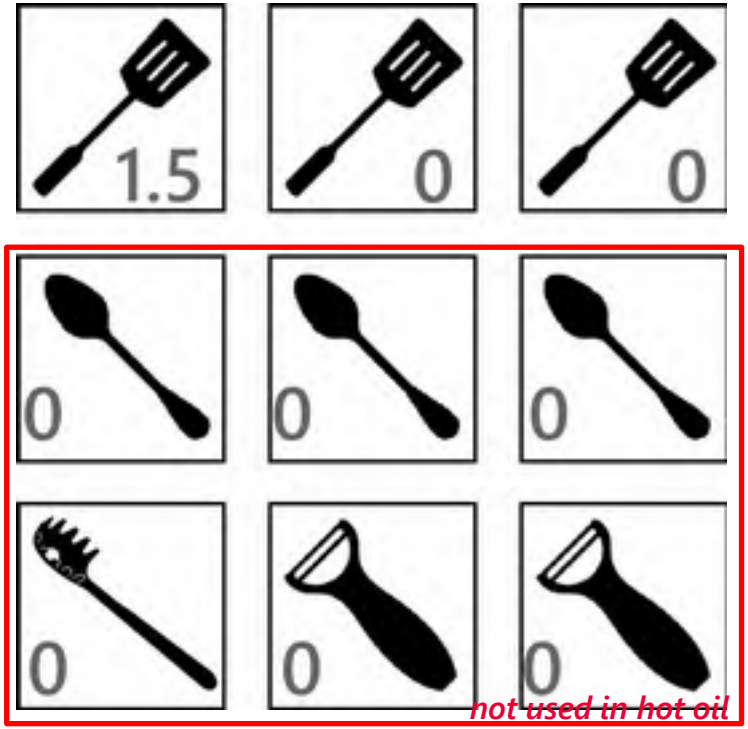


average = 7.9 μg/day (was 34.7)

= 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
- They didn’t sample the parts touching hot oil
  - exposures are correctly zero!
- Authors stand by the paper’s conclusions

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**]

Article Correction, Retraction and Removal Policy

Article correction | Expressions of concern | Article withdrawal | Article retraction | Article removal | Article

Policy overview

Elsevier recognizes the importance of the integrity and completeness of the scholarly record to the scientific community and attaches the highest importance to maintaining trust in the authority of its published articles.

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.
- Copyright has been infringed or there is some other serious legal issue (e.g., libel, breach of privacy).
- It reports unethical research and/or breaches Elsevier's publishing ethics policies regarding the conduct of research involving human participants and/or animals.
- There is evidence of compromised peer-review or systematic manipulation of the editorial process.
- There is evidence or material concerns of authorship being sold.
- There is evidence of citation manipulation.
- The author(s) failed to disclose a major competing interest (a conflict of interest) that, in the view of the editor, would have materially affected interpretations of the work or recommendations by editors and/or peer reviewers.
- 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.

ELSEVIER

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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Chemosphere 385 (2025) 144542

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Chemosphere

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

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

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.

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 – If I Got To Reword It

These results show that previously used plastic additives 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.

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:**

MJPhD

What Can An Individual Do?

- When acting as a peer reviewer
  - Check the methods and the math
  - Don't neglect the background
- If you see obvious errors in published work, there you can take action
- Keep your expectations low

No one likes retractions

- **They don't make money for publishers**
- **They are viewed as a black eye for the journal**
- **They are viewed negatively so authors don't want them**
- **They are unlikely to sway public opinion of meme science**

The number of articles written about the errors pales by comparison to the reporting on the original more sensationalized press release from Toxic-Free Future.

PUBPEER
The online Journal club

not indexed by Google or Bing

Home / Publications

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."

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."

Widely reported facts about plastics and microplastic are wrong.

- exposure is frequently over-reported
- reality checks are omitted

Correction in the scientific literature is slow; correcting public perception even slower.

- retractions don't benefit those directly involved
- zombie facts

There are things you can do.

- support PubPeer and Retraction Watch
- act when you find something wrong

MJPHD.net