UNITED EUROPEAN GASTROENTEROLOGY ueg week

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Assessment of microplastic concentrations in human stool

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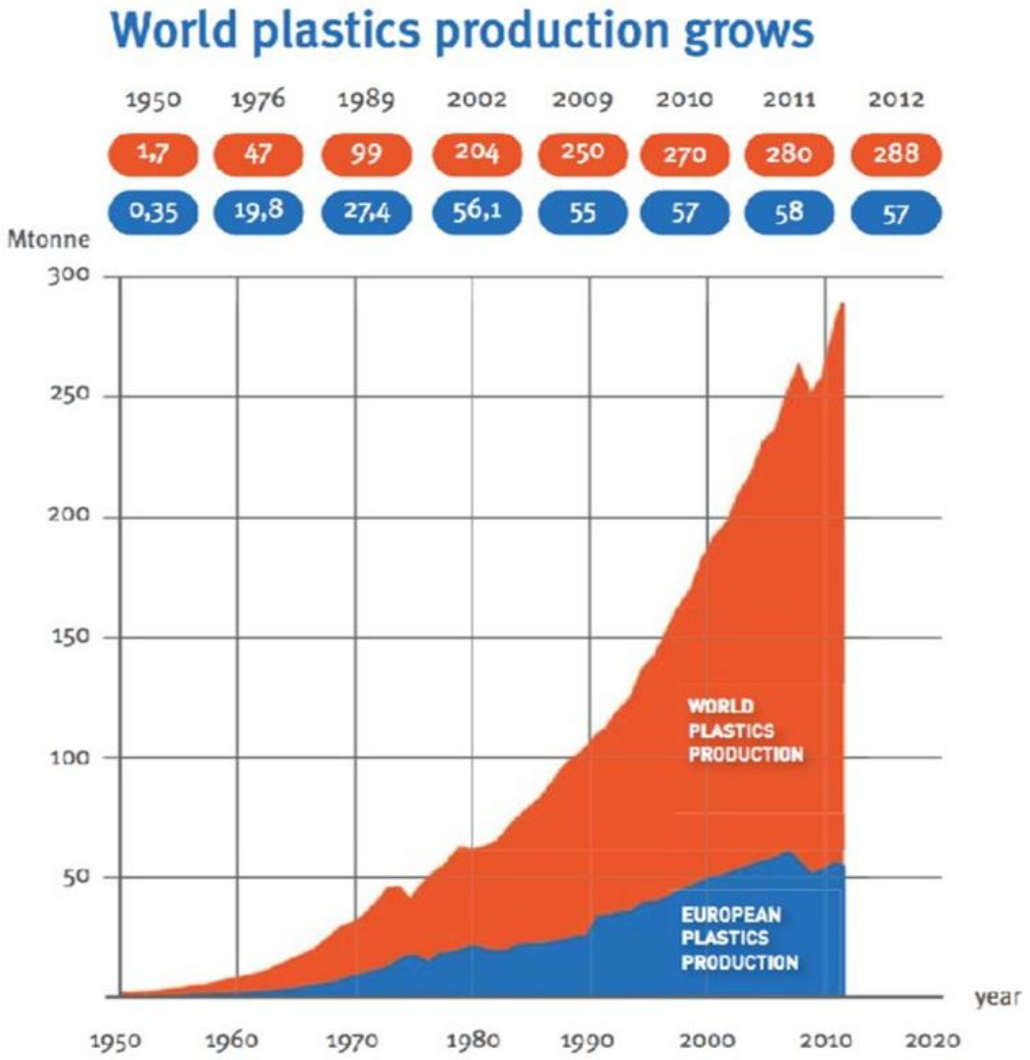
Disclosure of Conflicts of Interest

I herewith declare the following paid or unpaid consultancies, business interests or sources of honoraria payments since October 1, 2016, and anything else which could potentially be viewed as a conflict of interest:

→ **I have no conflicts of interest.**

Plastic – A short introduction



Boelens R et. al. GESAMP. Pollution in the Open Oceans 2009-2013. ISSN 1020-4873 http://www.gesamp.org/site/assets/files/1273/pollution-in-the-open-oceans-en.pdf

Thompson A. From Fish to Humans, A Microplastic Invasion May Be Taking a Toll. Scientific American. 2018 Sept https://www.scientificamerican.com/article/from-fish-to-humans-a-microplastic-invasion-may-be-taking-a-toll/

From plastic to microplastics

Primary microplastics:

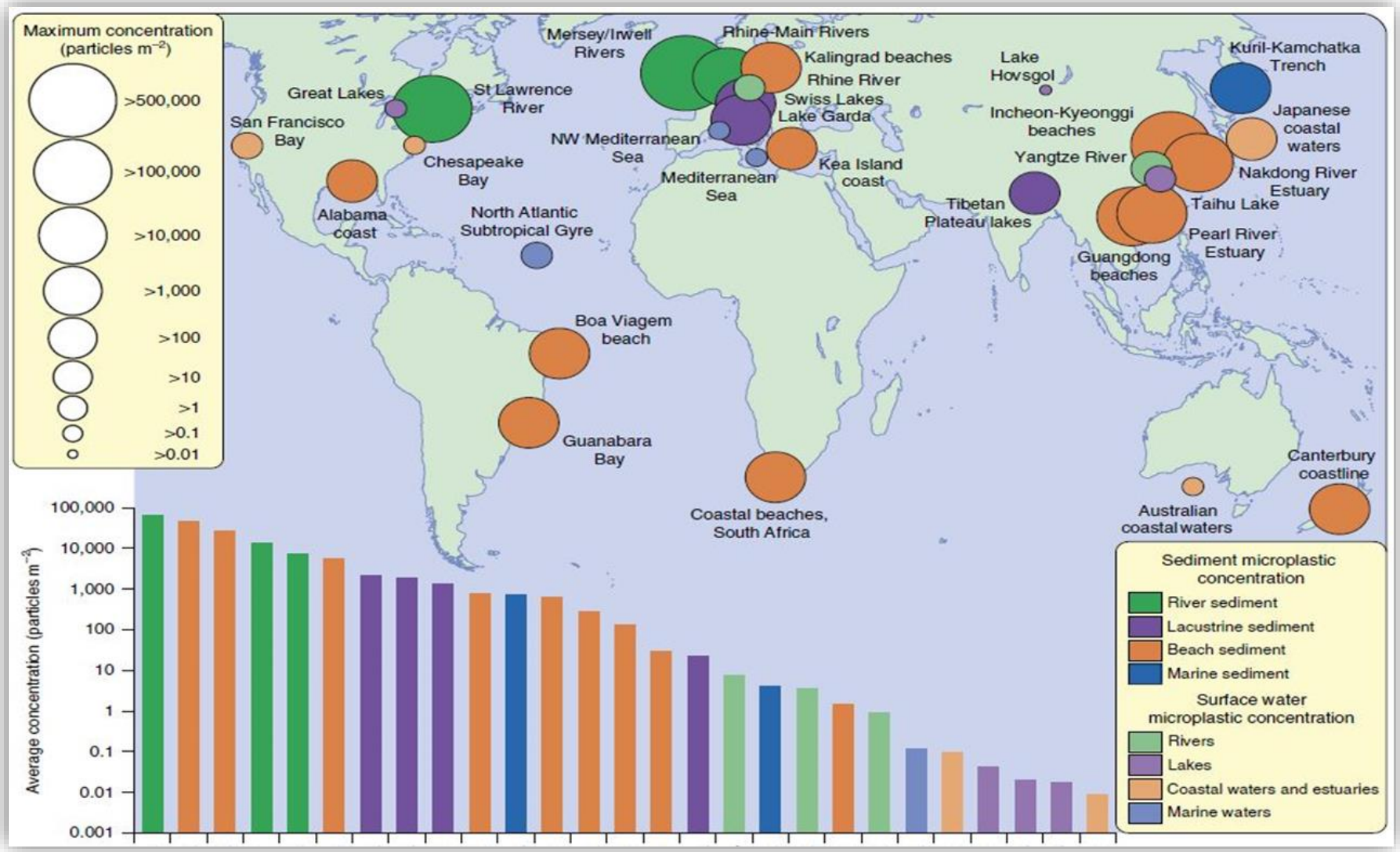
Secondary microplastics:

http://www.oceanmediainstitute.org/images/bermuda/microplastics.png

https://phys.org/news/2018-01-microbeads-cosmetics.html

https://blog.nationalgeographic.org/2015/01/30/race-for-water-odyssey-expedition-a-race-against-time-to-protect-oceans-from-plastic-pollution/

Microplastics pollution around the world



Hurley R, Woodward J, Rothwell JJ. Microplastic contamination of river beds significantly reduced by catchment-wide flooding. Nature Geoscience 2018; 11: 251-7

Ingested microplastics reach the food chain

Cui R, Kim SW, An YJ. Polystyrene nanoplastics inhibit reproduction and induce abnormal embryonic development in the freshwater crustacean Daphnia galeata. Sci Rep. 2017 Sep 21;7(1):12095.
Wilcox C, Puckridge M, Schuyler QA, et.al. A quantitative analysis linking sea turtle mortality and plastic debris ingestion. Sci Rep. 2018 Sep 13;8(1):12536.

Microplastics in sea animals and in the food chain

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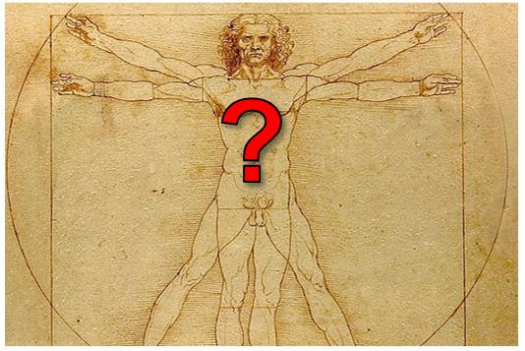

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[9] https://en.wikipedia.org/wiki/Vitruvian_Man#/media/File:Da_Vinci_Vitruve_Luc_Viatour.jpg

Methods – A world-wide prospective pilot study

Recruitment of 8 healthy test persons around the globe via personal contacts

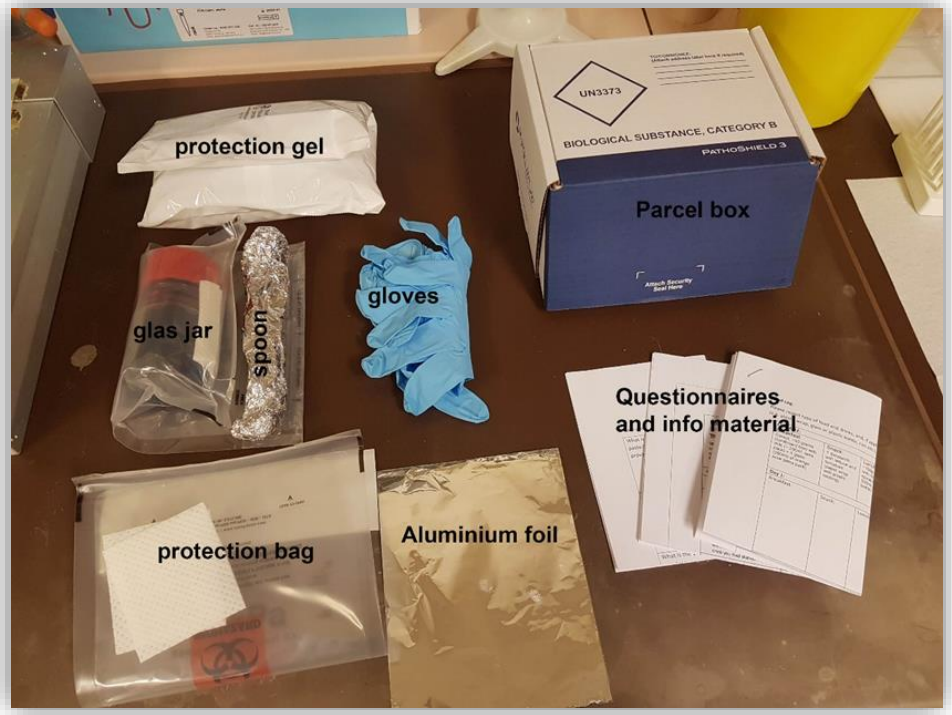
https://commons.wikimedia.org/wiki/File:Relief_map_of_Eurasia.png

Methods – exclusion criteria

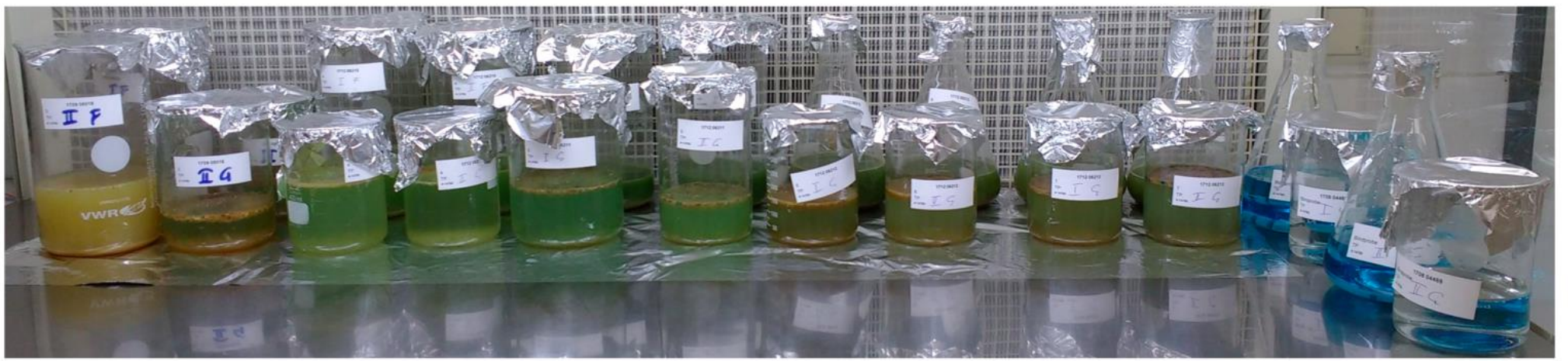
- Medical diet
- Diarrhoea or obstipation
- Antibiotics taken within the last 2 weeks
- Drugs affecting stool frequency and consistency (e.g. loperamide)
- Drugs affecting resorption (e.g. activated charcoal, cholestyramine)
- Diagnosed gastrointestinal disease (e.g. Ulcerative colitis, Crohn's disease)
- Invasive or abrasive dental treatment within the last 2 weeks

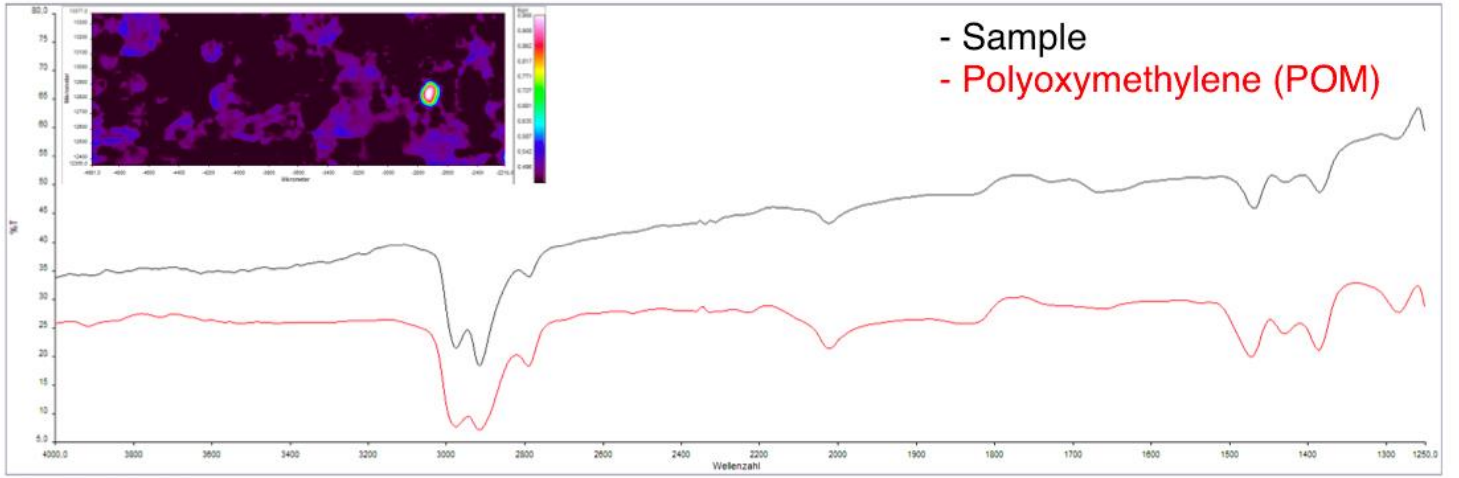
Methods – data collection & sampling

- Food protocol 6-7 days prior to stool sampling
- Brand name of tooth paste and cosmetic products
- Information about chewing gum and alcohol intake
- Information about drinking habits from PET bottles
- Plastic-free stool sampling and shipping to Vienna



Microplastic analysis by Fourier-transform infrared (FT-IR) micro-spectroscopy



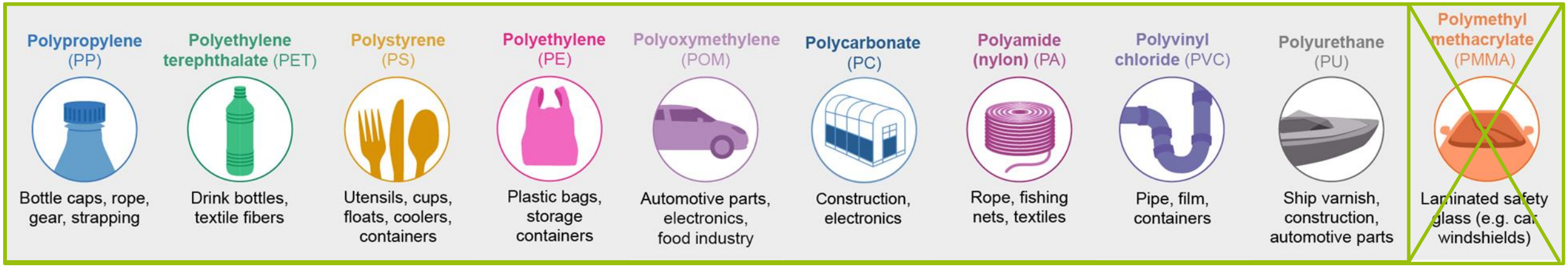


Results – descriptive statistics

- 8 participants: 3 males, 5 females, aged 33-65 years
- 0/8 – vegetarian
- 2/8 – daily chewing-gum users
- 6/8 – ingested sea-food during the observation period
- 8/8 – had contact to plastic-wrapped food
- On average, 750 ml/day were drunk from PET bottles

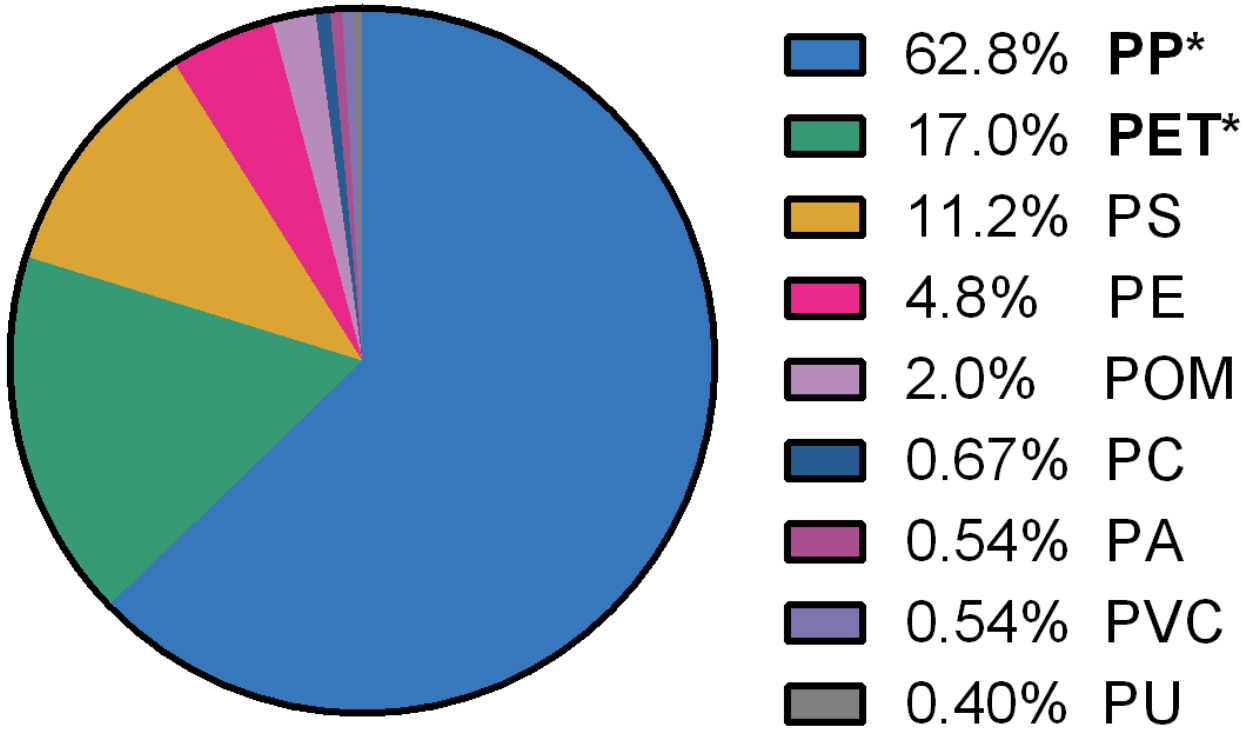
Results – stool analysis

- ❖ Stool weight: 34 [8-39] g
- ❖ Positive samples: 8/8
- ❖ Microplastic particles / 10g stool: 20 [18-172] particles
- ❖ Particle size: 50-500 µm
- ❖ Plastic types detected: 9/10 (3-7 types /sample)



Values are displayed as median [Q1-Q3]

Results – relative frequency of different microplastic types



> 95%

*PP and PET were found in all 8/8 samples

Discussion

- How representative are these results?
- What are the sources of microplastics ingestion?
- What is the clinical impact of gastrointestinal microplastics?
- How can we reduce plastic pollution?

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Supplementary Slides

How representative are these results?

Consultation with our Department of Medical Statistics (Prof. Daniela Dunkler):

- In our study microplastics were present in 8/8 stool samples (100%).
- The confidence interval of this finding is 68-100%, when applying it to larger cohorts.
- Hence, more than 50% of the world population might have microplastics in their stool.
- However, only larger studies will be able to confirm this assumption.

What are the sources of microplastics ingestion?

❖ Food itself

➔ Ingestion of sea-food correlated with microplastics content (R=0.648; p=0.089)

❖ Food contact materials

➔ Packaging and processing

https://www.plasticseurope.org/en/resources/publications/496-inside-food-contact-materials

What is the clinical impact of gastrointestinal microplastic

theguardian

UK world sport football opinion culture business lifestyle fashion environment tech travel all

home › environment › pollution climate change wildlife energy

Plastics

UK to investigate human health impact of microplastics

Chief medical officer for England Prof Dame Sally Davies to carry out study into health impacts of tiny particles of plastic consumed by fish

https://www.theguardian.com/environment/2016/nov/14/uk-to-investigate-human-health-impact-of-microplastics

How representative are these results?

- Microplastic translocates from the intestine and particles with sizes up to 130µm have been detected in the blood stream, lymphatic vessels and the liver of fish [1,2] and various mammals [3-7]
- Microplastics may harm via bioaccumulation (causing local immunoreactions) or can serve as a vector for other chemicals [7-10].
- In birds and fish oral plastic caused remodeling of the intestinal villi, distortion of iron absorption and hepatic stress [1,9-12]
- Especially patients with inflammatory bowel diseases might be vulnerable to microparticles [13,14].

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How can we reduce plastic pollution?

- Increase awareness
- Reduce plastic usage where possible
- Increase plastics reuse & recycling
- Dispose plastic waste appropriately

09/2018: The European Parliament voted in favor of a EU wide microplastics ban in cosmetics.

https://www.nationalgeographic.com/environment/planetorplastic/