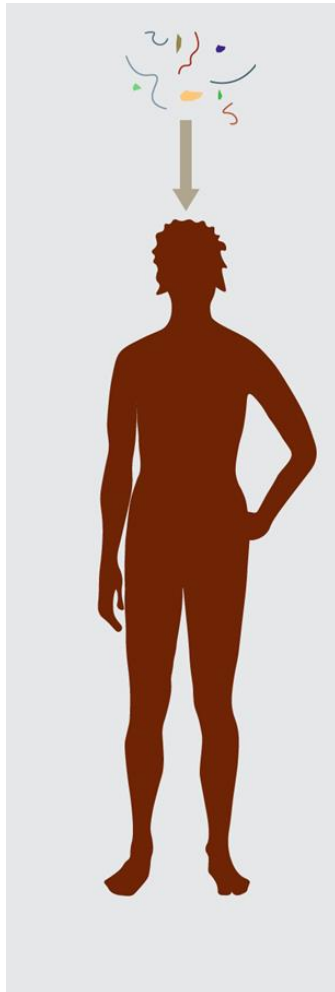
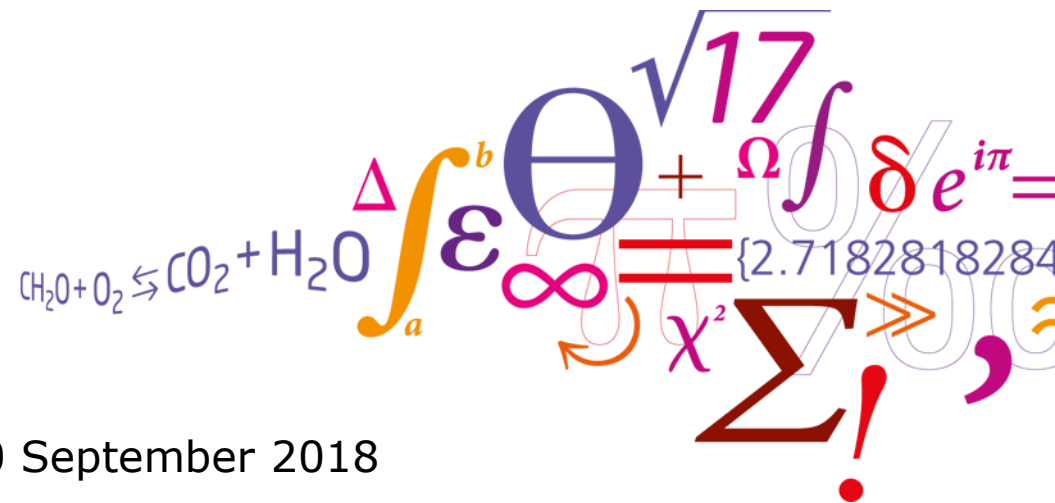


MICROPLASTICS AND HUMAN HEALTH: A CRITICAL PERSPECTIVE



Sinja Rist



ATV møde 20 September 2018

SEARCH **NEW YORK POST**

NEWS

Plastic particles in bottled water could be killing you: study

By Lia Eustachewich March 15, 2018 | 11:21am

News Politics Final Say Voices **Indy/Life** InFact Sport Business Video Culture IndyBest

INDY/LIFE

HOW YOU'RE EATING MICROPLASTICS – AND DON'T EVEN REALISE

Microplastics have been found in the flesh of fish, as well as their stomachs and mussels can also be contaminated too (Reuters)

Microplastics in seafood are already well recorded but there are many other sources

CHRISTINA THIELE
MALCOLM DAVID HUDSON

South China Morning Post EDITION: INTERNATIONAL

HEALTH & ENVIRONMENT

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Environment

Greenpeace in health warning after plastic found in a fish species popular for Chinese meals

Fragments were found in 60 per cent of wild flathead grey mullet examined by The Education University of Hong Kong – prompting Greenpeace warning over potential of putting toxins on the eating table

PUBLISHED : Monday, 23 April, 2018, 10:31pm
UPDATED : Tuesday, 03 July, 2018, 5:31pm

COMMENTS: 6

TOP STORIES / ENVIRONMENT

ENVIRONMENT

Bottled water not safe from microplastic contamination

▼ EARTH DAY: TIME FOR A PLASTIC-FREE PLANET

The revelation from a new global survey into microplastics in bottled water serves up a bitter irony. What we drink may well be contaminated. Possibly from the bottles themselves.



Microplastic pollution, a threat to marine ecosystem and human health: a short review

Shivika Sharma¹ · Subhankar Chatterjee¹

*"It is evident that humans are exposed to **microplastics** through their diet and the **high ratio of microplastic pollutants** in seafood creates a **major risk to food safety**"*

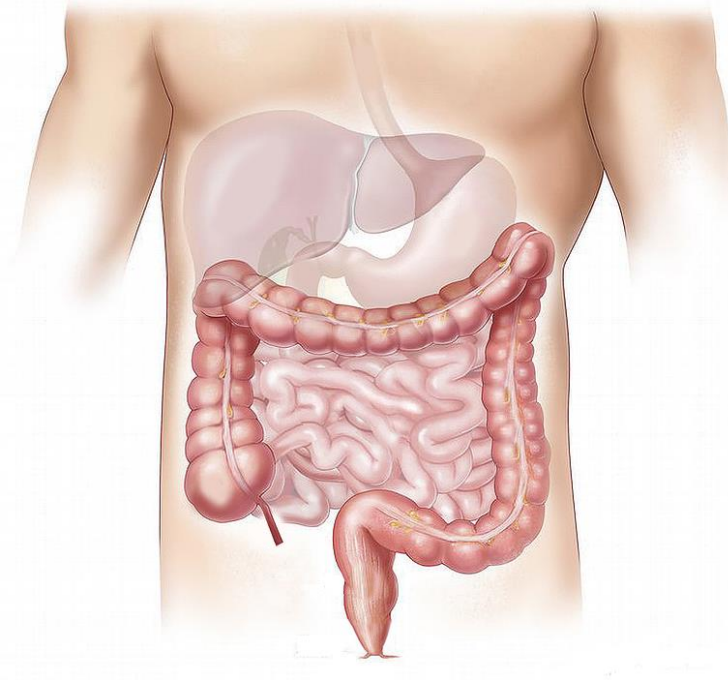
*"The alternate ingestion of **microparticles can cause** alteration in chromosomes which lead to **infertility, obesity and cancer**"*

Aims

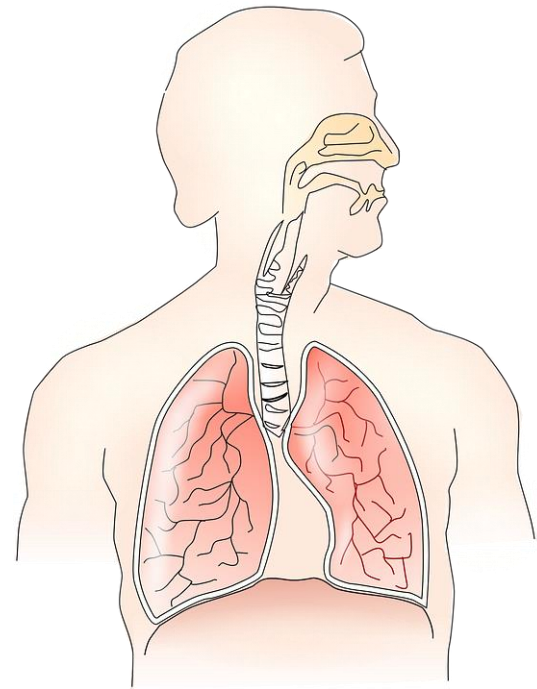
- 1) Examine available knowledge on human health effects of plastic particles and associated chemicals
- 2) Compare different exposure pathways for microplastics and associated chemicals to humans

Potential health effects: microplastics

- Main exposure pathways: ingestion and inhalation



Translocation
in the gastrointestinal tract



Translocation
in the lungs

Potential health effects: microplastics

Wear particles from abrasion of prostheses:

- PE particles $\leq 50 \mu\text{m}$ translocate to lymph nodes
- Found in liver and spleen
- Inflammatory responses in surrounding tissues



Airborne particulate matter:

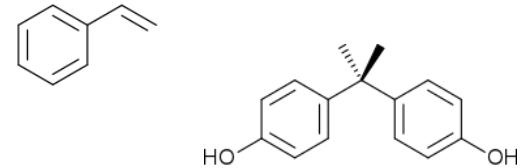
- Associated with respiratory and cardiovascular disease
- $< 2.5 \mu\text{m}$ fraction largely retained in lungs
- Oxidative stress and inflammation

Schirinzi et al. (2017) Cytotoxic effects of commonly used nanomaterials and microplastics on cerebral and epithelial human cells

- Exposure of 2 human cell lines (T98G and HeLa) to microplastics (PE, PS)
- Oxidative stress, but no effect on cell viability

Potential health effects: chemicals

- Residual monomers
 - Styrene in polystyrene
 - Bisphenol A (BPA) in polycarbonate
- Additives
 - Multitude of chemicals for different properties
 - Flame retardants, plasticizers, colorants, fillers, antioxidants...



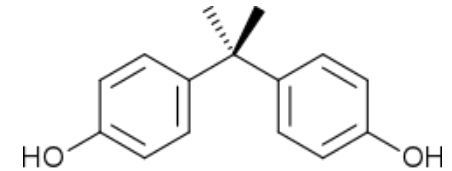
Groh et al. (2018) Chemicals associated with plastic packaging: Inventory and hazards

- 906 chemicals associated with plastic packaging (possibly 3377)
- 63 highest human health hazard
- 7 PBT or vPvB
- 15 endocrine disrupting chemical (EDCs)

Potential health effects: chemicals

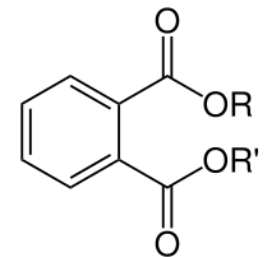
Example Bisphenol A (BPA)

- Suspected EDC
- Found in urine, blood, breast milk, tissue samples
- Exposure correlated to reproductive anomalies



Example Phthalates

- Used as plasticizers
- Commonly found in urin and blood
- Endocrine activity
- Adverse effects on development and reproduction



Aims

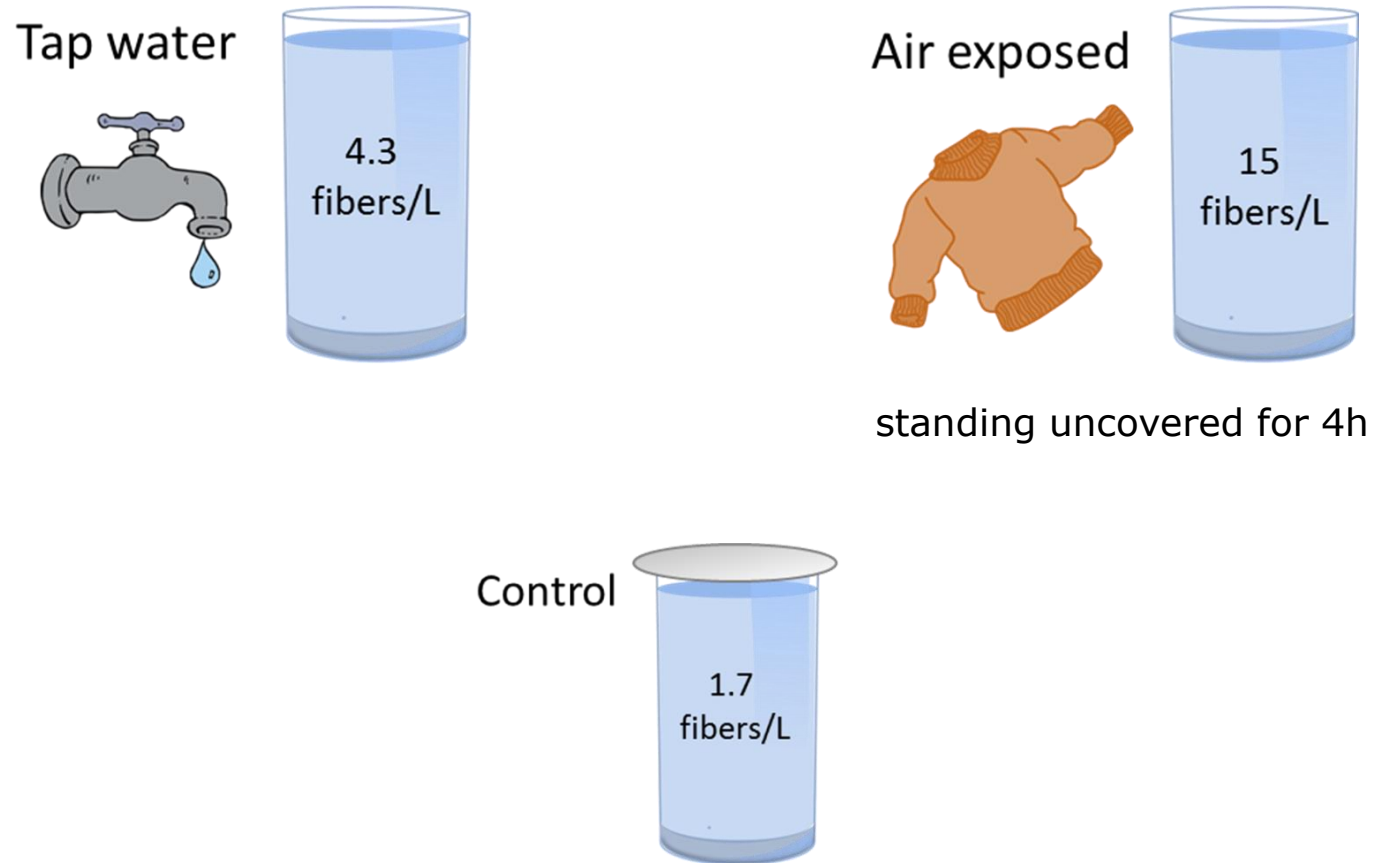
1) Examine available knowledge on human health effects of plastic particles and associated chemicals

2) Compare different exposure pathways for microplastics and associated chemicals to humans

Relative exposure: microplastics

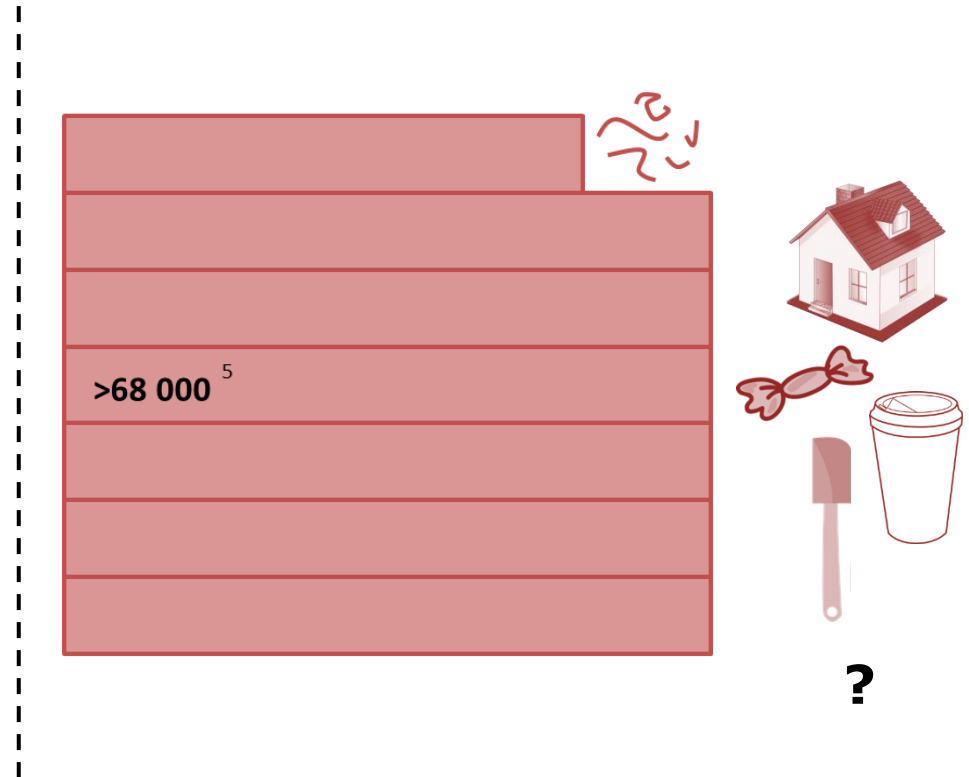


Relative exposure: microplastics



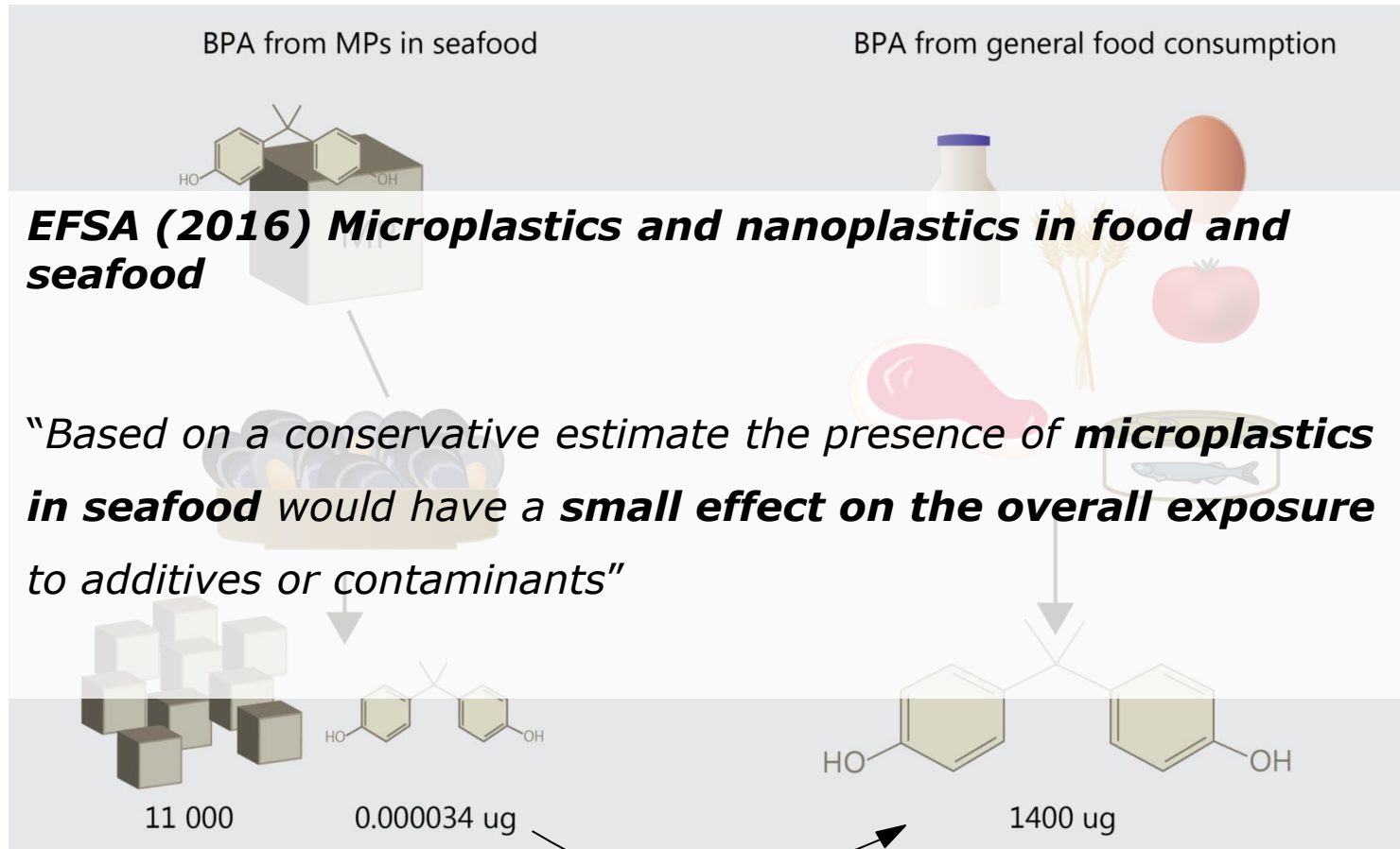
Relative exposure: microplastics

Maximum annual intake per person



¹Karami et al. 2018. Sci. Total Environ ²Yang et al. 2015. Environ. Sci. Technol. ³Kosuth et al. 2017. ⁴Van Cauwenberghe et al.2014. Environ. Pollut. ⁵Catarino et al. 2018. Environ. Pollut.

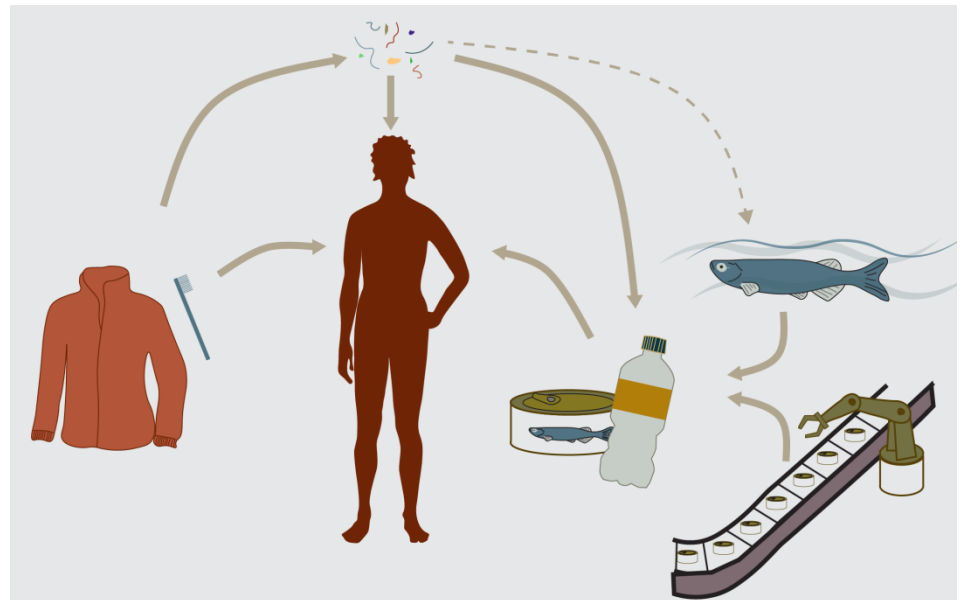
Relative exposure: plastic-associated chemicals



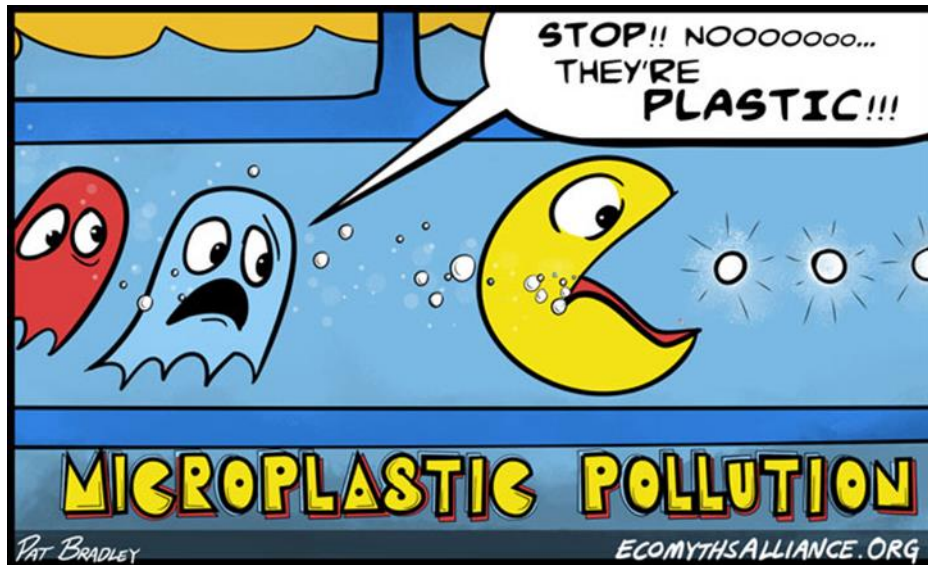
40 mio times more!

Conclusions

- Microplastics have a potential particle and chemical toxicity
- BUT no studies on human health effects of microplastics in food and beverages
- Exposure mostly through general consumption and everyday use of plastics
- Systematic failure to include the overall picture of how we consume, use and dispose of plastics and associated chemicals



Thank you for your attention!



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A critical perspective on early communications concerning human health aspects of microplastics

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HIGHLIGHTS

- There is data supporting possible chemical and particle toxicity effects of plastic.
- The current debate on human health effects of plastics is unbalanced.
- There is a disproportionate focus on microplastics in individual food products.
- Exposure to additives and microplastics is mainly related to general plastic use.
- We urge for a more balanced discussion on human exposure to plastics.

GRAPHICAL ABSTRACT