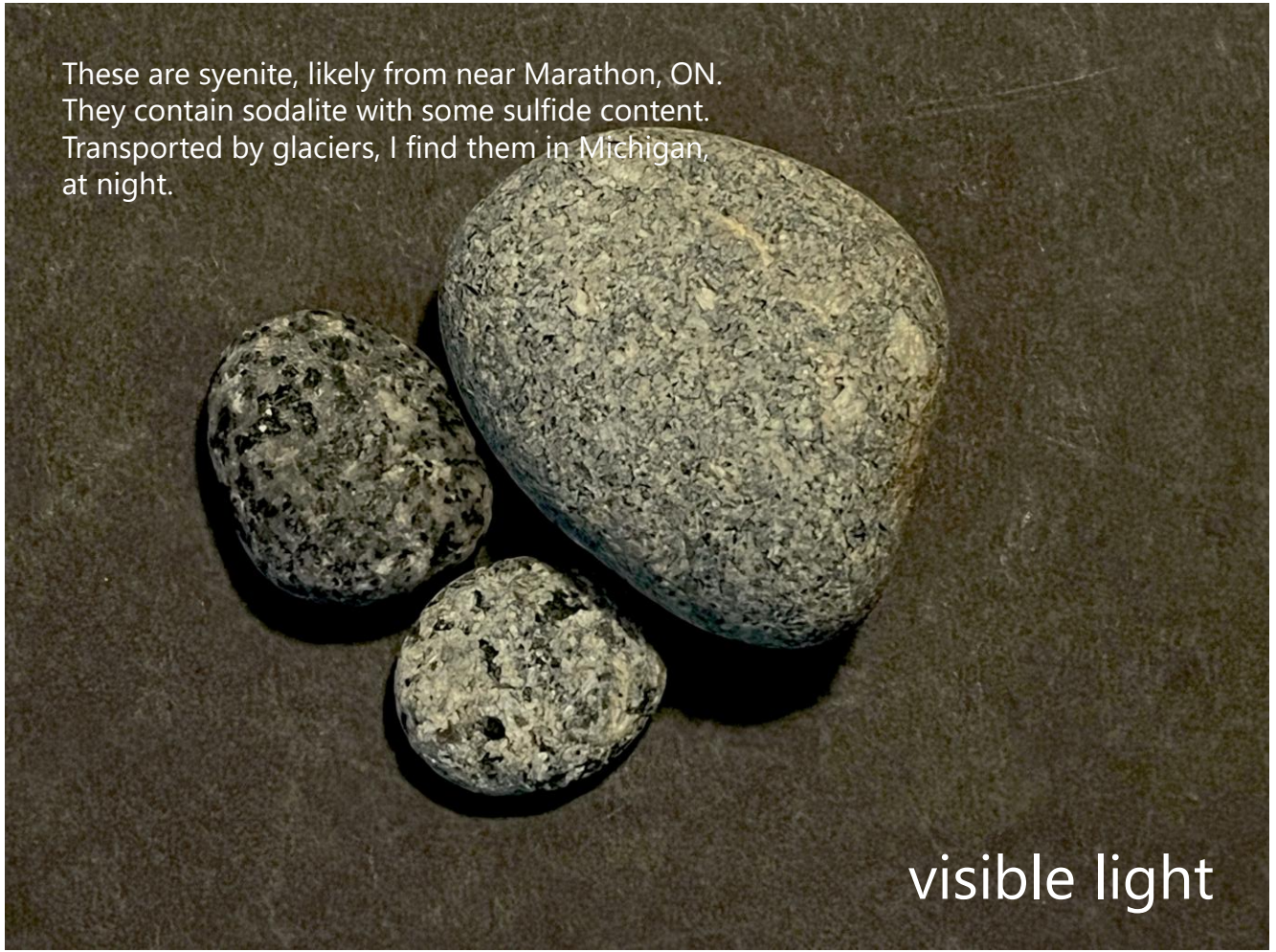
MJPHD

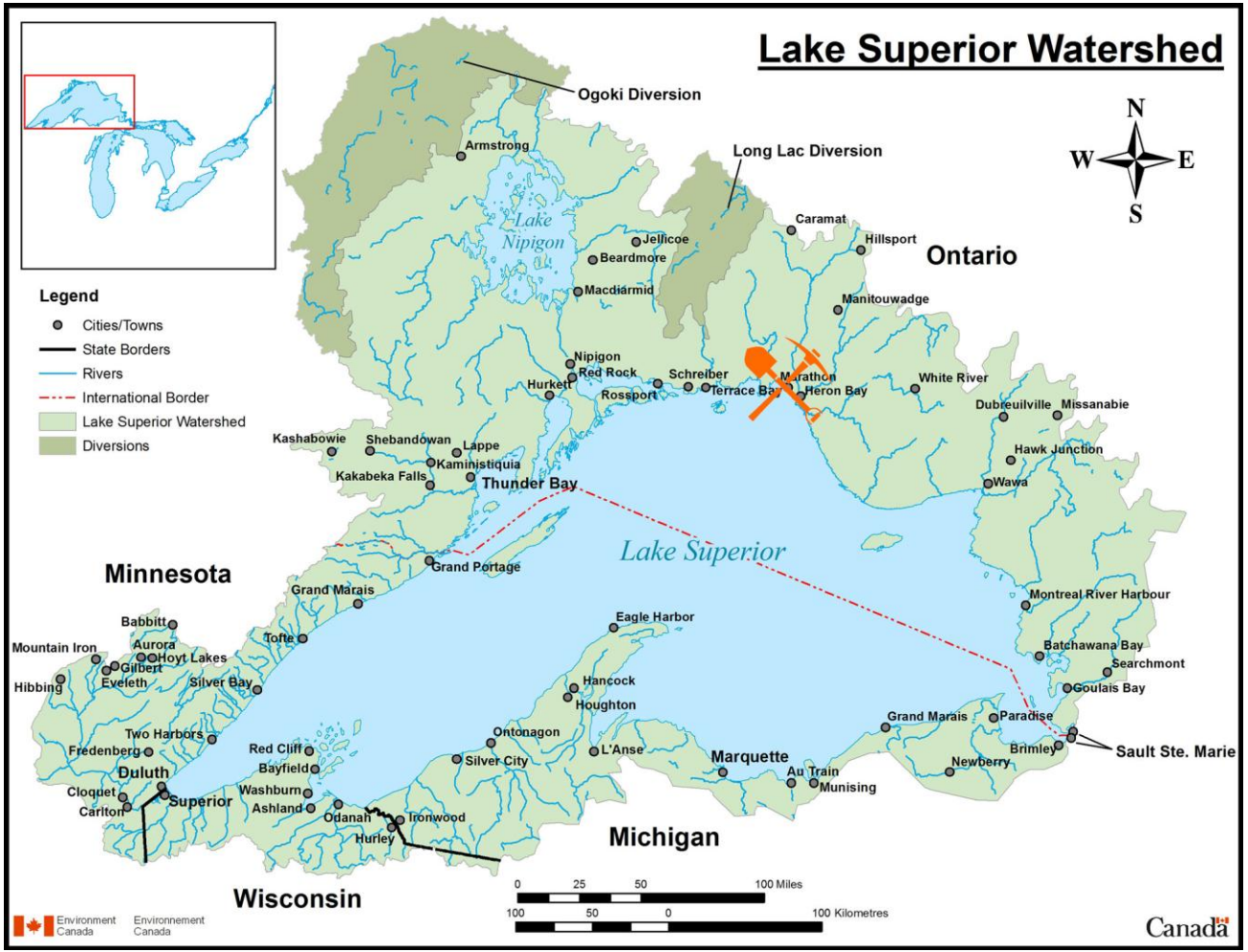
# ILLUMINATING MICROPLASTICS :
## *EFFORTS TO BRING CITIZEN SCIENCE TO THE MIDDLE AND HIGH SCHOOL CLASSROOM*

MARK JONES
*CREATIVE DIRECTOR*
MJPHD, LLC

*7 October 2025*

Dwayne told me to tell my story. It is a story with several twists and turns. It all began with something Canadian.

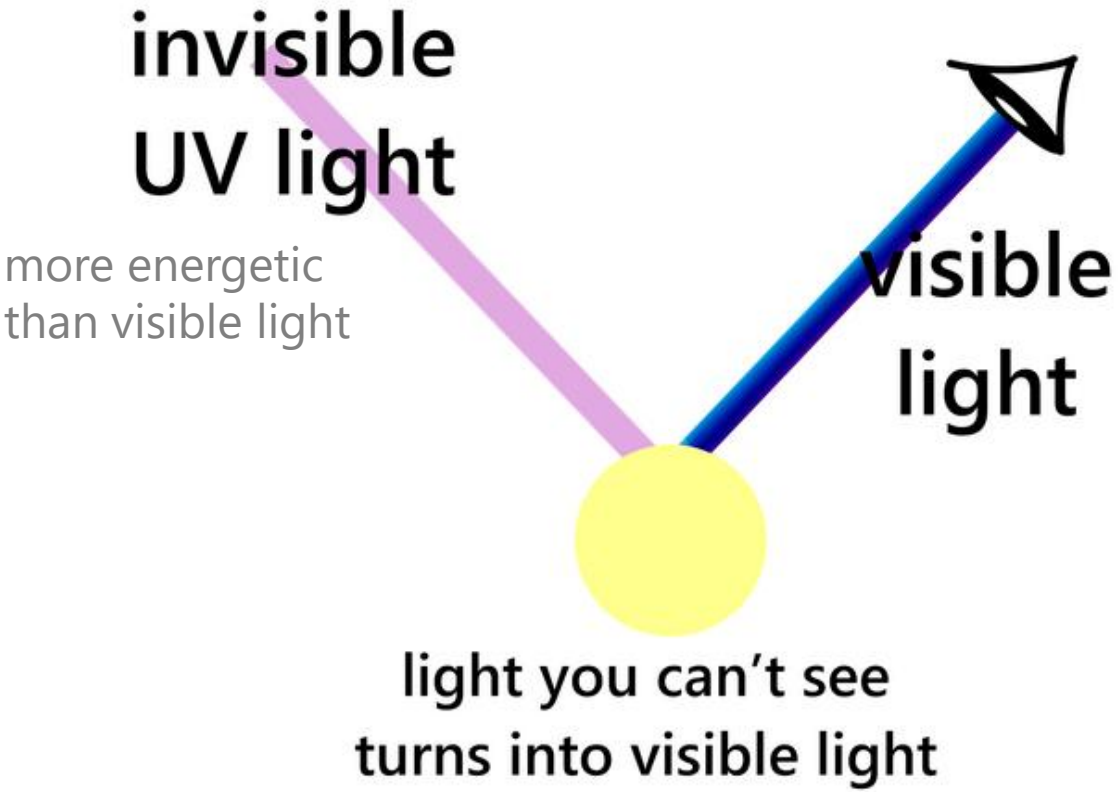

These are syenite, likely from near Marathon, ON.
They contain sodalite with some sulfide content.
Transported by glaciers, I find them in Michigan,
at night.
visible light


Lake Superior Watershed
Ogoki Diversion
Long Lac Diversion
Armstrong
Lake Nipigon
Jellicoe
Beardmore
Macdiarmid
Caramat
Hillsport
Ontario
Manitouwadge
Nipigon
Red Rock
Schreiber
Hurkett
Rossport
Terrace Bay
Marathon
Heron Bay
White River
Dubreuilville
Missanabie
Hawk Junction
Wawa
Kashabowie
Shebandowan
Lappe
Kaministiquia
Kakabeka Falls
Thunder Bay
Lake Superior
Grand Portage
Minnesota
Grand Marais
Babbitt
Aurora
Hoyt Lakes
Gilbert
Eveleth
Mountain Iron
Hibbing
Silver Bay
Tofte
Eagle Harbor
Hancock
Houghton
Ontonagon
Silver City
L'Anse
Marquette
Au Train
Munising
Grand Marais
Paradise
Brimley
Newberry
Sault Ste. Marie
Montreal River Harbour
Batchawana Bay
Searchmont
Goulais Bay
Two Harbors
Fredenberg
Duluth
Superior
Cloquet
Carlton
Red Cliff
Bayfield
Washburn
Ashland
Odanah
Ironwood
Hurley
Michigan
Wisconsin
Legend
Cities/Towns
State Borders
Rivers
International Border
Lake Superior Watershed
Diversions
N
W
E
S
0 25 50 100 Miles
100 50 0 100 Kilometres
Environment Canada
Environnement Canada
Canada

The filter is important. It gets rid of stray visible light making fluorescence much easier to see.


UV light
(365 nm filtered)

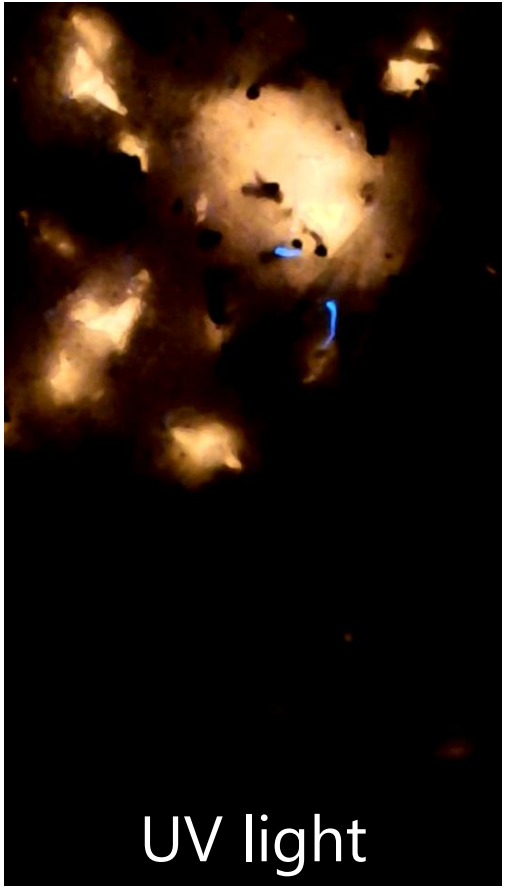
# FLUORESCENCE



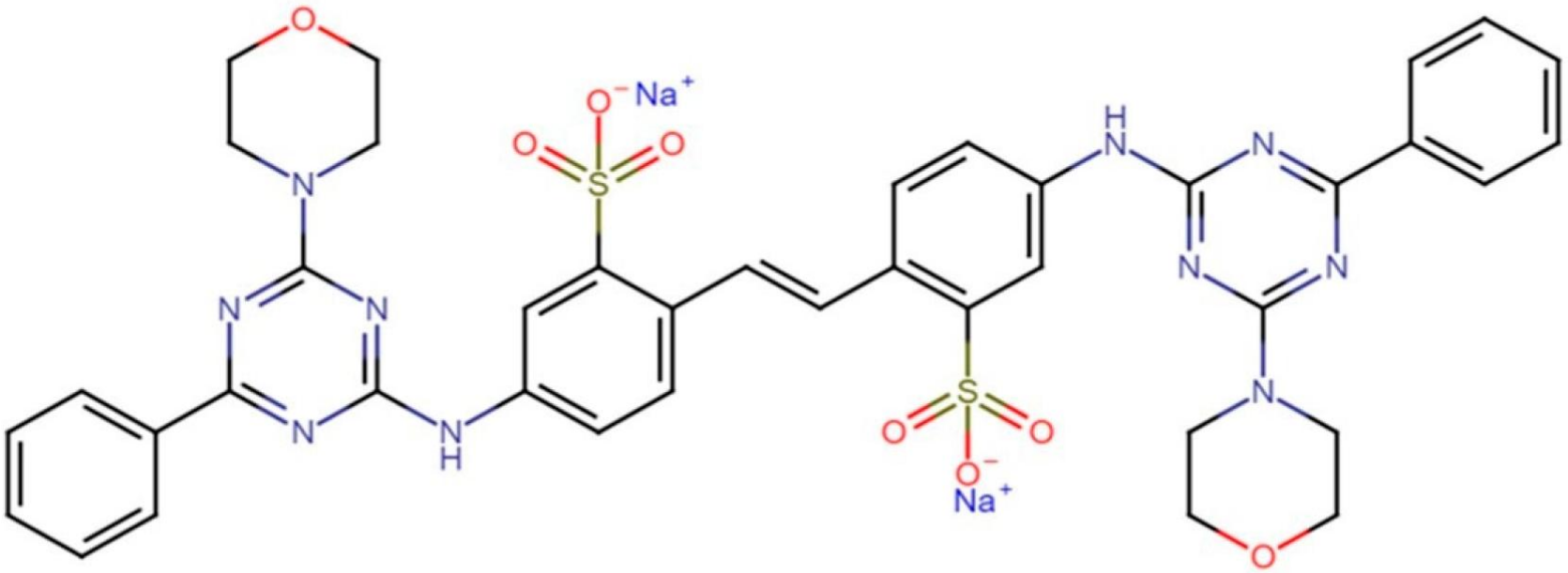
UV

white light

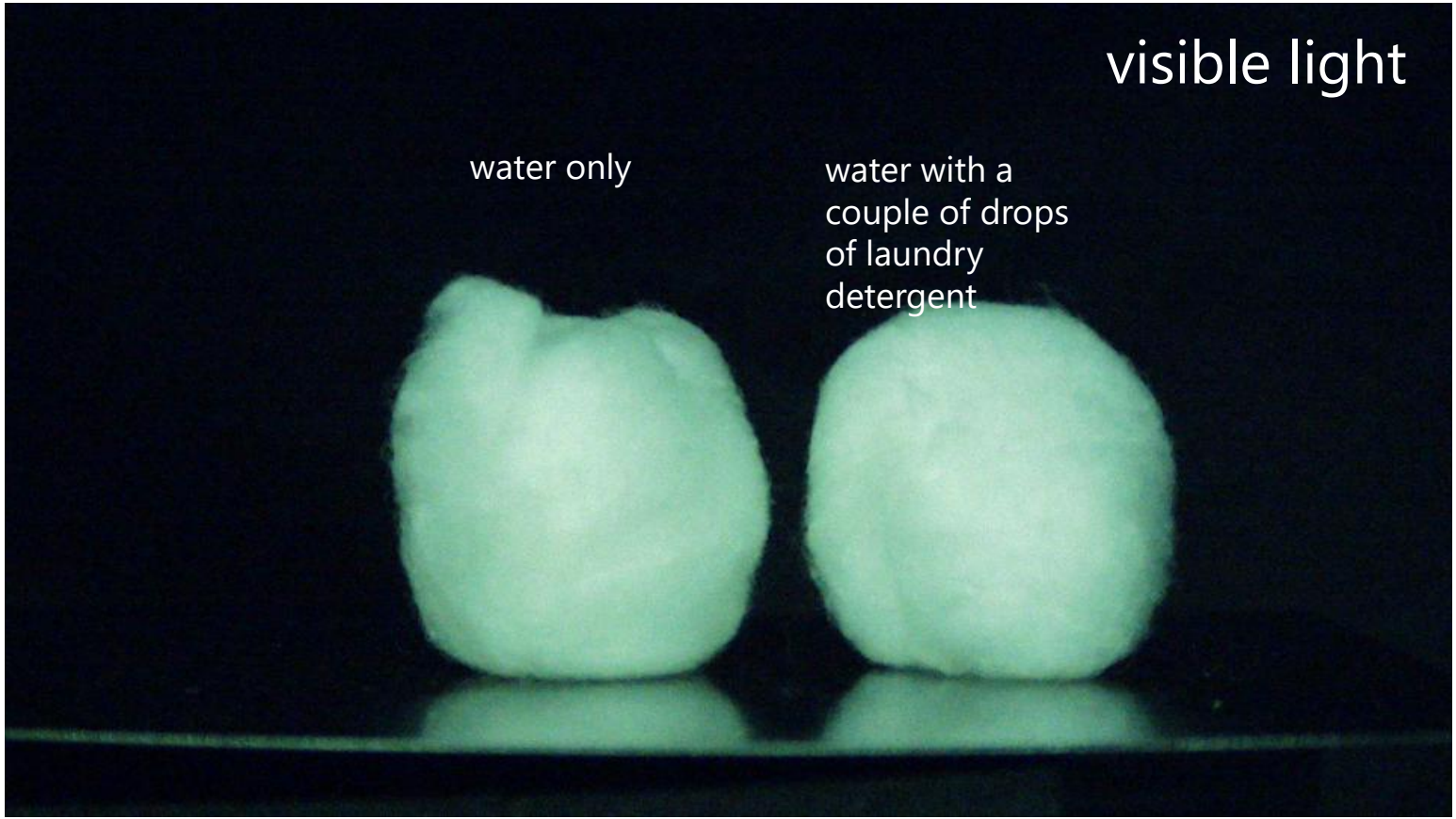

visible light


UV light

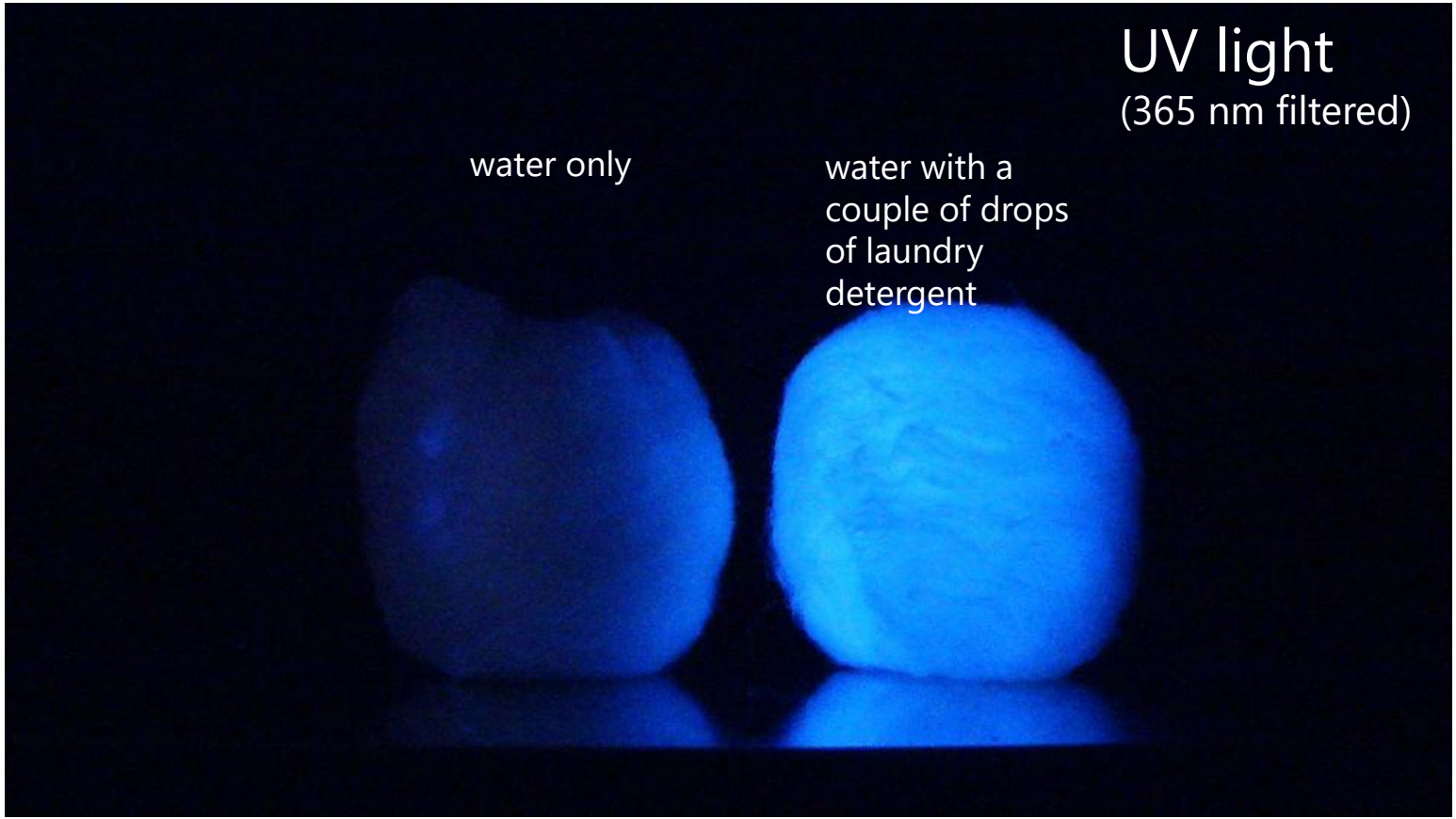
# Optical Brighteners



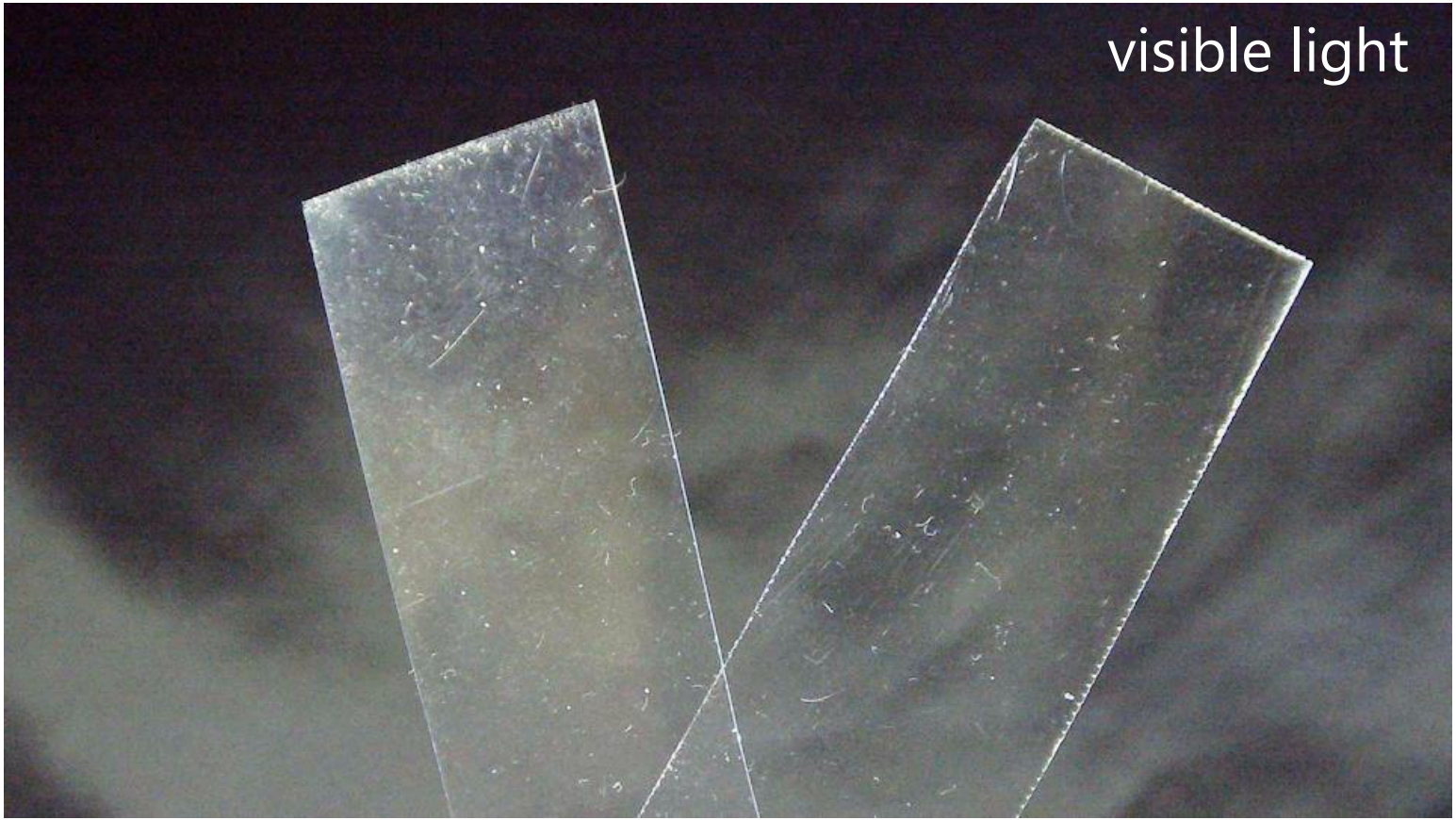
# Optical Brighteners



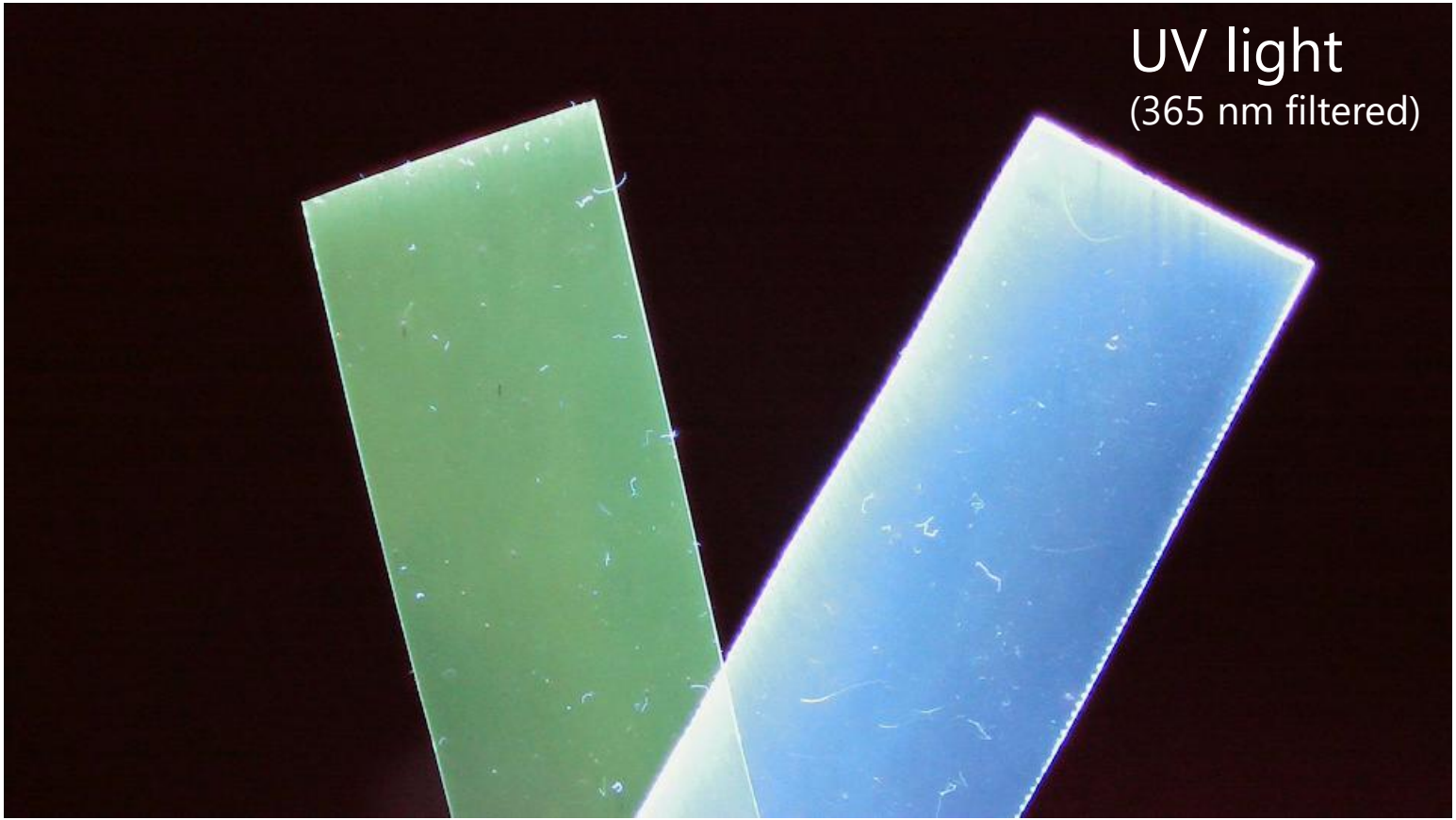
# Optical Brighteners



# PET



# PET

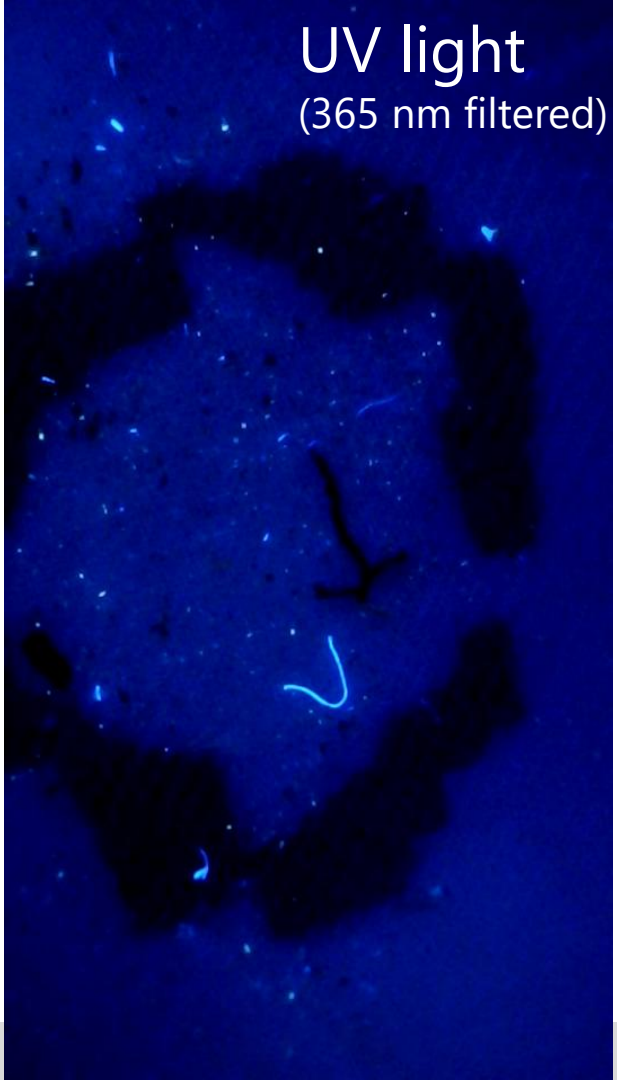


# OBX Beach Sand

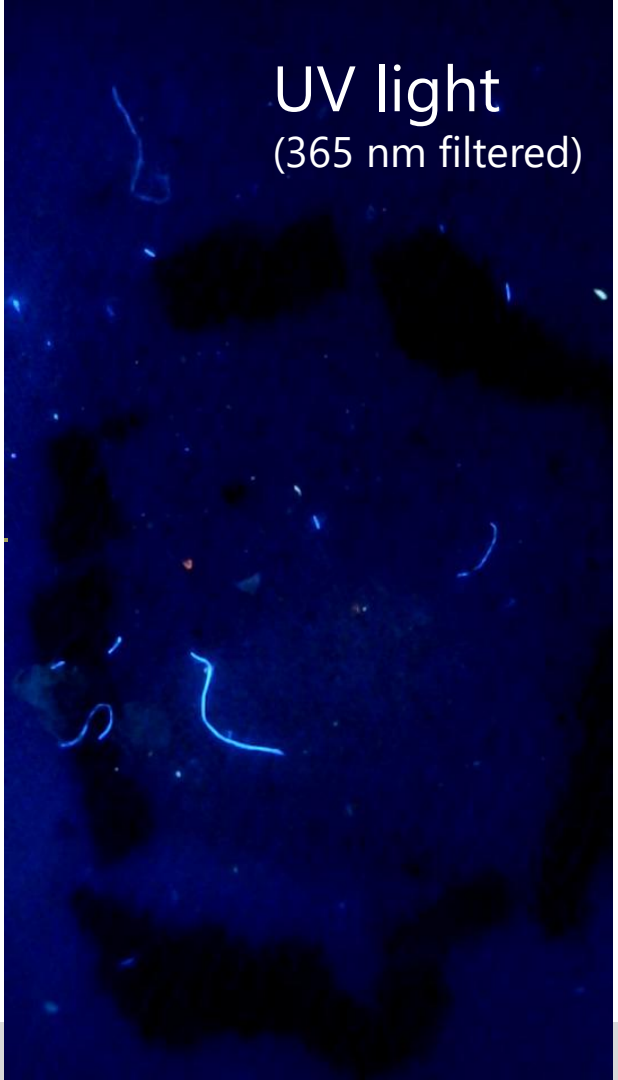
# OBX Beach Sand

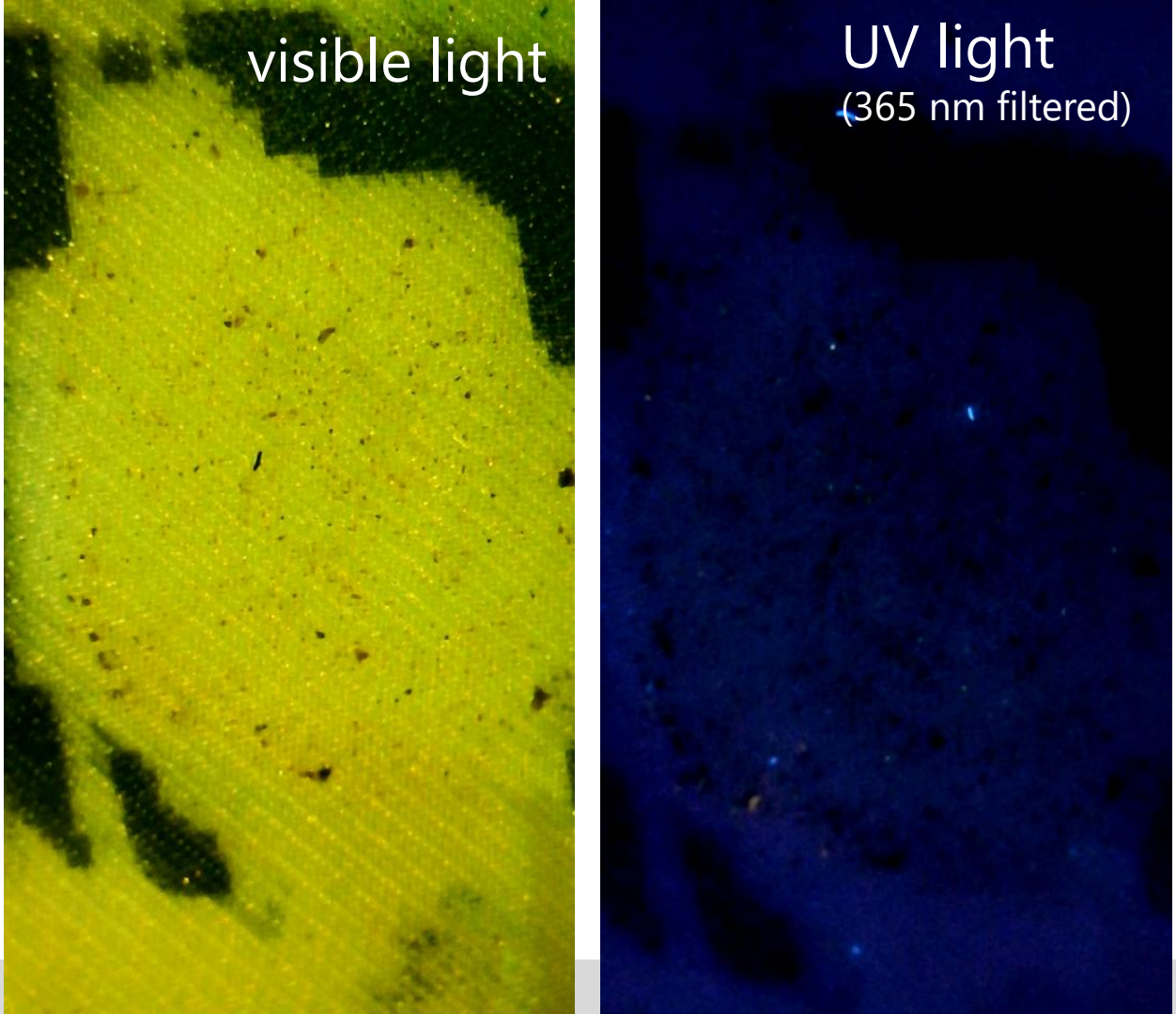
# OBX Beach Sand


visible light

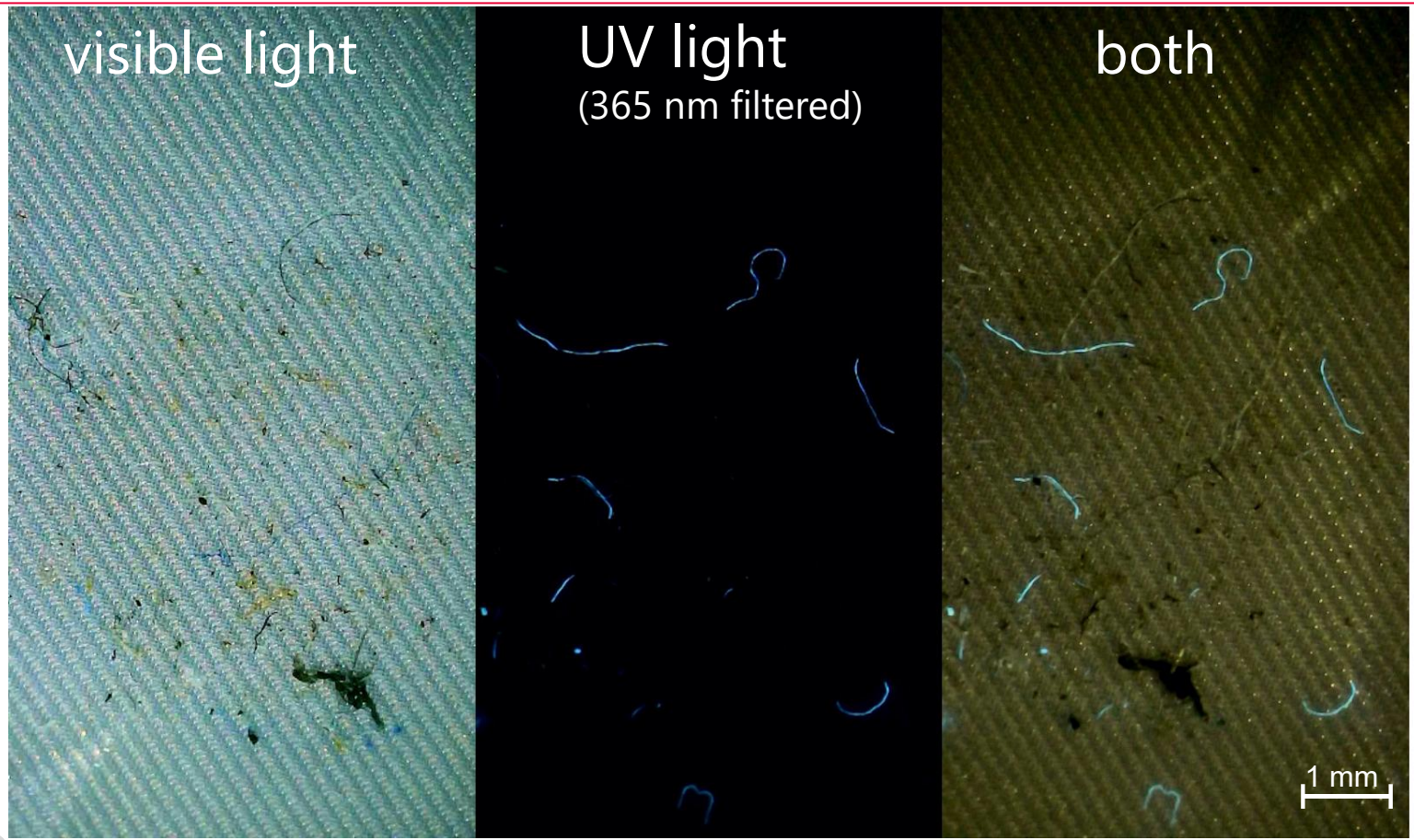

UV light
(365 nm filtered)


visible light


UV light
(365 nm filtered)


visible light
UV light
(365 nm filtered)

# Freshly Fallen Snow – 18 February




LED
UV light
filter


Midland Local Section

CENTRAL MICHIGAN UNIVERSITY

# Water Chemistry in the Great Lakes Region

*https://www.cmich.edu/academics/colleges/college-science-engineering/centers/cmu-biological-station/h2o-q-in-the-classroom*

MJPhD

Get a sample of water.

Filter out the small particles.

View/count the particles.

Water Research 155 (2019) 410–422

Contents lists available at ScienceDirect

Water Research

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

Review

# Microplastics in freshwaters and drinking water: Critical review and assessment of data quality

Albert A. Koelmans [a, *], Nur Hazimah Mohamed Nor [a], Enya Hermsen [a], Merel Kooi [a], Svenja M. Mintenig [b, c], Jennifer De France [d, **]

[a] Aquatic Ecology and Water Quality Management Group, Wageningen University, the Netherlands
[b] KWR Watercycle Research Institute, the Netherlands
[c] Wetsus, European Centre of Excellence for Sustainable Water Technology, the Netherlands
[d] World Health Organization, 20, Avenue Appia, 1211, Geneva, Switzerland

**high quality data is difficult!**

ARTICLE INFO

*Article history:*
Received 27 November 2018
Received in revised form
25 February 2019
Accepted 26 February 2019
Available online 28 February 2019

*Keywords:*
Microplastics
Drinking water
Waste water
Surface water
Human health

ABSTRACT

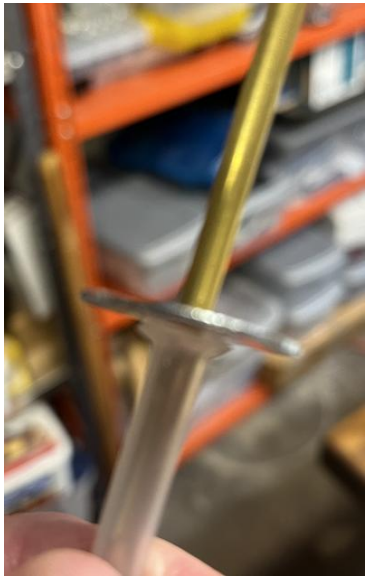
Microplastics have recently been detected in drinking water as well as in drinking water sources. This presence has triggered discussions on possible implications for human health. However, there have been questions regarding the quality of these occurrence studies since there are no standard sampling, extraction and identification methods for microplastics. Accordingly, we assessed the quality of fifty studies researching microplastics in drinking water and in its major freshwater sources. This includes an assessment of microplastic occurrence data from river and lake water, groundwater, tap water and bottled drinking water. Studies of occurrence in wastewater were also reviewed. We review and propose best practices to sample, extract and detect microplastics and provide a quantitative quality assessment of studies reporting microplastic concentrations. Further, we summarize the findings related to microplastic concentrations, polymer types and particle shapes. Microplastics are frequently present in freshwaters and drinking water, and number concentrations spanned ten orders of magnitude ($1 \times 10^{-2}$ to $10^{8}$ #/m$^3$) across individual samples and water types. However, only four out of 50 studies received

current iteration designed to sample near but not at the surface

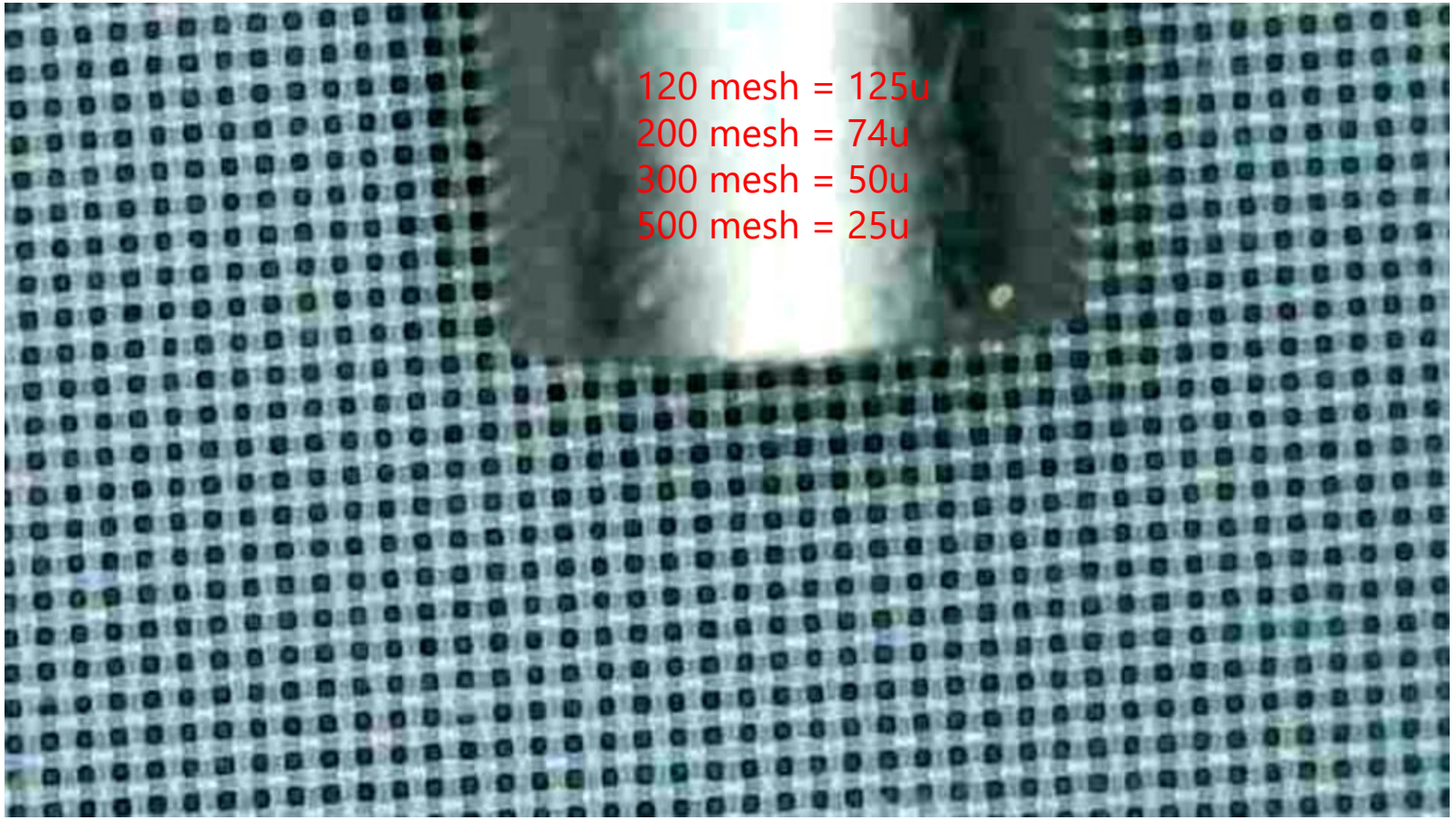
various options for filters explored

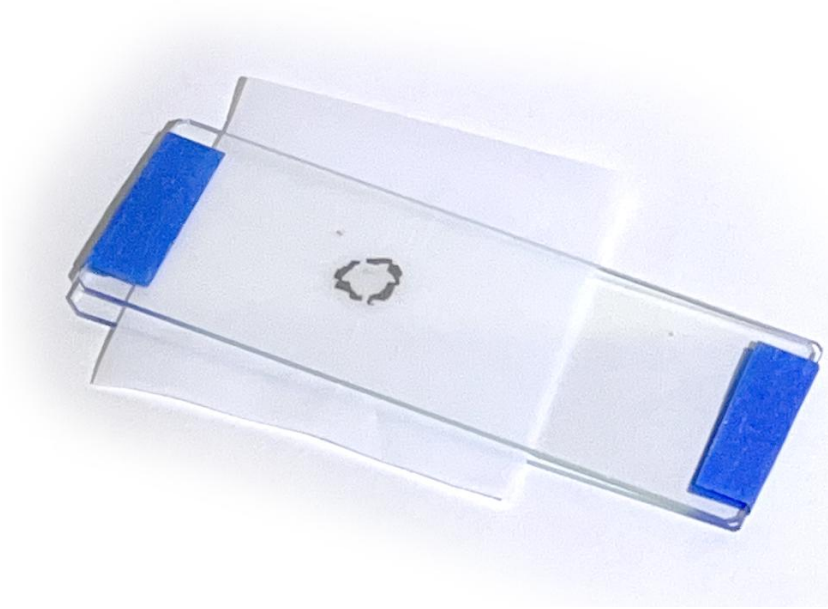
current iteration designed to filter at microscope resolution






# Silk Screen Fabric as Filters



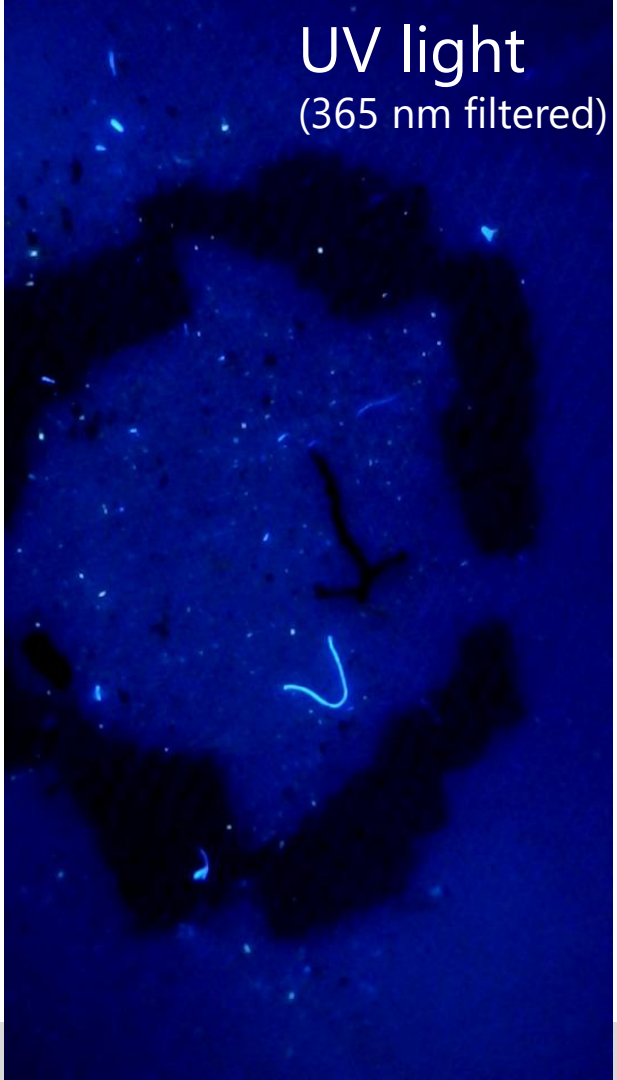


slide sandwich showing traced outline of funnel on filter media

# Sampling Steps

- Use masking tape to make microscope slide sandwich leaving one side open
- Open slide sandwich
- Rinse funnel with sample
- Dry tip
- Pull filter mesh around tip
- Push retainer over fabric snuggly ensuring outline doesn’t move
- Pass 100 mL of water through funnel
- If filtering slows or doesn’t flow, use syringe to pressurize
- Carefully remove retainer
- Place on filter paper to dry
- Put in on slide and close the sandwich
- Outline funnel tip on slide with marker

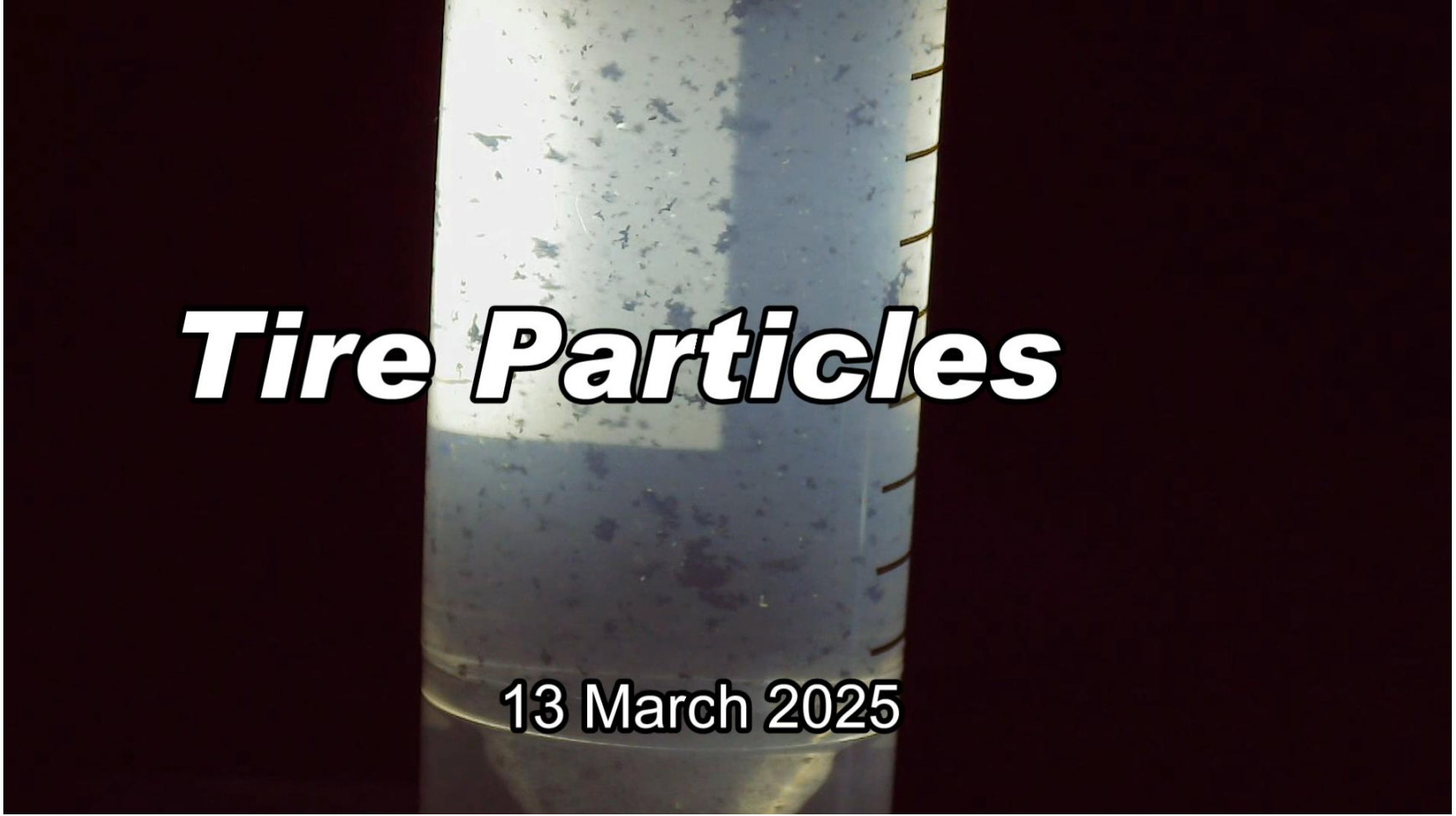

visible light


UV light
(365 nm filtered)

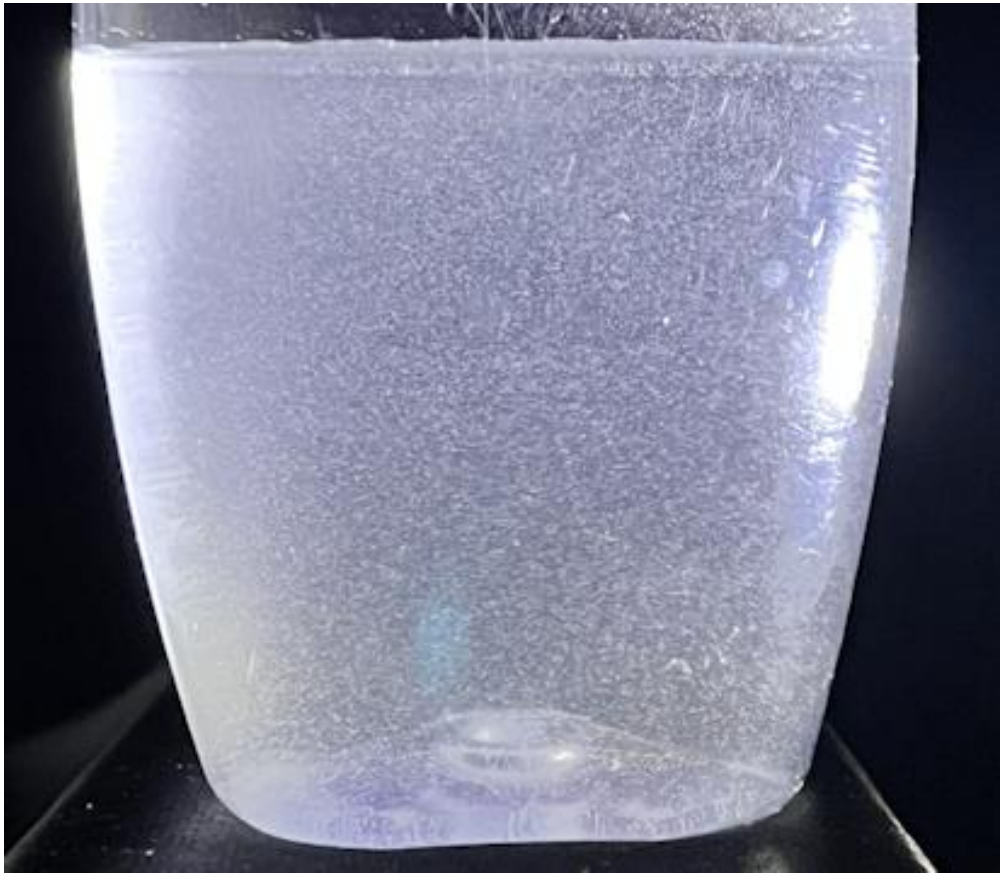

Thanks to Henry Lecaptain for 3D printing the filter holder.

# Flaws

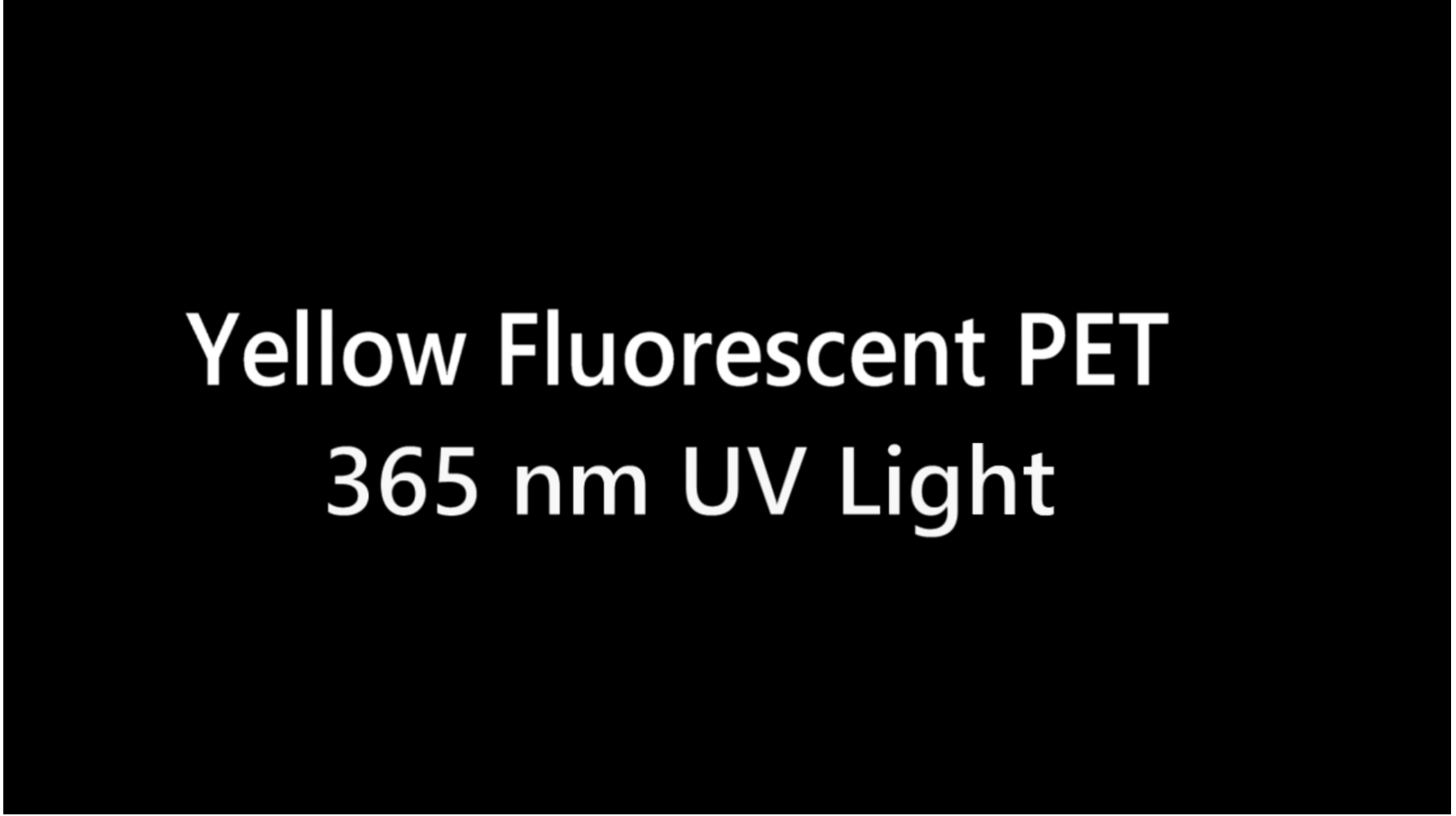
- Speed at the expense of perfect accuracy
- Sampling challenges can dramatically shift results
- Fluorescence emphasizes some materials while ignoring others


Tire Particles
13 March 2025


Making Microplastic
Suspension
small batch




NATURESWEET
CHERUBS
HEAVENLY SALAD TOMATOES
NET WT 16.5 oz (467g)
LETTUCE OUT!
LETTUCE OUT!
foodID


Yellow Fluorescent PET
365 nm UV Light

# Snow

17 March 2025

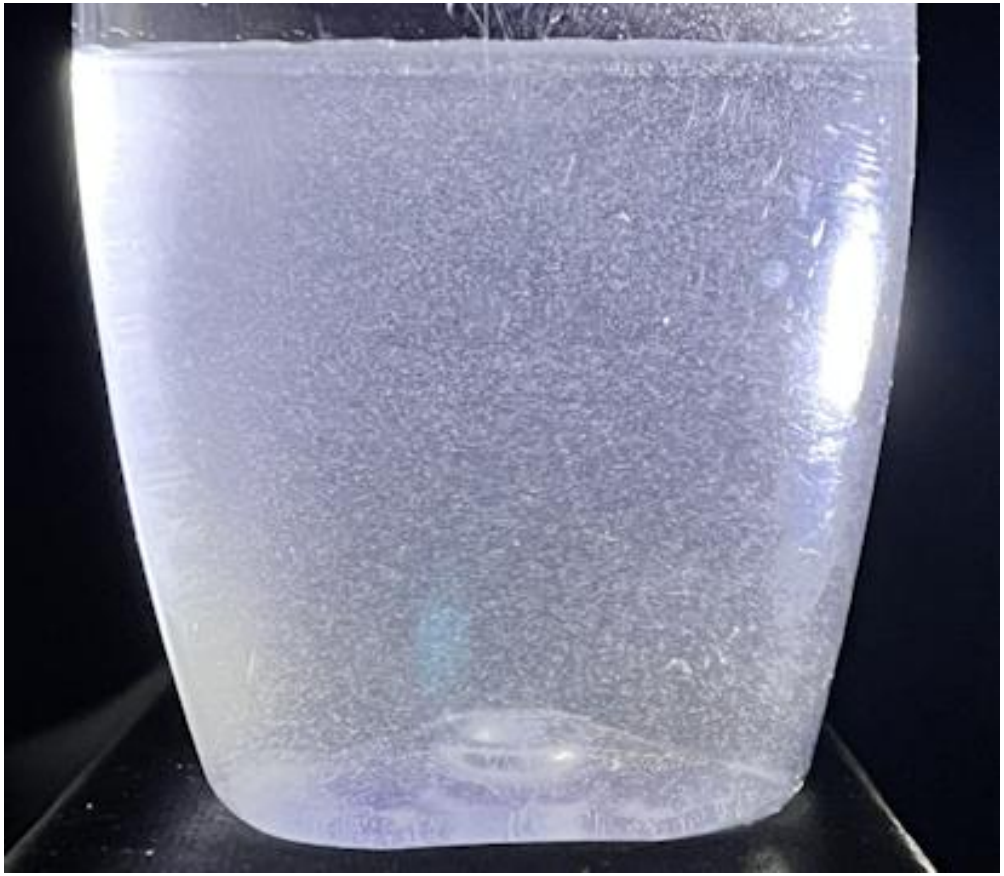
Finding new ways to look at the world can yield interesting results.

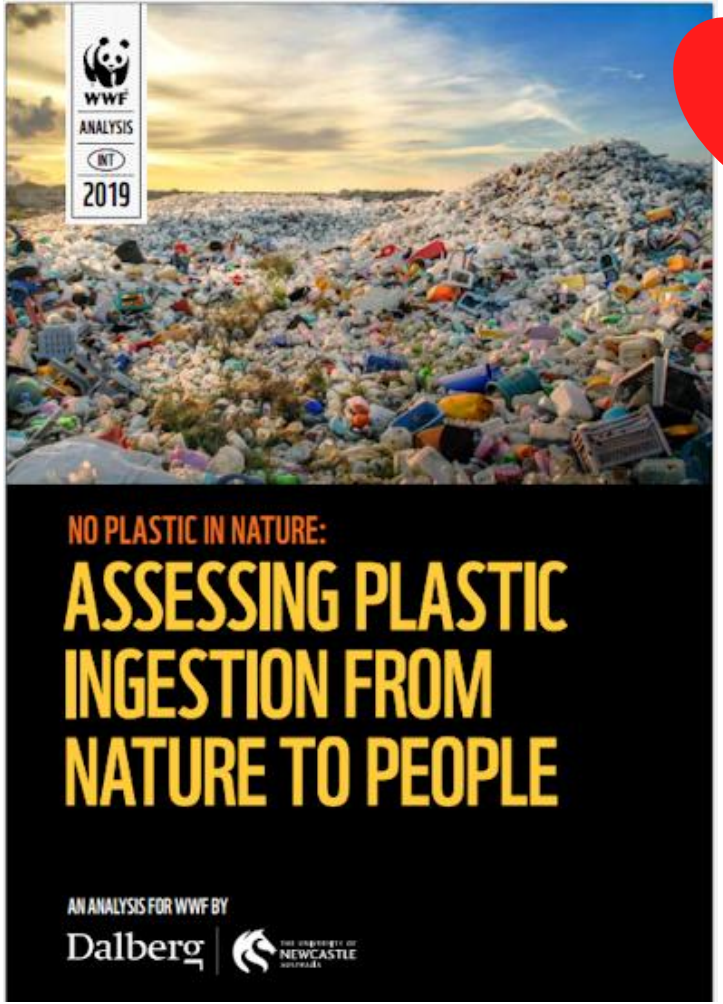
Plastic particles are everywhere.

Sampling may help identify areas where something can be done.

Microplastic Ingestion


Getting Flawed Paper Retracted




"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


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


THE UNIVERSITY OF NEWCASTLE AUSTRALIA

Study Research Engage Campus Life Our Uni 0

## Newsroom

- Future Students
- Research and Innovation
- The Conversation
- Industry
- International
- Community and Alumni
- Library
- Current Students
- Current Staff
- College of Engineering, Science and Environment
- 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.**

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.

*Dr Thava Palanisami*

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




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

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


per week

whole card = 5 g

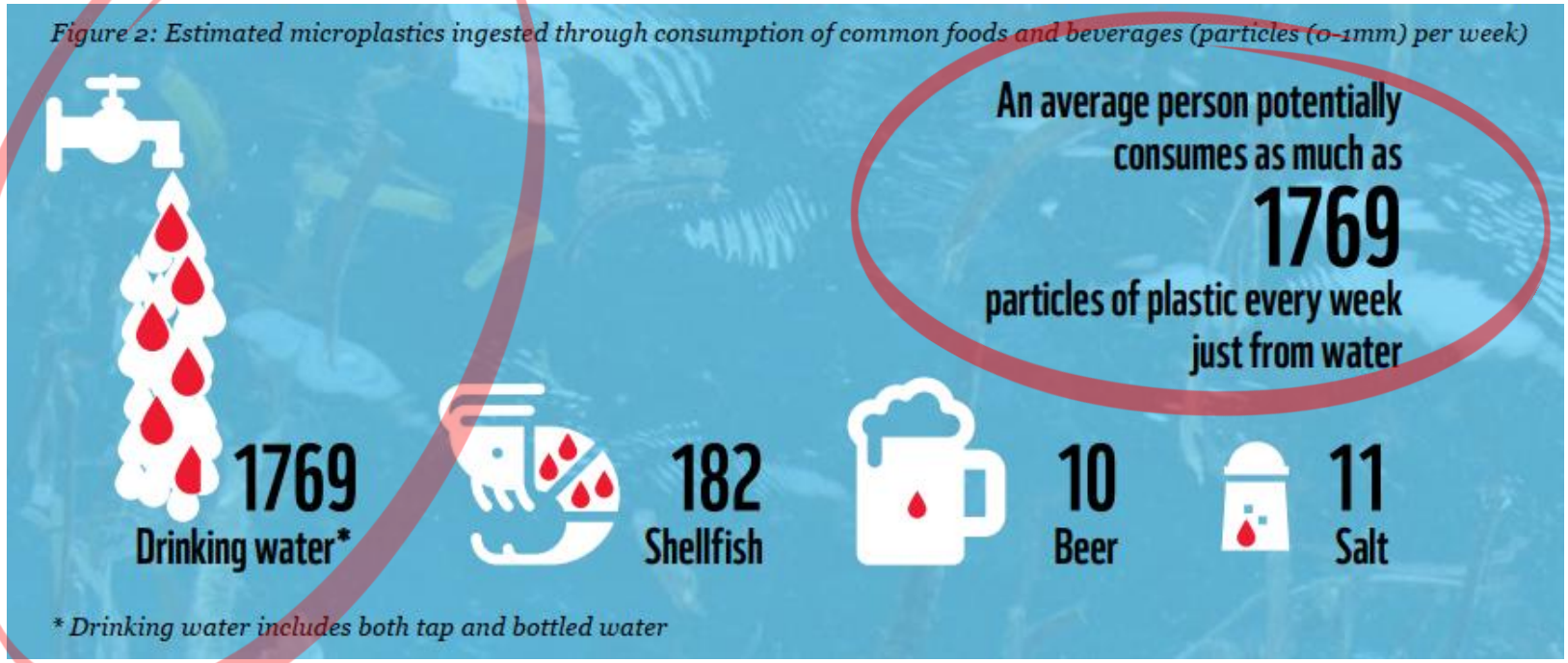
per day

1/7 card = 710 mg

per meal

1/21 card = 240 mg


*2.5 mg average particle to reach 5 grams.*




TOXIC

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.

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


**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


*0.02 credit cards worth*

**one model** **another model**



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

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


Environmental Science & Technology

pubs.acs.org/est

Article

# Lifetime Accumulation of Microplastic in Children and Adults

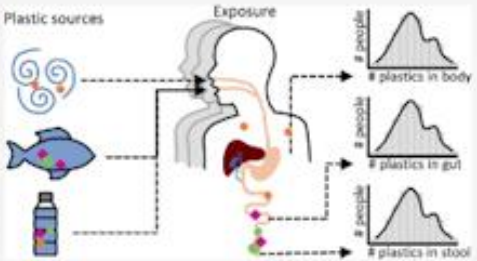
Nur Hazimah Mohamed Nor,* Merel Kooi, Noël J. Diepens, and Albert A. Koelmans

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

Read Online

ACCESS | Metrics & More | Article Recommendations | Supporting Information

**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 $\mu$m) 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 $8.32 \times 10^3$ (90% CI, $7.08 \times 10^2$−$1.91 \times 10^6$) particles/capita or 6.4 (90% CI, 0.1−$2.31 \times 10^3$) ng/capita for children until age 18, and up to $5.01 \times 10^4$ (90% CI, $5.25 \times 10^3$−$9.33 \times 10^6$) particles/capita or 40.7 (90% CI, 0.8−$9.85 \times 10^3$) ng/capita for adults until age 70 in the body tissue for 1−10 $\mu$m 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.

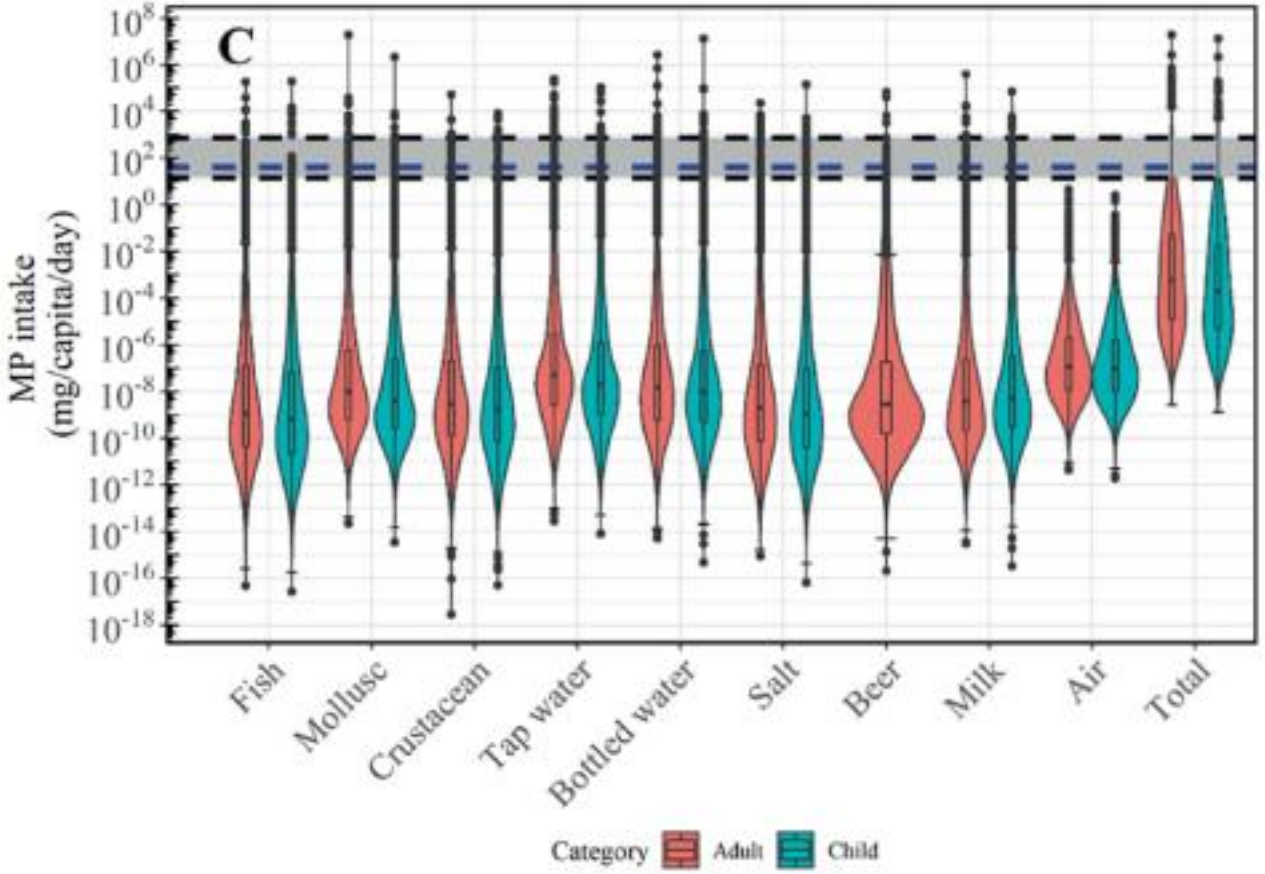



883 particles per person per day

583 ng/person/day

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

MJPhD




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

# 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

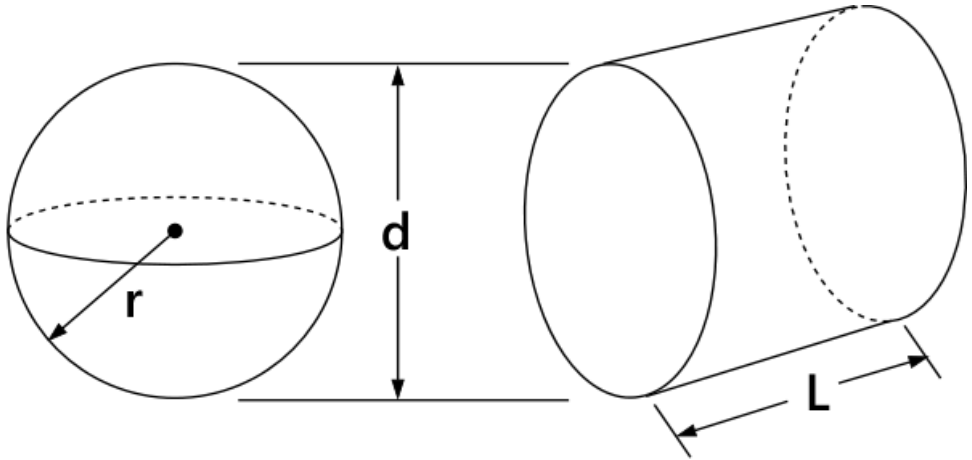
ABSTRACT

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 $m_{LMP}$ 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 $m_{LMP}$. This work raises some serious issues of Senathirajah in the way they combine data and they obtained particle sizes. It concludes that Senathirajah overestimates $m_{LMP}$ by several orders of magnitude and that $m_{LMP}$ 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



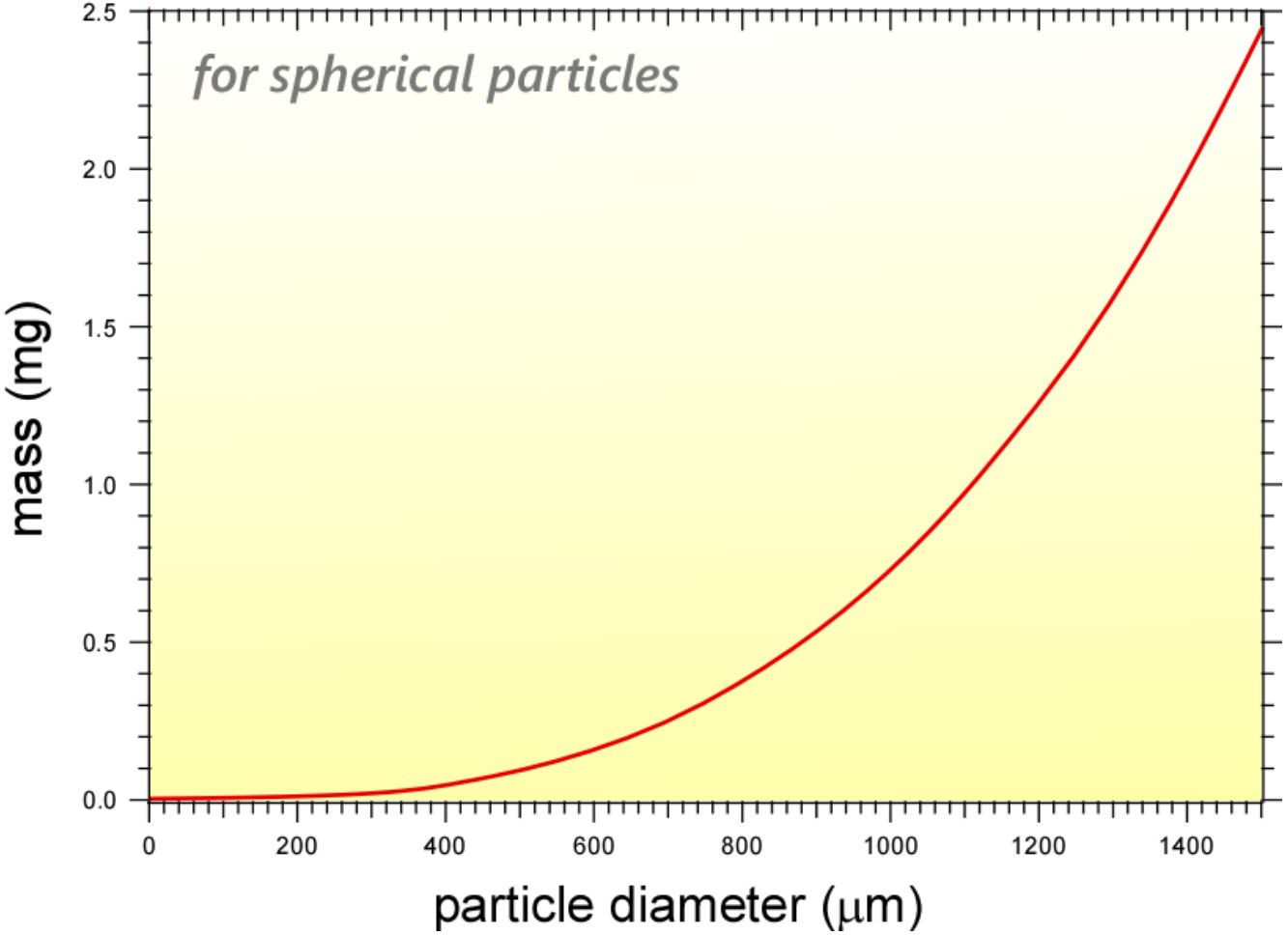

$$m = \rho V = \frac{\pi \rho d^3}{6}$$

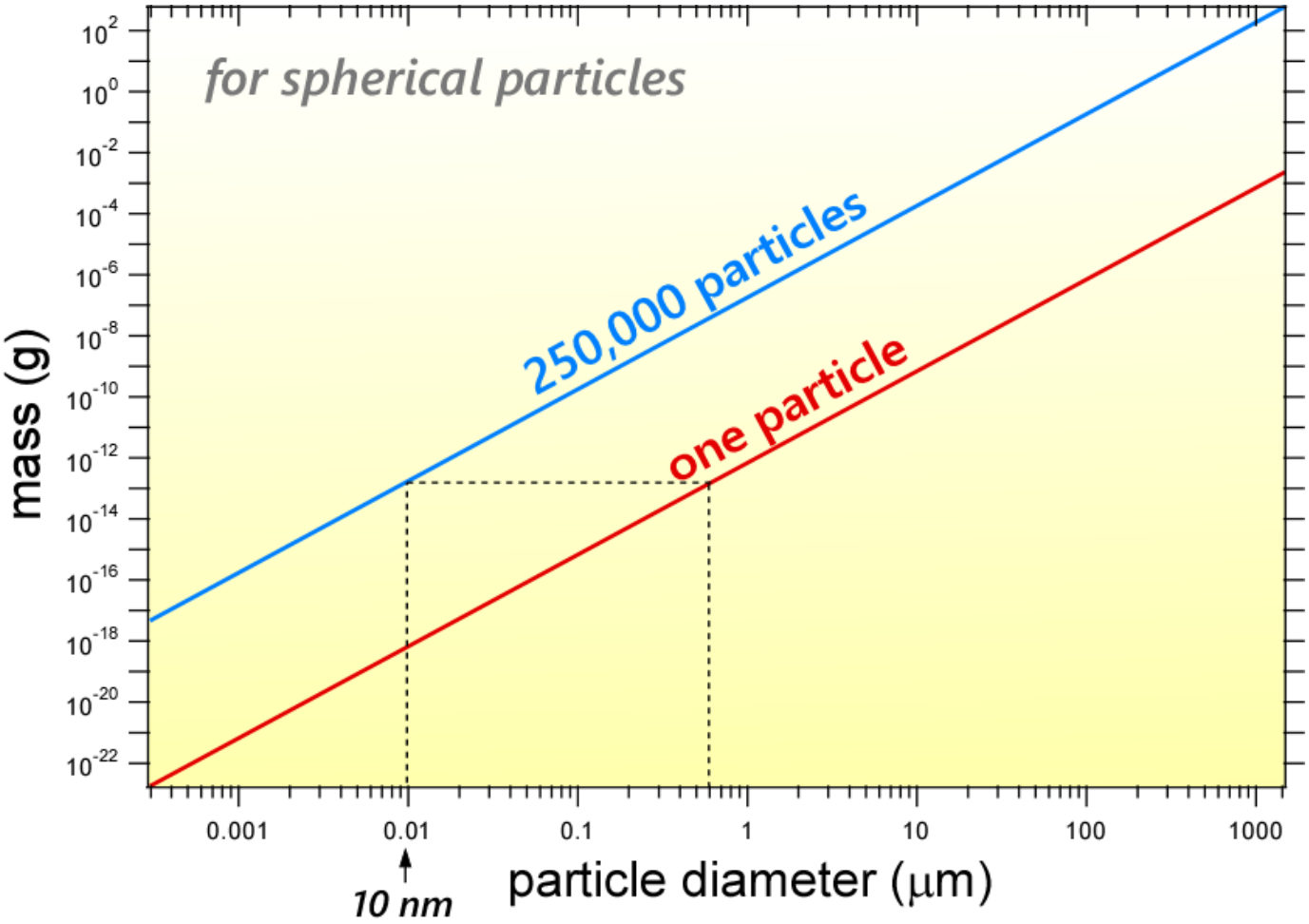
$$m = \frac{\pi \rho d^2 L}{4}$$

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

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

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


for spherical particles
mass (mg)
2.5
2.0
1.5
1.0
0.5
0.0
0
200
400
600
800
1000
1200
1400
particle diameter (μm)


for spherical particles
250,000 particles
one particle
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
10 nm
particle diameter (μm)

Widely reported facts about environmental plastic and plastic consumption are wrong.

Corrections of public perception and in the scientific literature are challenging.

Plastic particles are everywhere.

*Picasso, 1955*

Toxic-Free FUTURE

About Us | Blog | Pressroom | Contact

Our Work | Research | Get The Facts | Take Action | Donate

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 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

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

**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**

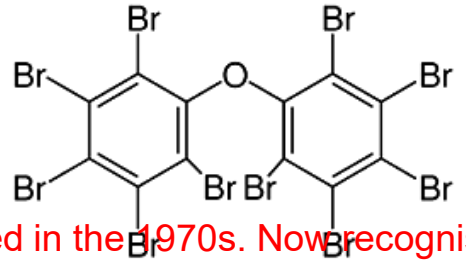
This study found ΣFR concentrations up to 22,790 mg/kg in food serviceware, hair accessories, kitchen utensils, and toys.

- 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-LIFE

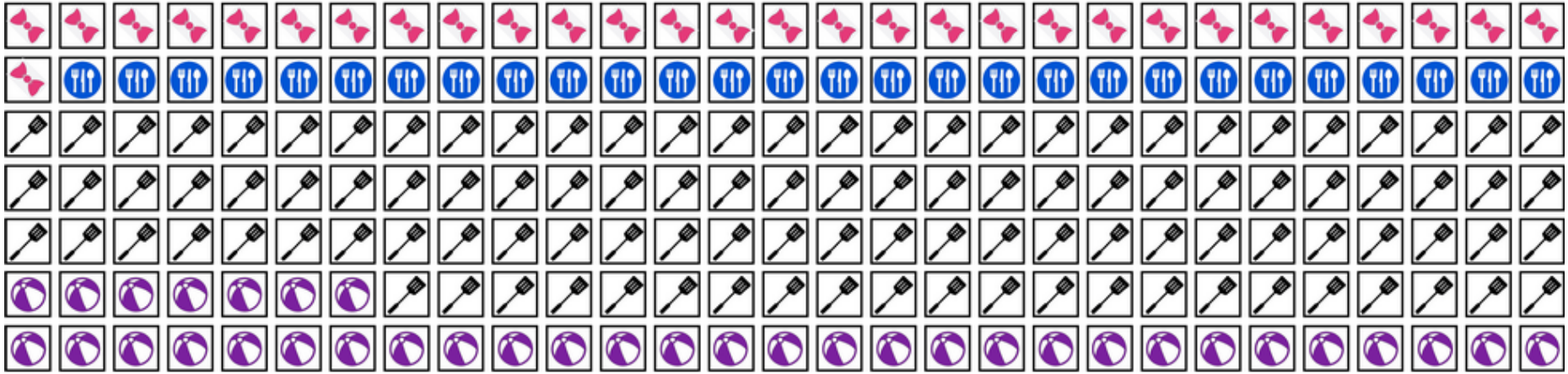
# Calculation of Exposure to Brominated Flame Retardants

- 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

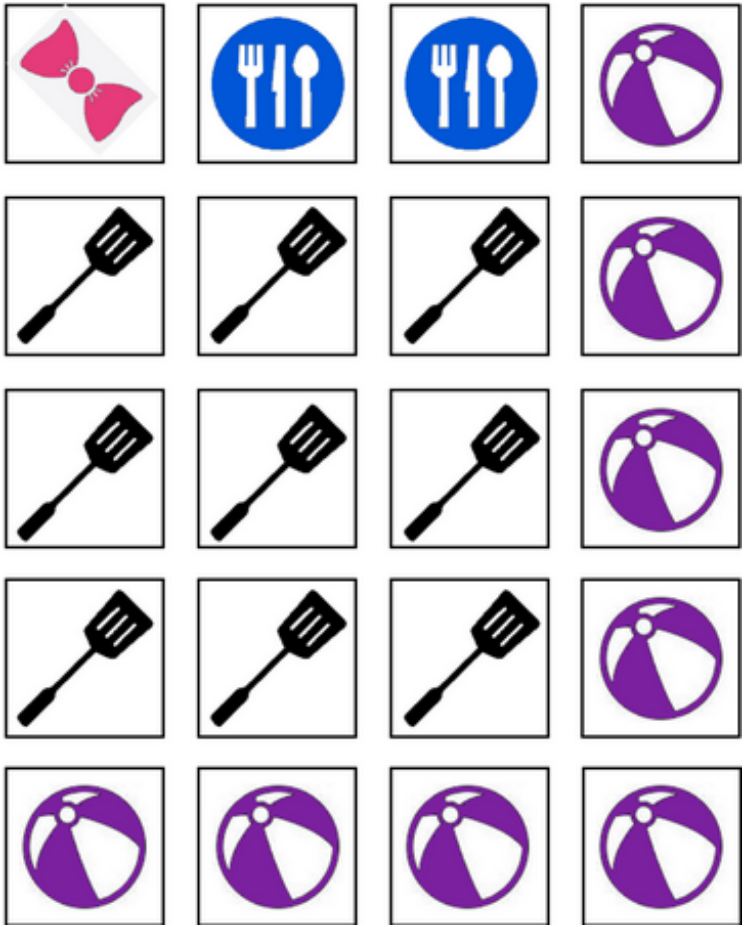
BDE-209 – decabromoether - commercialised in the 1970s. Now recognised as a hazardous and persistent pollutant under 2017 Stockholm Convention on Persistent Organic Pollutants meaning that treaty members must eliminate its production and use.



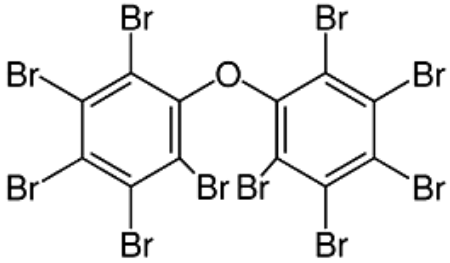
203 total items: 30 hair accessories, 28 food service, 36 toys, 109 kitchen items

# 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

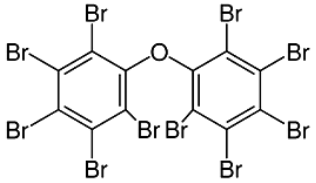
concluded too close to 42μg/day EPA reference dose

*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

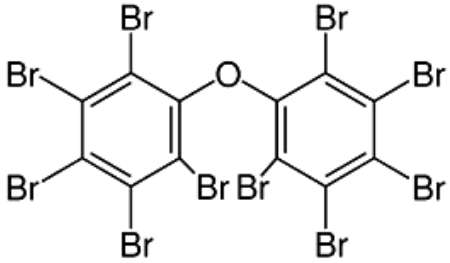
reported median value of 34.7μg/day

actual median 4.1 μg/day

average is 16 μg/day (24 ignoring BDL

reference dose is 420 μg/day

MJPhD


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

# It Gets Worse

# CORRIGENDUM 2

concentration → correlation → exposure

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

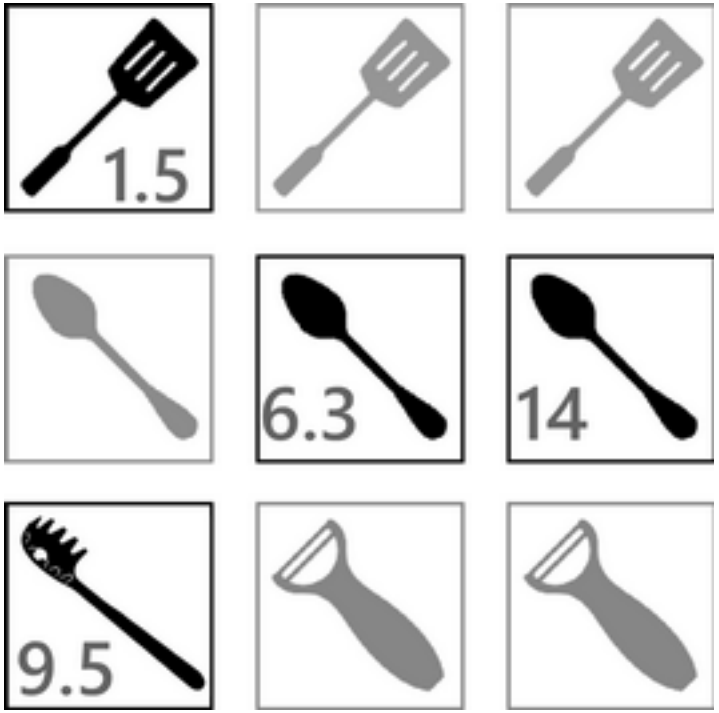
$E \propto C$

**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.*

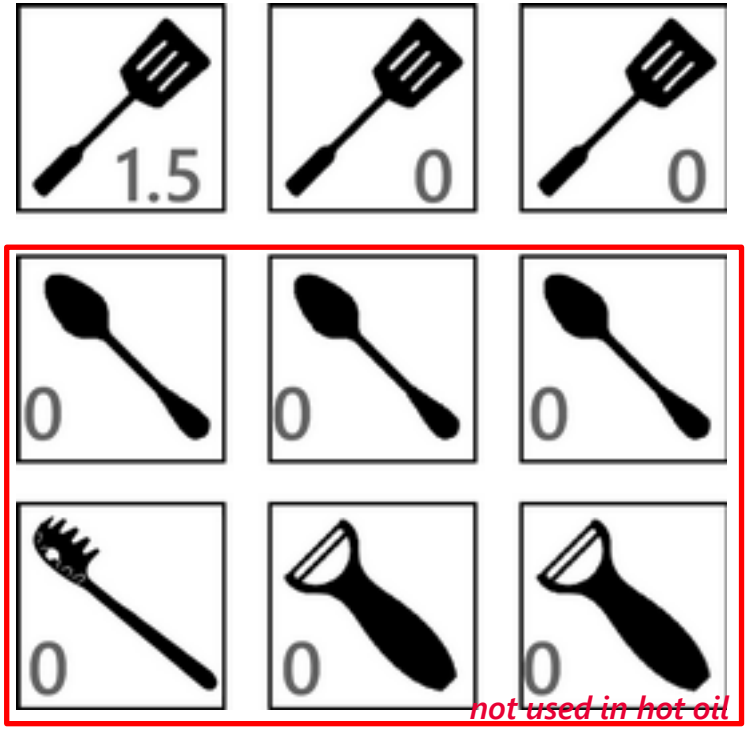
## author's treatment




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

MJPhD

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

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

**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

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.

MJPHD.net