Interferenti endocrini e microplastiche.

30 SETTEMBRE 2020
ORDINE DEI MEDICI CHIRURGHI E DEGLI ODONTOIATRI DELLA PROVINCIA DI TRENTO

S. BERNASCONI

PROFESSORE ORDINARIO DI PEDIATRIA

MEDICO TRENTINO

MICROBIOME Research Hub

Ruolo del MMG e del PLS e più in generale del medico e del personale sanitario nell'educazione ambientale

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Effetti sull’uomo dell’inquinamento da farmaci: gli interferenti endocrini

Sergio Bernasconi, Professore Ordinario di Pediatria. ISDE Italia

Lutte contre les microplastiques : un objectif de santé publique pour les médecins généralistes ?

Santé publique VOLUME 31 / N° 6 - novembre-décembre 2019

La contamination de l'environnement par les microplastiques est un sujet émergeant qui prendra de l'ampleur compte tenu de la consommation cosmopolite des plastiques et d'une production mondiale toujours en hausse. Il est évident qu'une action efficace ne saurait s'envisager sans des mesures fortes provenant des décideurs politiques et des industriels. Cependant, les acteurs de santé sont de plus en plus sollicités pour défendre les causes environnementales, et les autorités de santé nationales pourraient être bien inspirées de compter sur les médecins généralistes pour mener des actions sur le sujet. Ils sont des acteurs de terrain, compétents et audibles sur des sujets touchant à la santé publique communautaire. Leur évolution d'exercice (pluridisciplinarité, coopération, recommandations) tend vers une meilleure organisation structurelle et pourrait mener à des actions de prévention individuelle et collective efficaces, validées et évaluables sur l'ensemble du territoire.

Public attitudes towards microplastics: Perceptions, behaviors and policy implications

Resources, Conservation & Recycling 163 (2020) 105096

Lingzhi Deng[a,b,c], Lu Cai[a,b,c], Fengyun Sun[a,b,c], Gen Li[a,b,c], Yue Che[a,b,c,*]

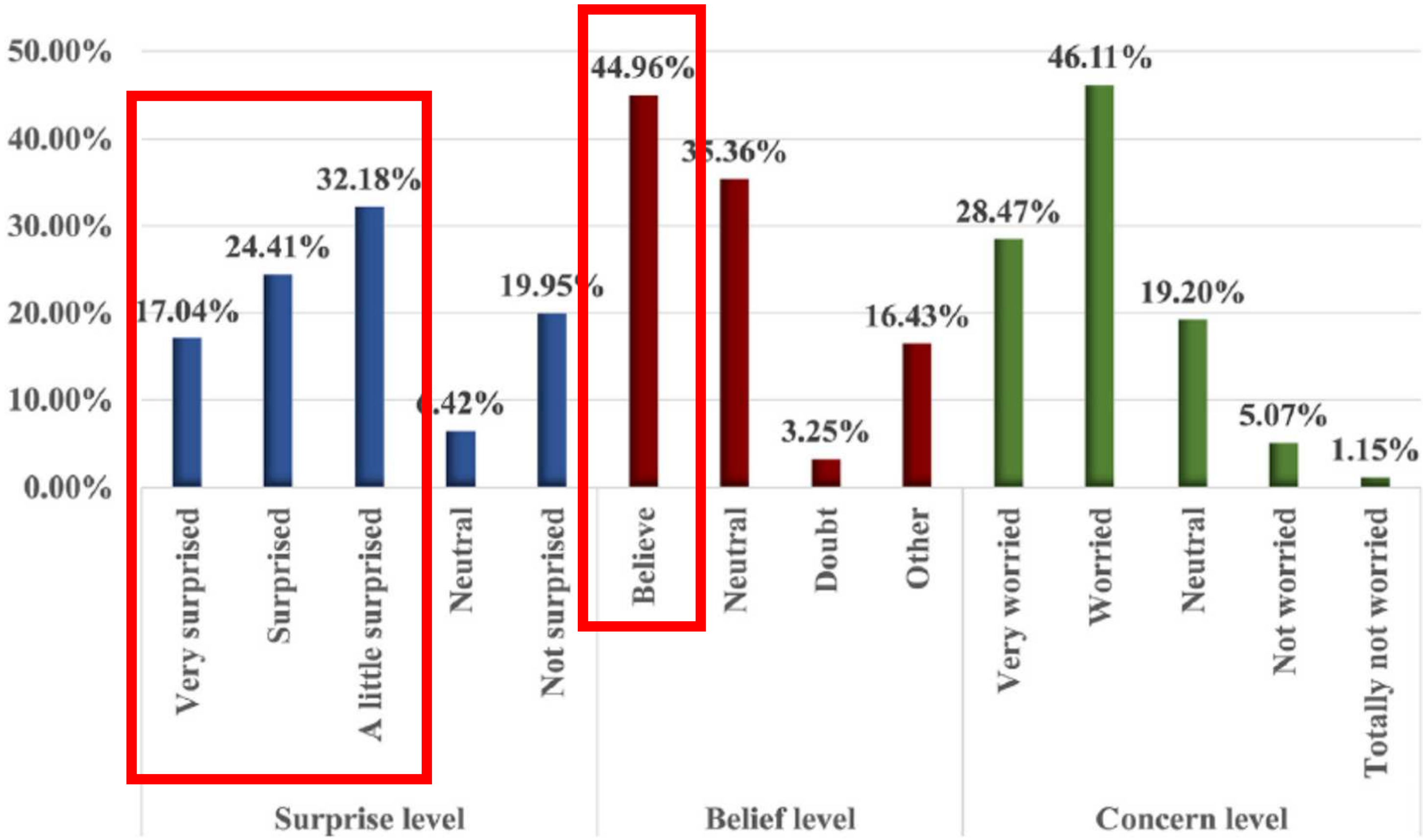

Fig. 5. Respondents' perception of microplastics' impact on human health.

Public attitudes towards microplastics: Perceptions, behaviors and policy implications

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Lingzhi Deng[a,b,c], Lu Cai[a,b,c], Fengyun Sun[a,b,c], Gen Li[a,b,c], Yue Che[a,b,c,*]

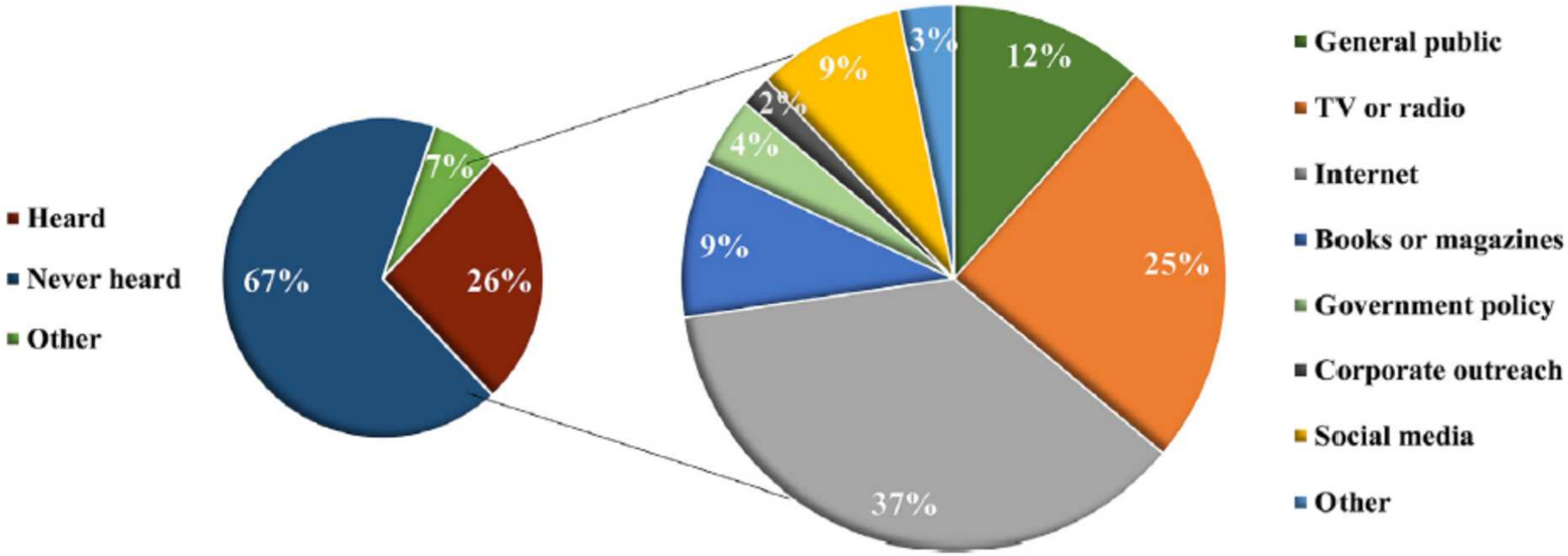

Fig. 3. Respondents' ways to know about microplastics.

Interferenti endocrini e microplastiche.

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CONSIDERAZIONI PRELIMINARI

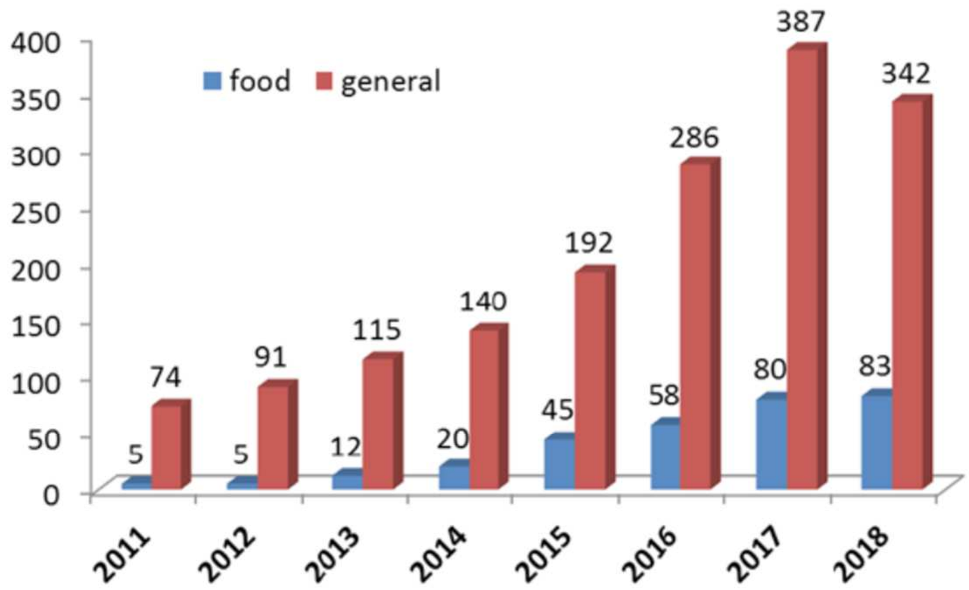
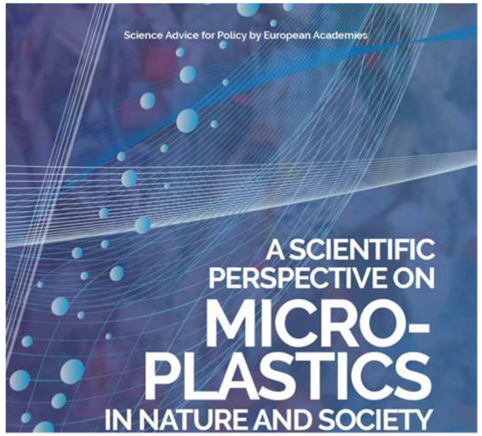
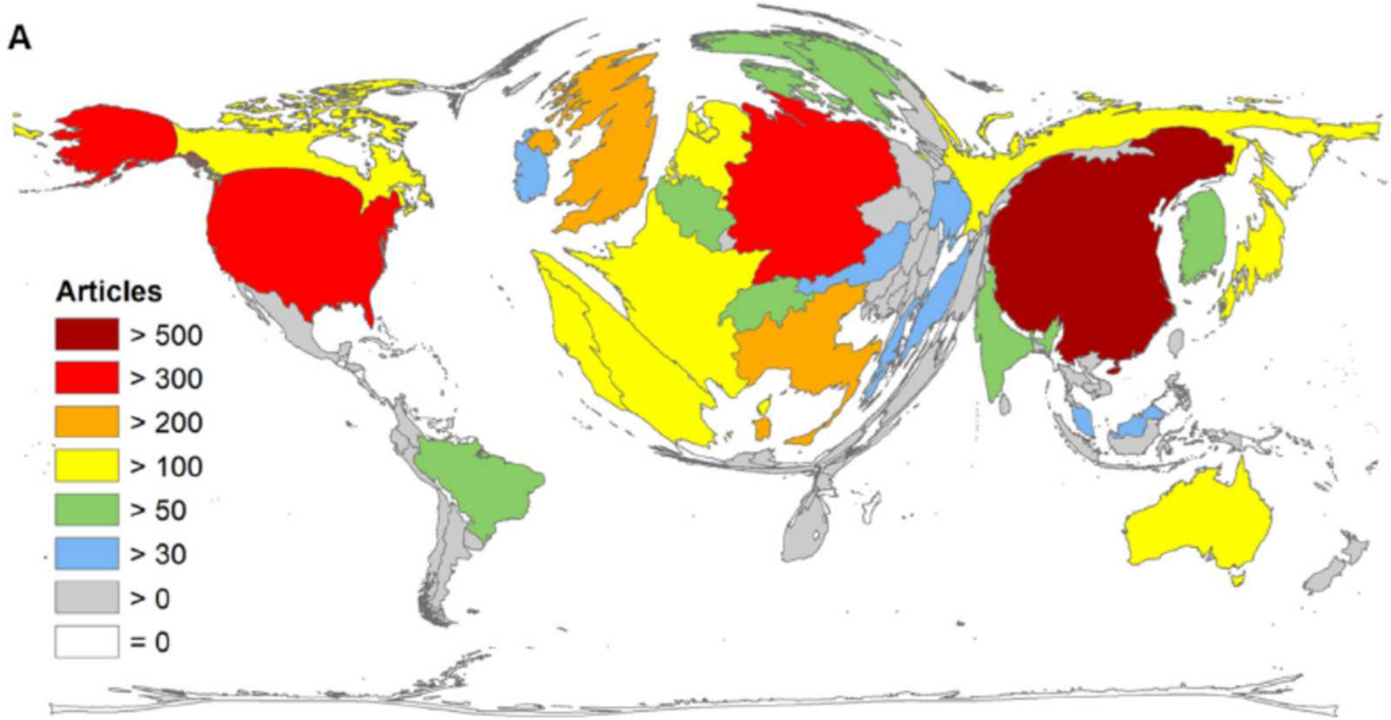


Figure 4: Scientific publications (including articles, reviews and conference proceedings) on the topic of microplastics generally (red bars) and microplastics in food (blue bars) have been increasing since 2011 (Scopus only).
JRC, personal communication and applying their Europe Media Monitor (EMM) and the Tool for Innovation Monitoring (TIM). For more, see also the graphs and report in Annex 6 from the literature search performed to support this project for an analysis of the number and type of scientific publications on NMPs found using a wider set of databases.



CONSIDERAZIONI PRELIMINARI

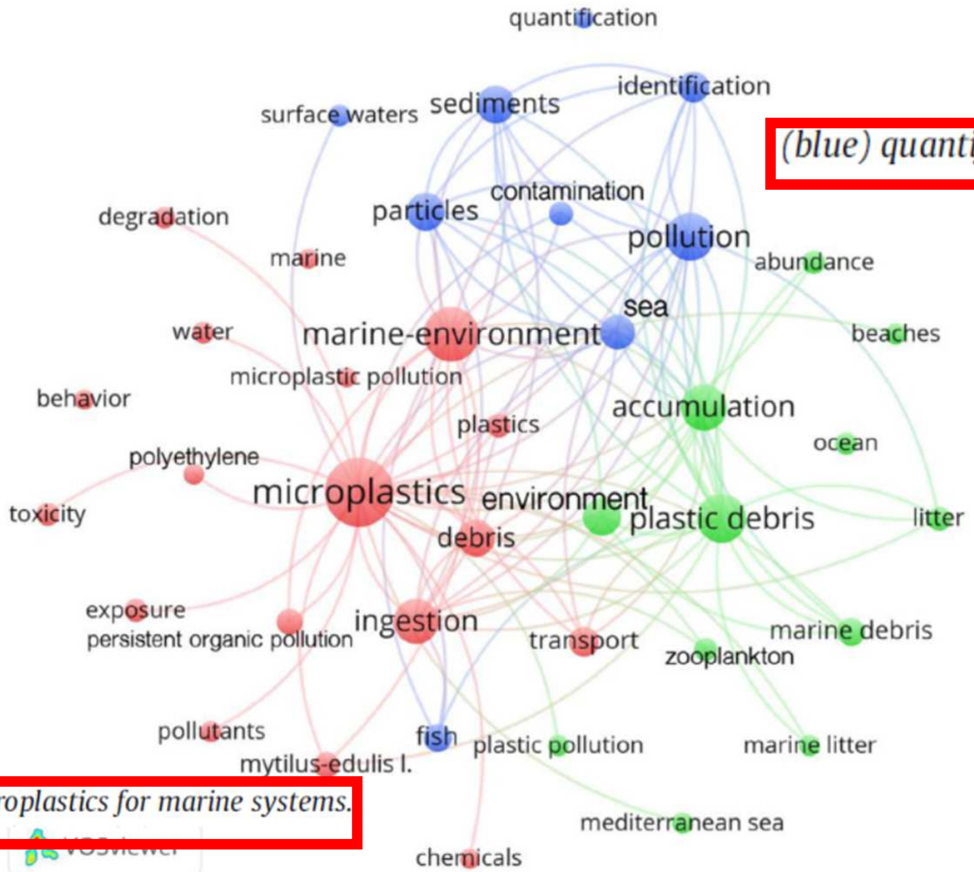
Water Research 170 (2020) 115358



Research landscape of a global environmental challenge: Microplastics

Doris Klingelhöfer*, Markus Braun, David Quarcoo, Dörthe Brüggmann,
David A. Groneberg

CONSIDERAZIONI PRELIMINARI



(blue) quantification and identification.

(green) environmental pollution via accumulation and transport of plastic debris.

(red) toxicity of microplastics for marine systems.

Fig. 3. Cluster analysis of keyword (threshold > 100 indications of keywords, > 100 combinations for combining lines). *(green) environmental pollution* via *accumulation and transport of plastic debris. (red) toxicity of microplastics for marine systems. (blue) quantification and identification.* (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

MICROPLASTICHE : DEFINIZIONE

(Nano)plastics in the environment – Sources, fates and effects

João Pinto da Costa *, Patrícia S.M. Santos, Armando C. Duarte, Teresa Rocha-Santos

Science of the Total Environment 566–567 (2016) 15–26

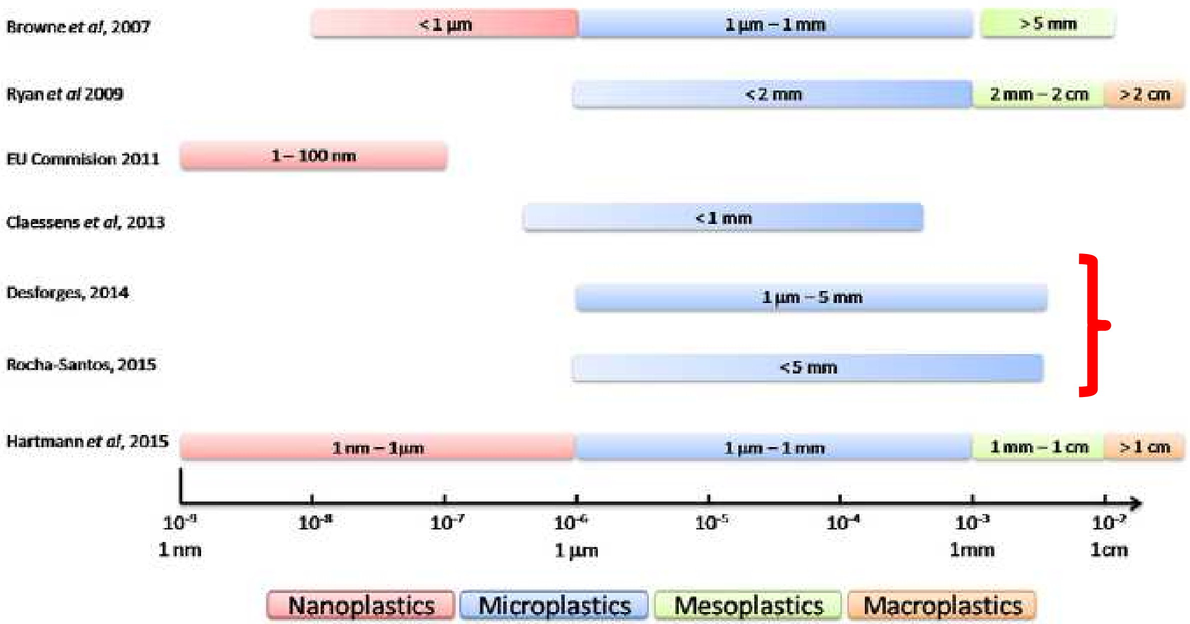


Fig. 1. A size-based definition of plastics as proposed by different authors (Rocha-Santos and Duarte 2015, Hartmann et al. 2015, Browne et al. 2007, Ryan et al. 2009, EUCommision 2011, Claessens et al. 2013, Desforges et al. 2014).

Research landscape of a global environmental challenge: Microplastics

Water Research 170 (2020) 115358

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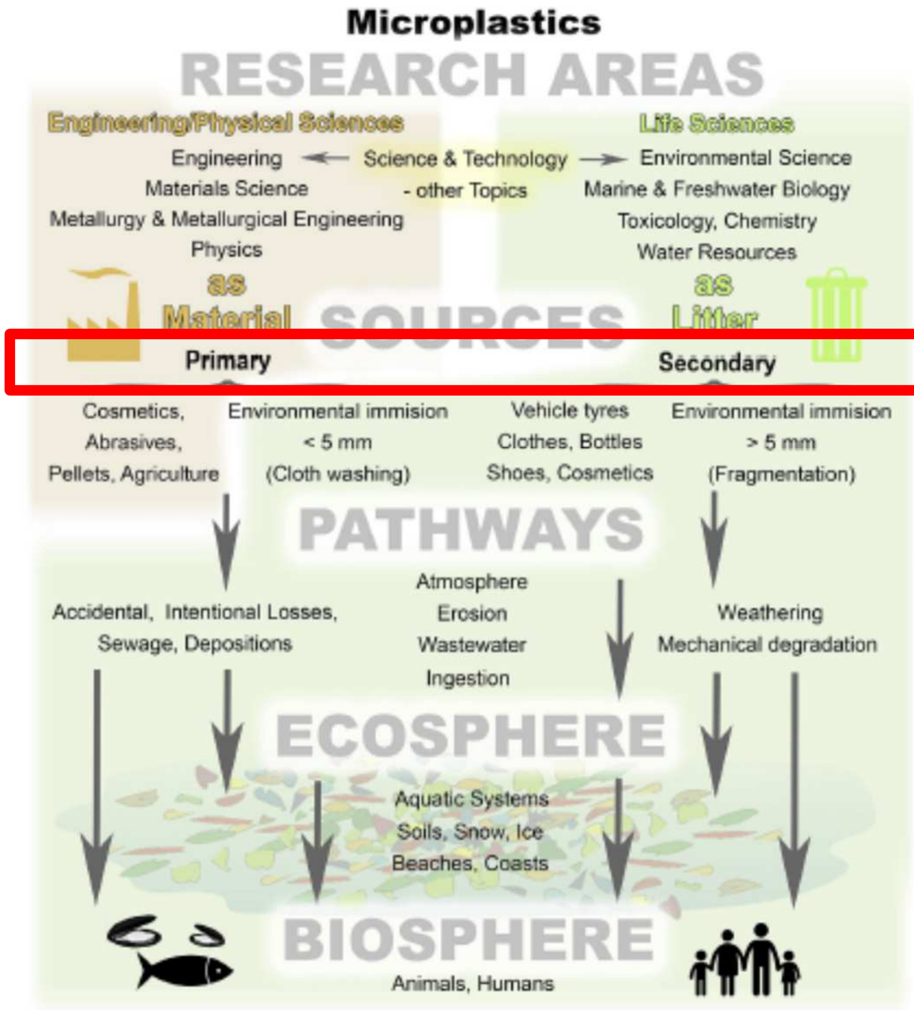

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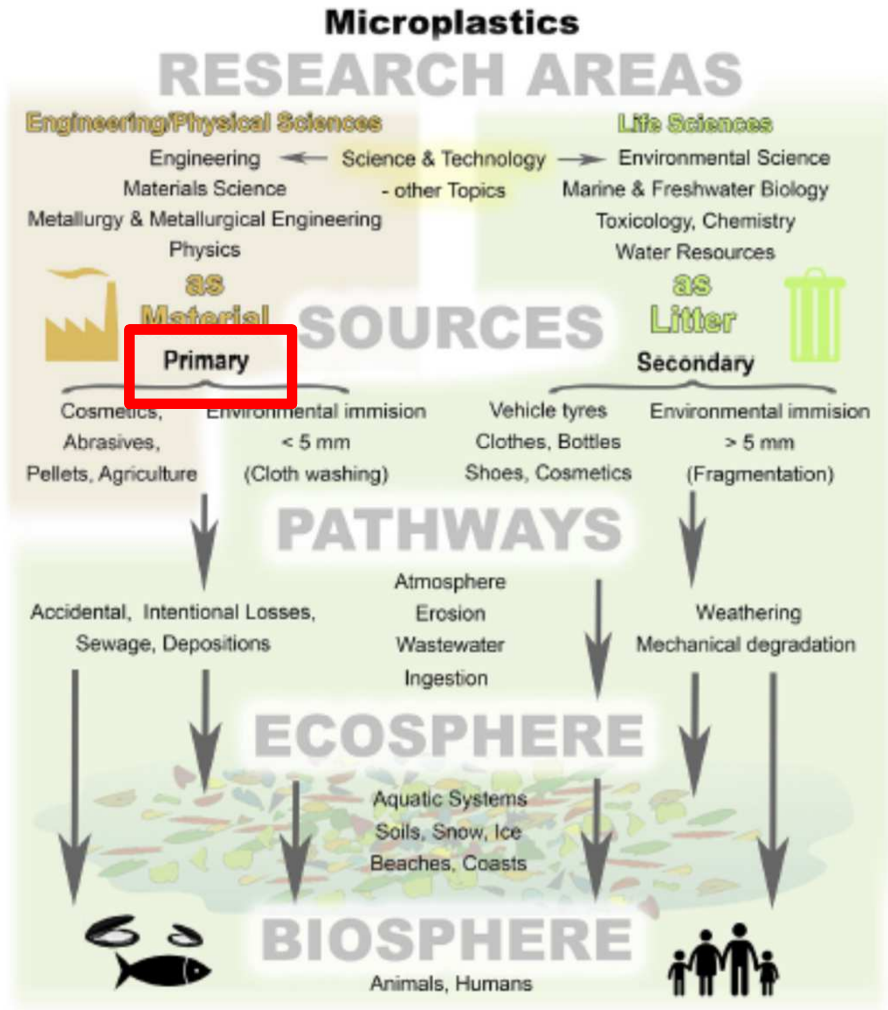


MICROBIOME
Research Hub

Characterisation, quantity and sorptive properties of microplastics extracted from cosmetics

Marine Pollution Bulletin 99 (2015) 178–185

Imogen E. Napper [a,*], Adil Bakir [a,b], Steven J. Rowland [b], Richard C. Thompson [a]

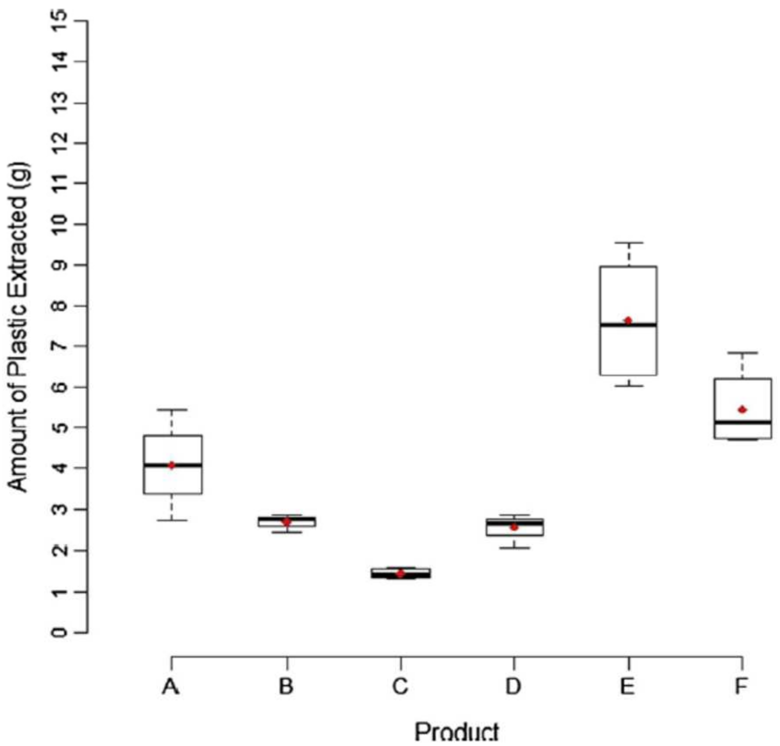
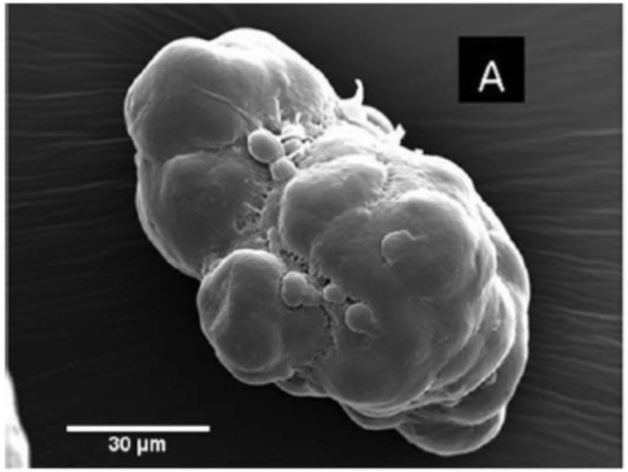


Fig. 1. Total mass of plastic microbeads extracted from six facial scrubs (A–F) per 100 mL. Diamond symbol indicates $\bar{x}$ ($n = 4$). The tails show both the maximum and minimum mass obtained, and the box represents the upper and lower quartiles. There were significant differences between the amount of microplastic in each of the products ($p < 0.05$).



Scanning electron microscopy (SEM) of a typical rough facial scrub plastic microbead particle

Potential Health Impact of Environmentally Released Micro- and Nanoplastics in the Human Food Production Chain: Experiences from Nanotoxicology

Hans Bouwmeester,* Peter C. H. Hollman, and Ruud J. B. Peters

DOI: 10.1021/acs.est.5b01090
Environ. Sci. Technol. 2015, 49, 8932–8947

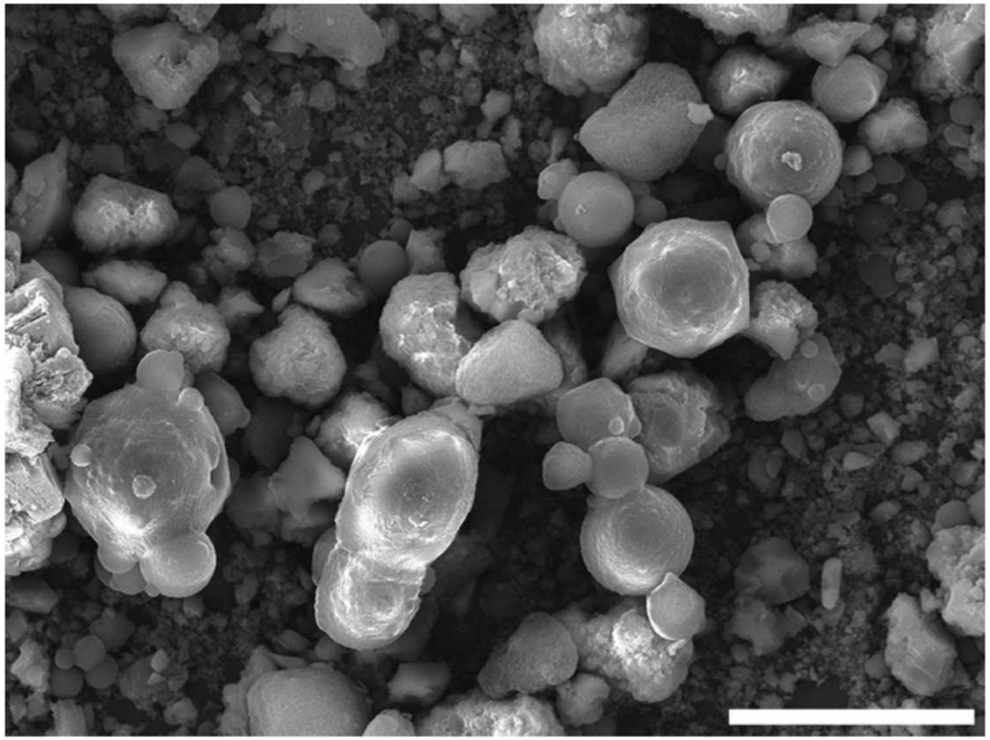
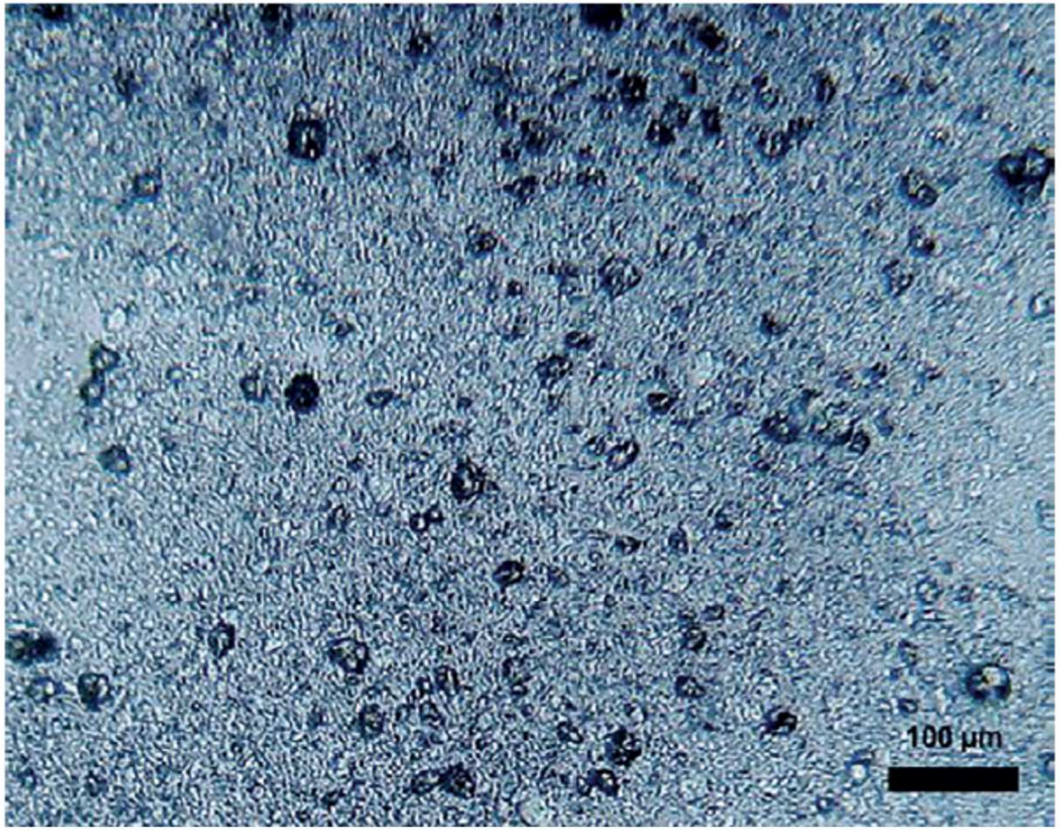


Figure 2. Polyethylene microplastics in a sample of toothpaste. The plastic particles have a shape that suggest they are produced by grinding larger particles. The small black dots are pores of the filter that was used to collect the samples, the scale bar is 20 μm.

Figure 7 *Polyethylene based microspherules in toothpaste. Credit: Dantor, https://upload.wikimedia.org/wikipedia/commons/a/a9/Mikroplastasarp.jpg.*



Microplastics in cosmetics: Environmental issues and needs for global bans

C. Guerranti[a,*], T. Martellini[a,b], G. Perra[c], C. Scopetani[b], A. Cincinelli[a,b]

Environmental Toxicology and Pharmacology 68 (2019) 75–79

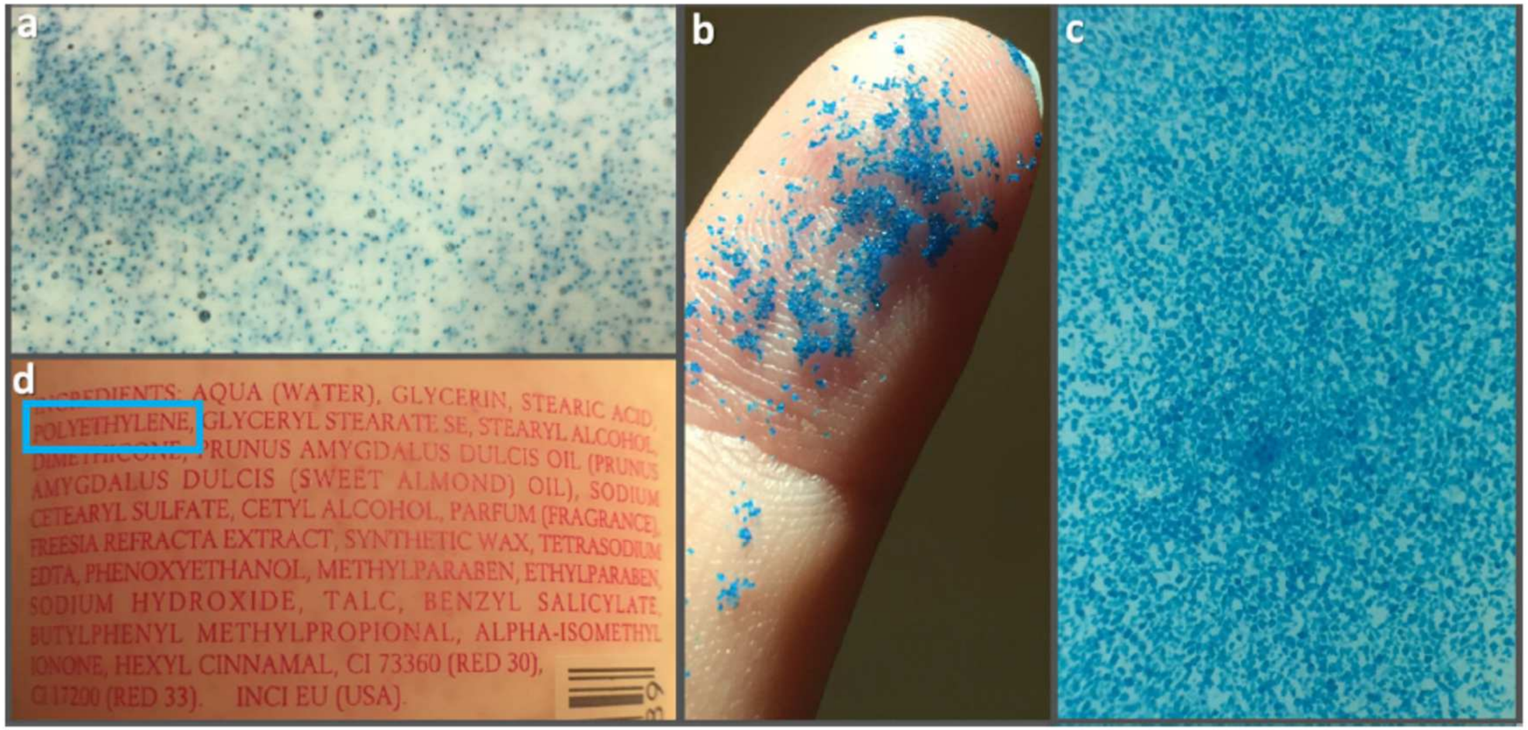
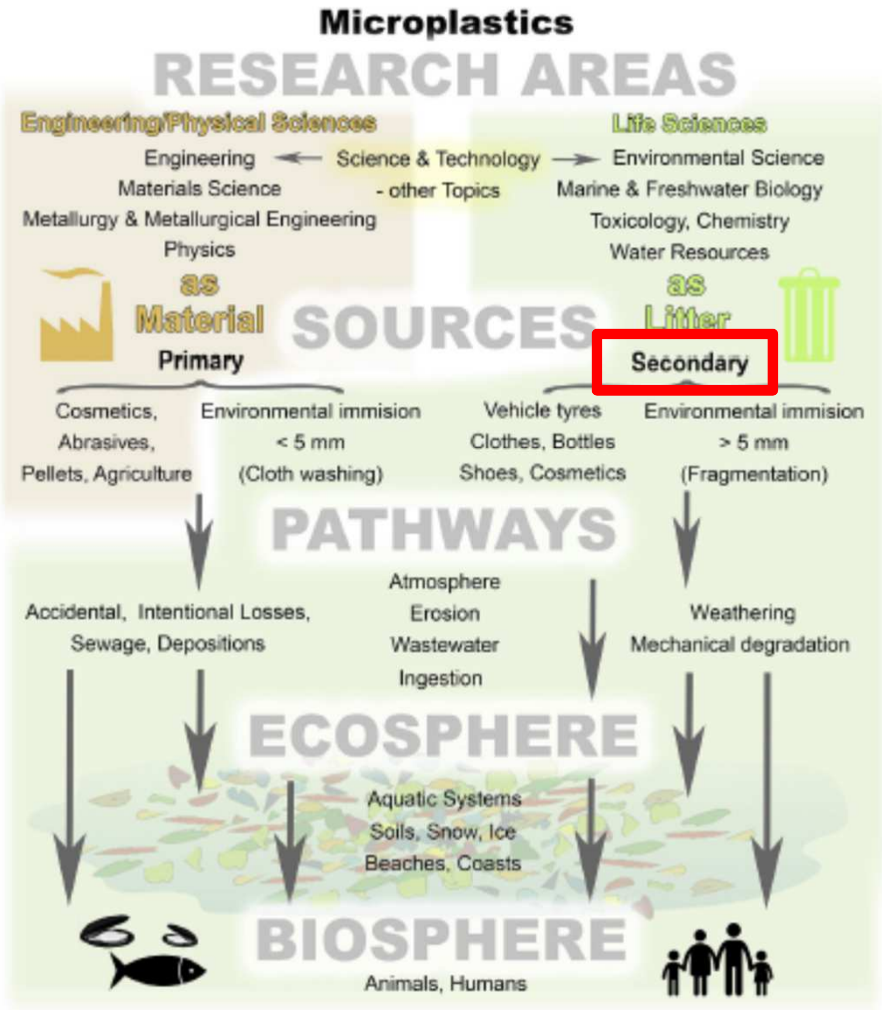


Fig. 1. a) μBs contained in a hair shampoo (polyethylene, as from INCI ingredients list); b–c) μBs extracted from cosmetic products; d) example of a listed μB's ingredient in a cosmetic product.

Research landscape of a global environmental challenge: Microplastics

Water Research 170 (2020) 115358

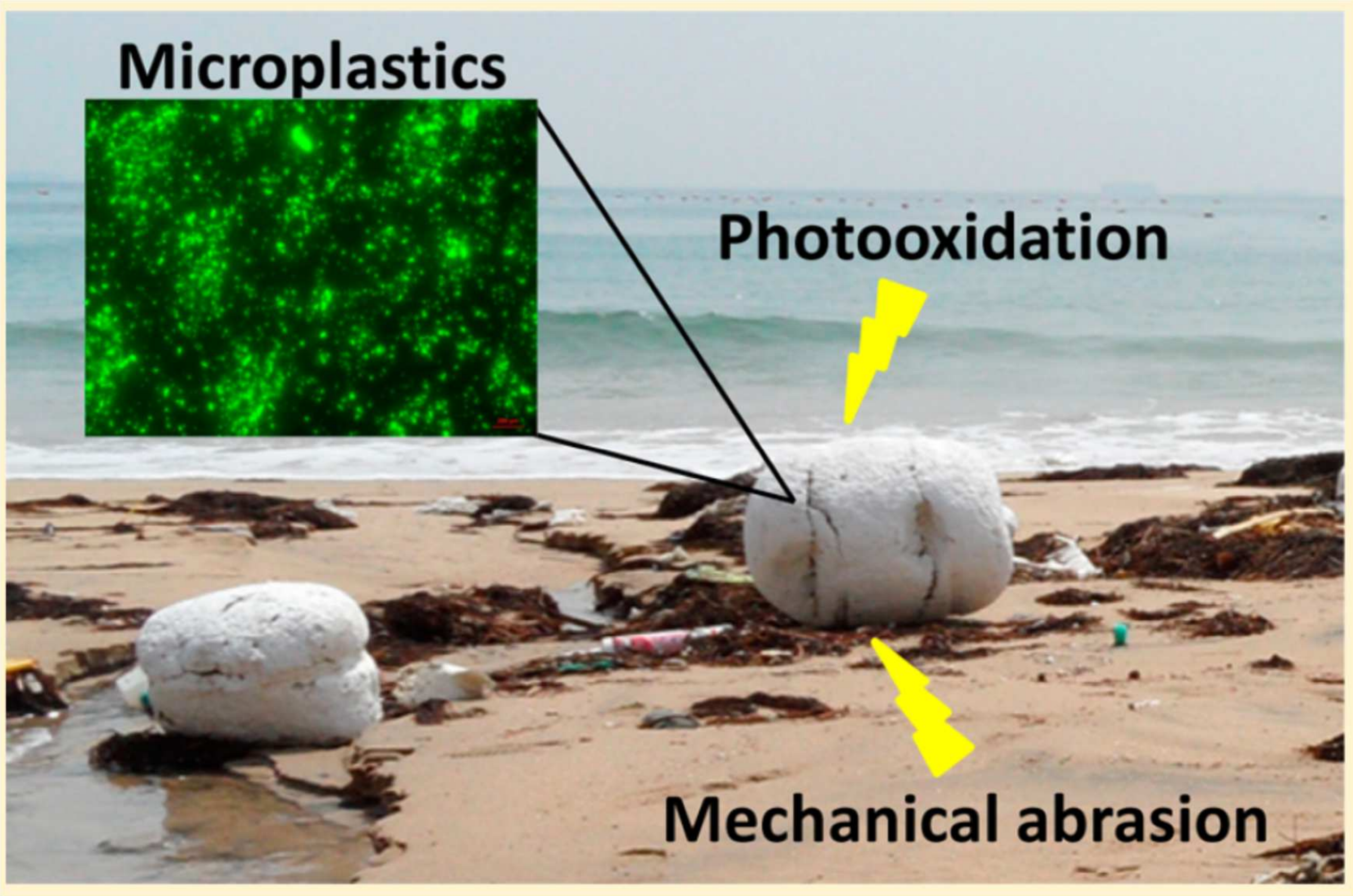
Doris Klingelhöfer*, Markus Braun, David Quarcoo, Dörthe Brüggmann,
David A. Groneberg



Combined Effects of UV Exposure Duration and Mechanical Abrasion on Microplastic Fragmentation by Polymer Type

DOI: 10.1021/acs.est.6b06155
Environ. Sci. Technol. 2017, 51, 4368–4376

Young Kyoung Song,[†,‡] Sang Hee Hong,[†,‡] Mi Jang,[†,‡] Gi Myung Han,[†] Seung Won Jung,[‡,§]
and Won Joon Shim*[,†,‡]



An overview of chemical additives present in plastics: Migration, release, fate and environmental impact during their use, disposal and recycling

John N. Hahladakis[a,*], Costas A. Velis[a,*], Roland Weber[b], Eleni Iacovidou[a], Phil Purnell[a]

Journal of Hazardous Materials 344 (2018) 179–199

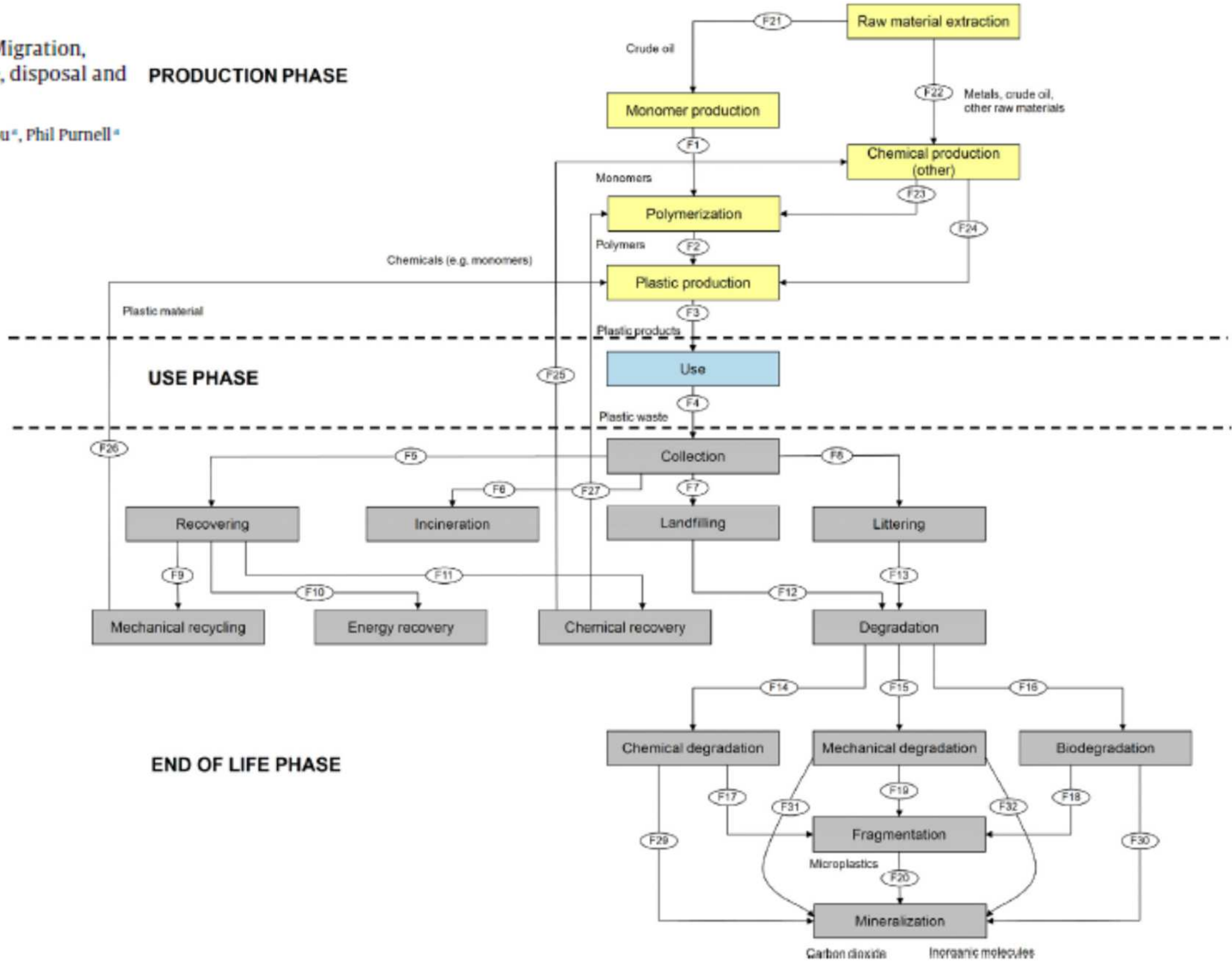


Fig. 1. The life cycle of plastic products (excluding energy input and emissions) created in STAN (sub**ST**ance flow **AN**alysis) Software (redrawn from Source: [8]. "F" stands for Flow and the number shown next to corresponds to the particular flow series (an automatic procedure incorporated in STAN)).

Environmental occurrences, fate, and impacts of microplastics

Panfeng Wu[a,b,1], Jinsheng Huang[b,1], Yuling Zheng[b], Yicheng Yang[b], Yue Zhang[b], Feng He[c], Hao Chen[d], Guixiang Quan[e,b], Jinlong Yan[e], Tiantian Li[f], Bin Gao[b,*]

Ecotoxicology and Environmental Safety 184 (2019) 109612

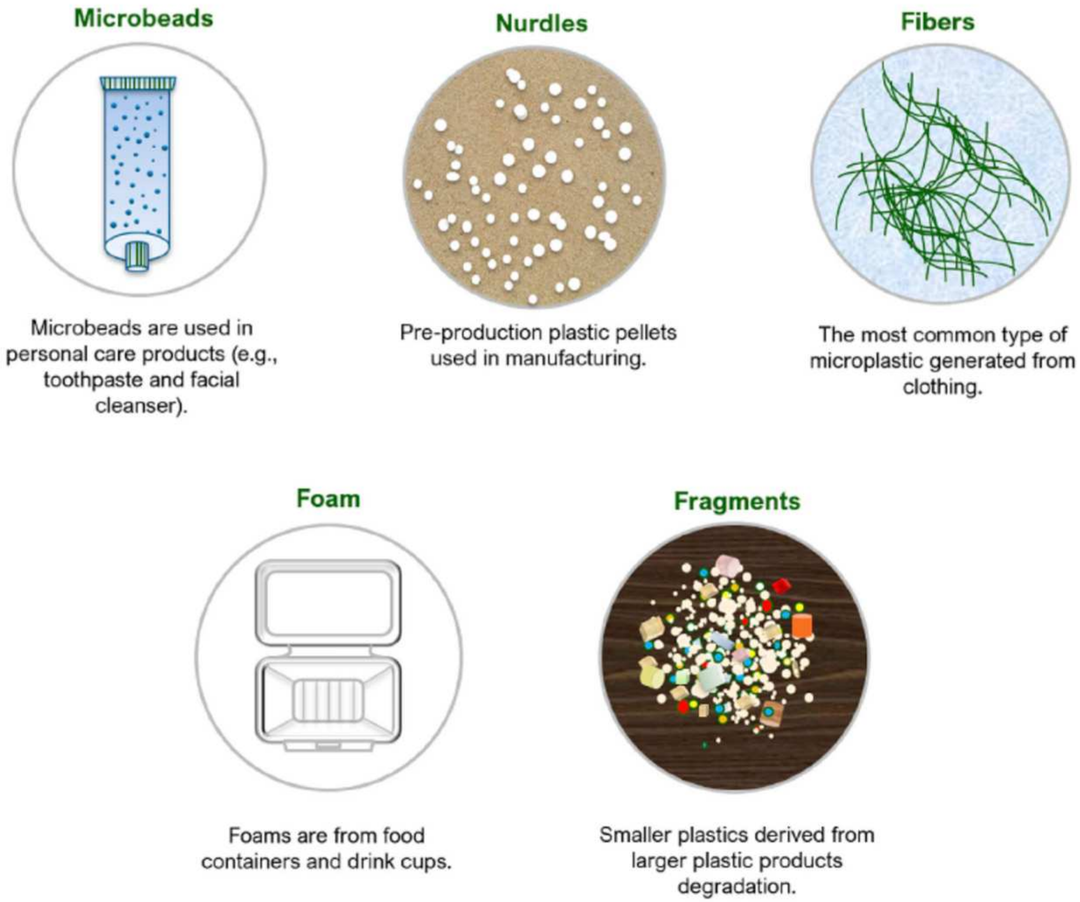


Fig. 2. Categories and sources of MPs in the environment.

MICROPLASTICHE : DIFFUSIONE AMBIENTE

Environmental occurrences, fate, and impacts of microplastics

Panfeng Wu[a,b,1], Jinsheng Huang[b,1], Yuling Zheng[b], Yicheng Yang[b], Yue Zhang[b], Feng He[c], Hao Chen[d], Guixiang Quan[e,b], Jinlong Yan[e], Tiantian Li[f], Bin Gao[b,*]

Ecotoxicology and Environmental Safety 184 (2019) 109612

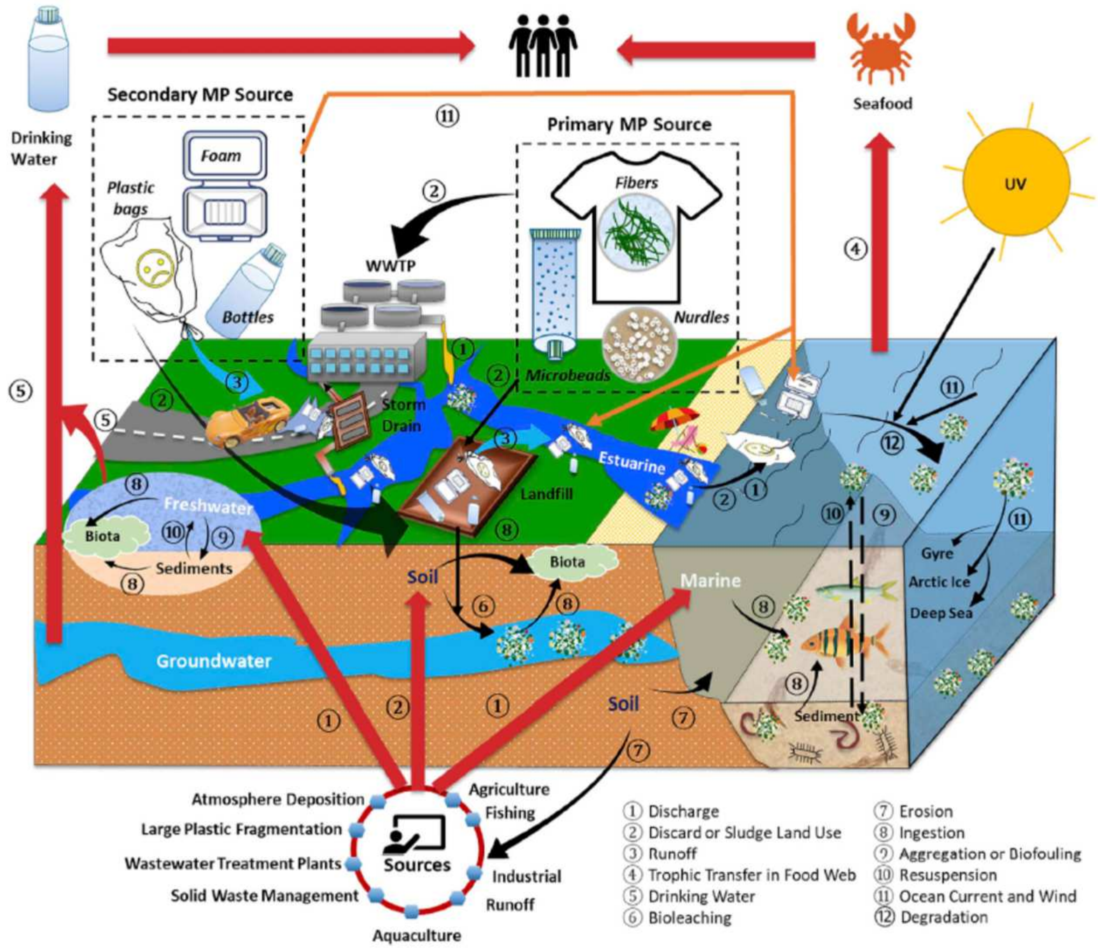


Fig. 3. Sources, transport, accumulations, and fate of MPs in the environment.

White and wonderful? Microplastics prevail in snow from the Alps to the Arctic

Sci. Adv. 2019; **5** : eaax1157 14 August 2019

Melanie Bergmann[1*†], Sophia Mützel[1†], Sebastian Primpke[1], Mine B. Tekman[1], Jürg Trachsel[2], Gunnar Gerdts[1]

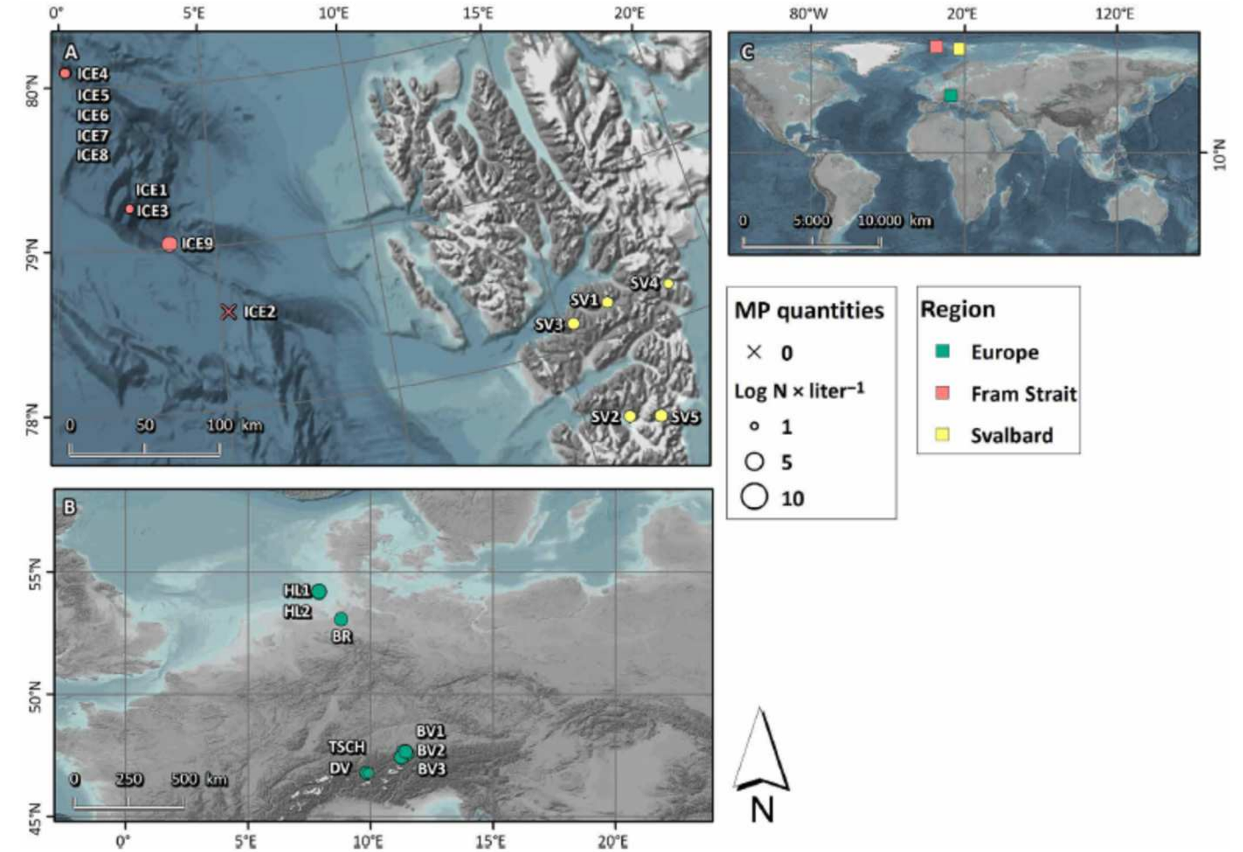


Fig. 1. Map of sampling locations for snow. (**A**) Sampling sites in the Arctic (ICE, ice floes; SV, Svalbard) and (**B**) in Europe (HL, Heligoland; BR, Bremen; BV, Bavaria; TSCH, Tschuggen; DV, Davos). (**C**) Overview of all locations. Size of circles reflects MP particle quantities at log scale.

Microplastics in the environment: A critical review of current understanding and identification of future research needs☆

Environmental Pollution 254 (2019) 113011

Zeynep Akdogan, Basak Guven*

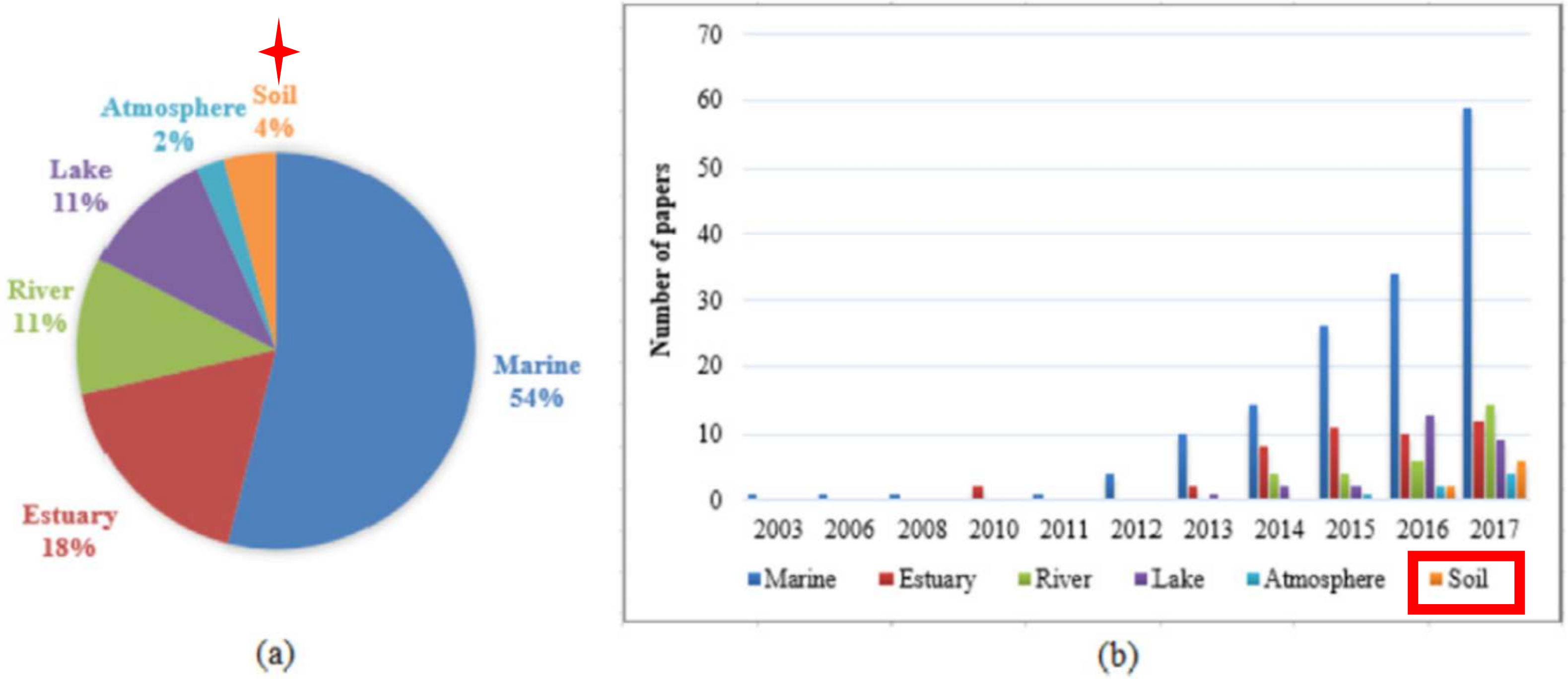


Fig. 2. Microplastic related research in Web of Science database (retrieved on 15/11/2018). (a) Distribution in environmental systems (b) number of publications by year.

Microplastics as an emerging threat to terrestrial ecosystems

Anderson Abel de Souza Machado[1,2,3] | Werner Kloas[2,4] | Christiane Zarfl[5] |
Stefan Hempel[1,3] | Matthias C. Rillig[1,3]

Glob Change Biol. 2018;24:1405–1416.

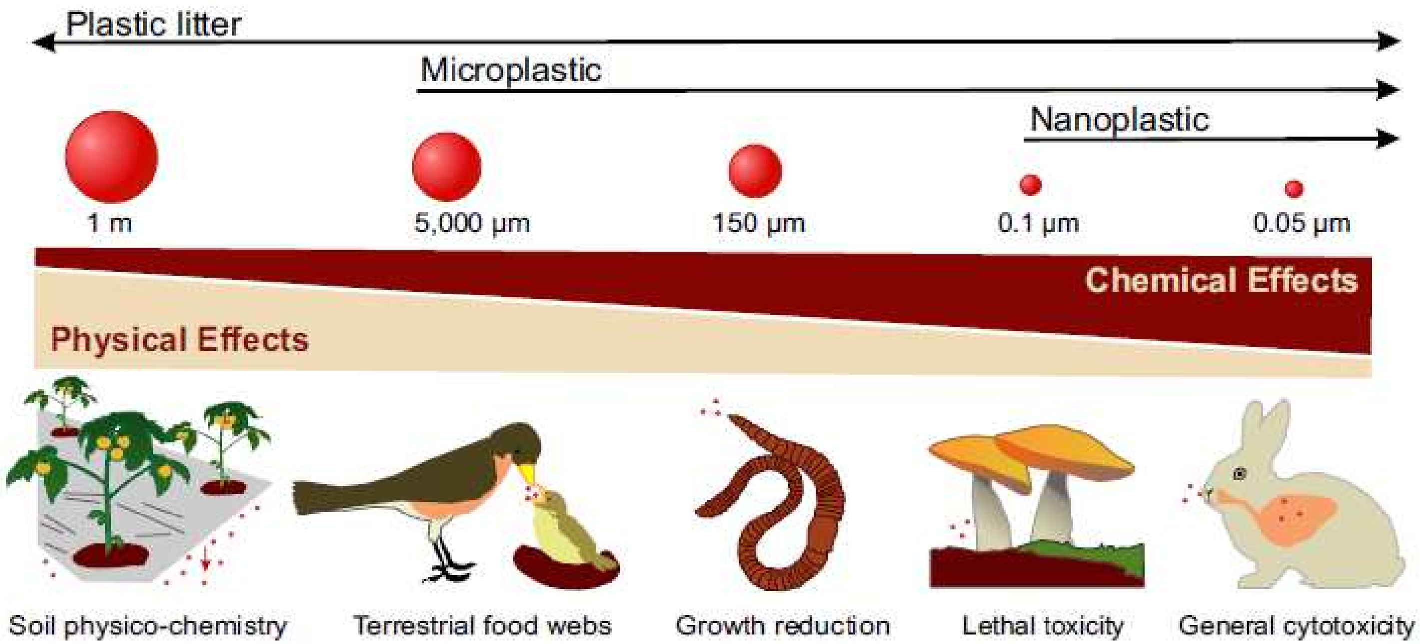


FIGURE 2 : Microplastics as trigger of combined physical or chemical-like effects. Soil biogeochemistry related to agricultural mulching (Steinmetz et al., 2016), ingestion by terrestrial and continental birds (Gil-Delgado et al., 2017; Holland et al., 2016; Zhao et al., 2016), reduction in growth of earthworms (Lwanga et al., 2016), lethal toxicity to fungi (Miyazaki et al., 2014, 2015; Nomura et al., 2016), mammal lung inflammation (Hamoir et al., 2003; Oberdorster, 2000; Schmid & Stoeger, 2016) and broad cytotoxicity (Forte et al., 2016; Kato et al., 2003) of nanoplastics [Colour figure can be viewed at wileyonlinelibrary.com]

Current research trends on plastic pollution and ecological impacts on the soil ecosystem: A review☆

Yooeun Chae, Youn-Joo An*

Environmental Pollution 240 (2018) 387–395

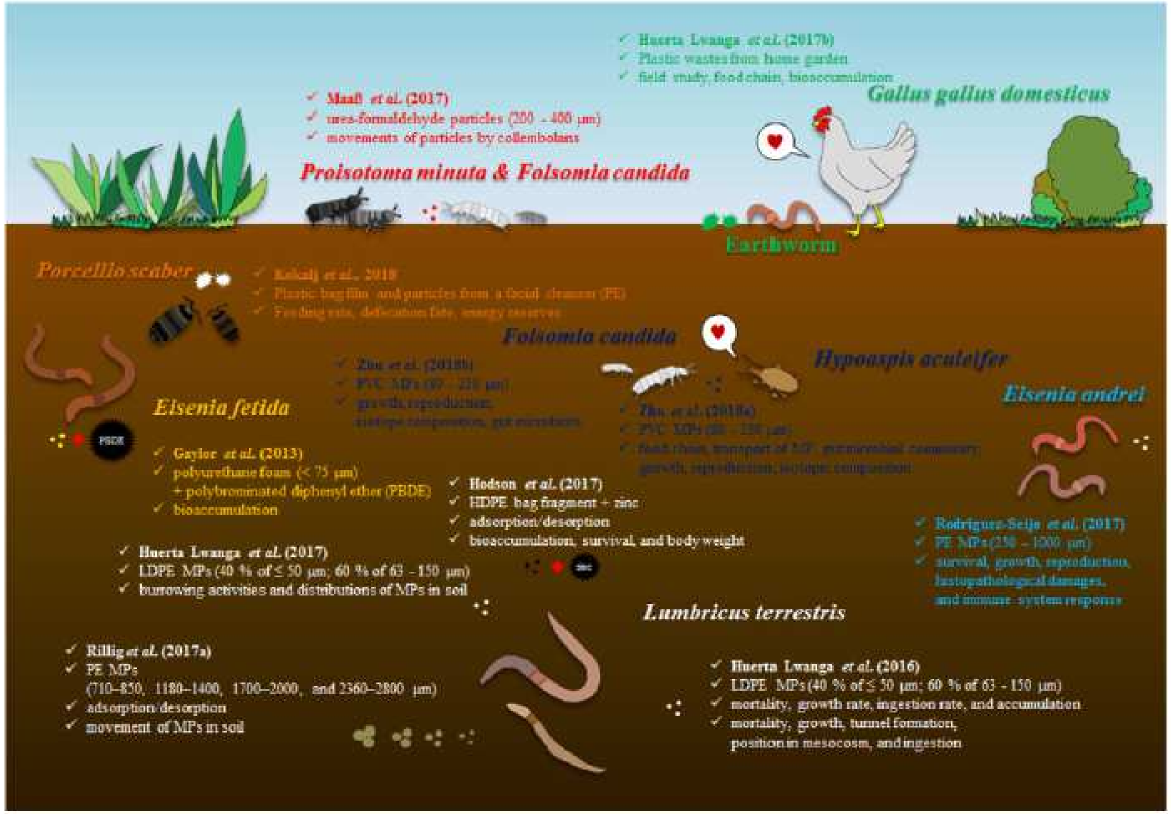


Fig. 2. Studies on the effect and impact of microplastics on soil organisms (*Eisenia andrei, Eisenia fetida, Lumbricus terrestris, Folsomia candida, Proisotoma minuta, Gallus gallus domesticus, Porcellio scaber,* and *Hypoaspis aculeifer*).

Earthworms' place on Earth

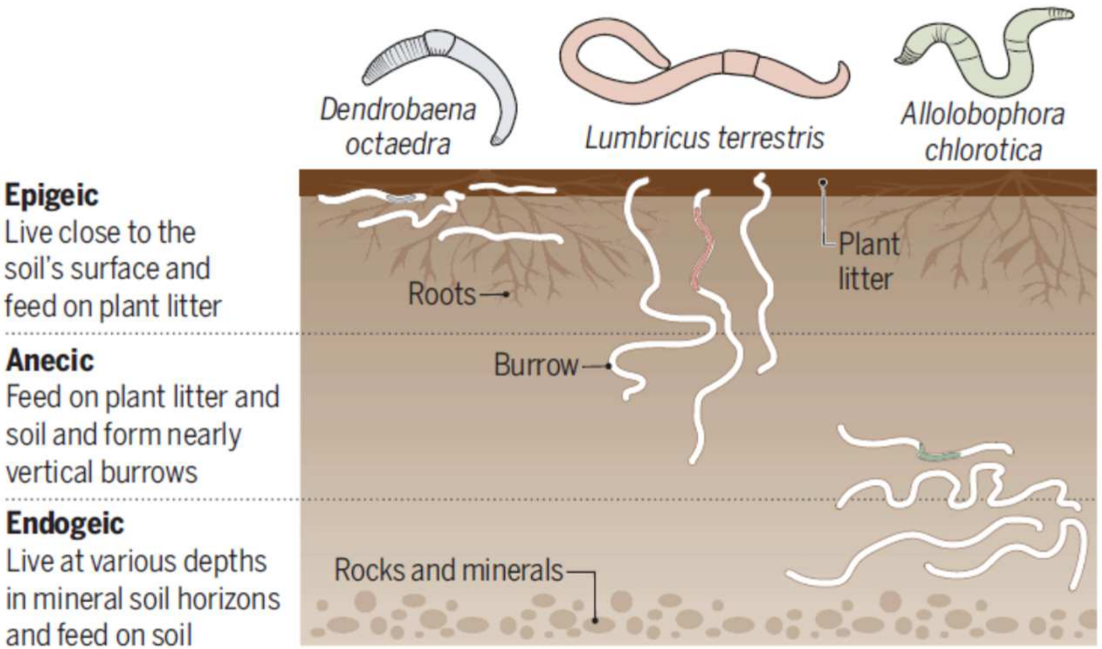
25 OCTOBER 2019 • VOL 366
ISSUE 6464

SCIENCE

A new study provides a global view of earthworm ecology

Earthworm ecology

Shown are three main ecological categories of earthworms and examples of resident earthworm species. Not all species fall neatly into these categories, as some earthworms can vary their burrowing and feeding preferences depending on life stage and soil conditions.



worms promote the stabilization of soil particles into aggregates, increase soil porosity, and elevate the rates at which water infiltrates soil during rainfall; reduce erosion of surface soils from hillslopes; and accelerate the movement of gases into or out of soil.

accelerate organic matter decomposition by ingesting more than 30 times their own weight in soil per day and can rapidly mix large amounts of leaf litter into underlying soil horizons, increasing the release of plant nutrients. The presence of earthworms typically enhances plant growth, including that of most crops

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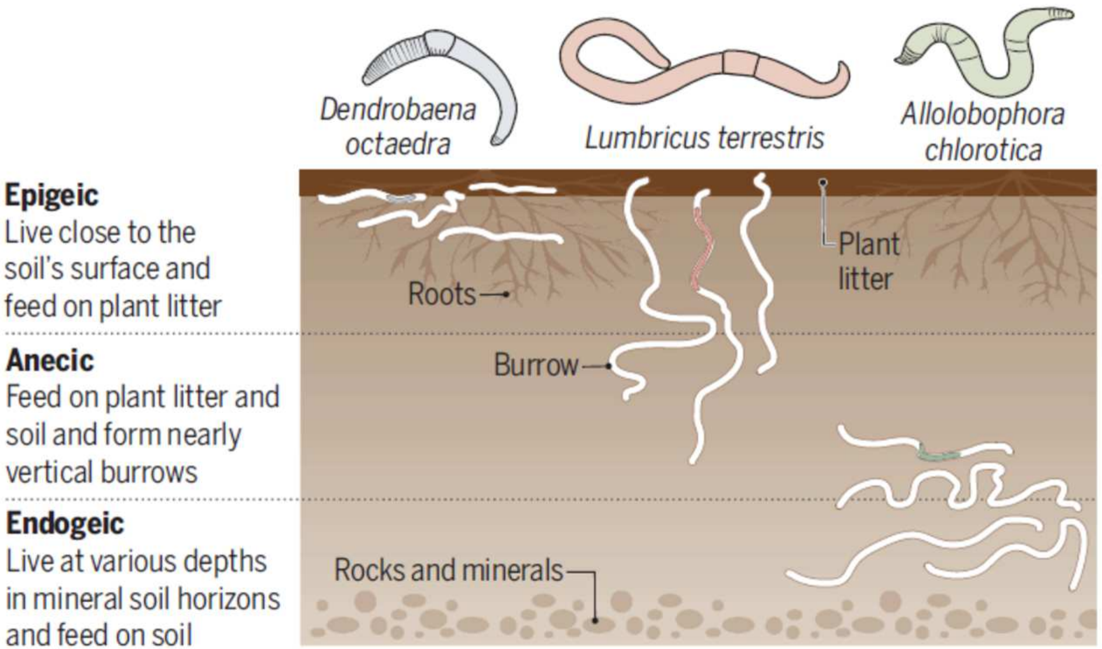

worms promote the stabilization of soil particles into aggregates, increase soil porosity, and elevate the rates at which water infiltrates soil during rainfall; reduce erosion of surface soils from hillslopes; and accelerate the movement of gases into or out of soil.

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Environmental Pollution 254 (2019) 113011

Zeynep Akdogan, Basak Guven*

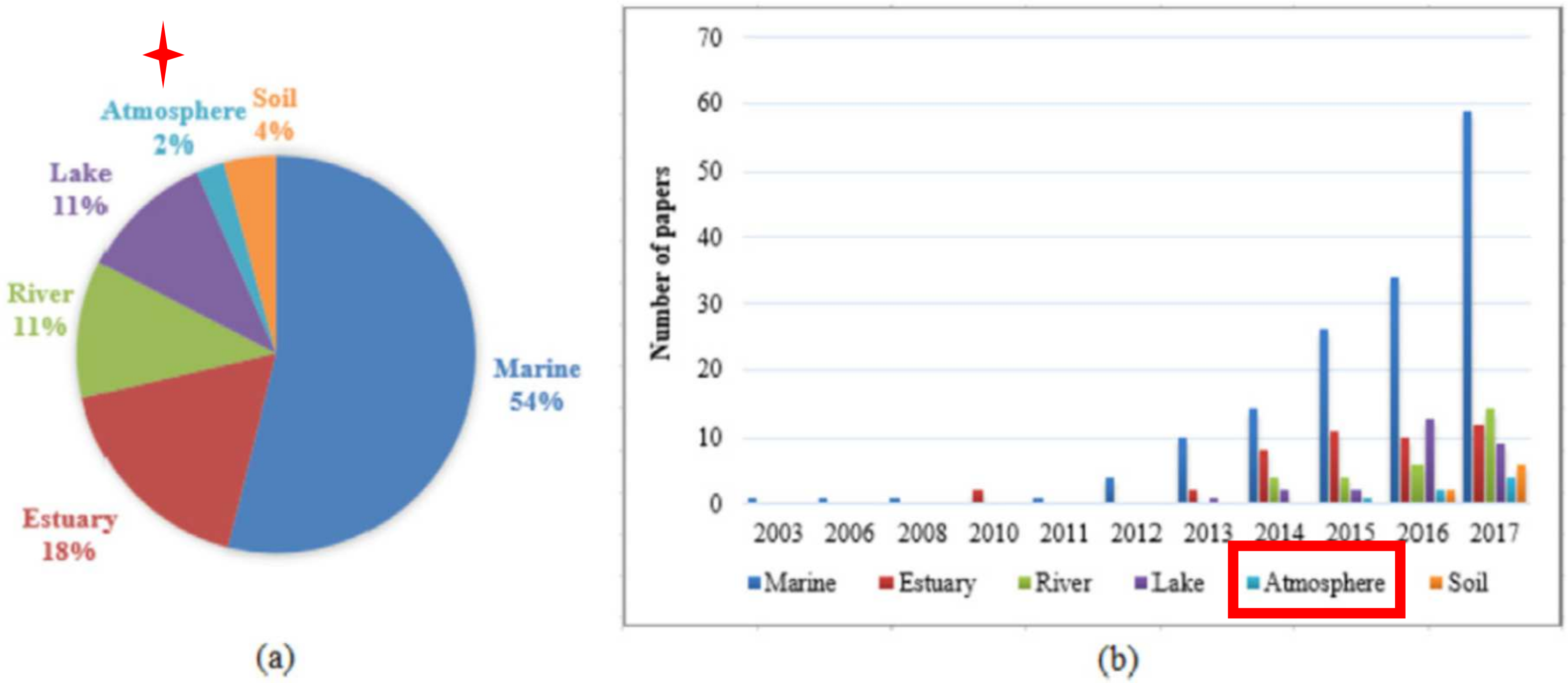


Fig. 2. Microplastic related research in Web of Science database (retrieved on 15/11/2018). (a) Distribution in environmental systems (b) number of publications by year.

Atmospheric microplastic deposition in an urban environment and an evaluation of transport

Environment International, https://doi.org/10.1016/j.envint.2019.105411

S.L. Wright[a,b,1,*], J. Ulke[a,1,2], A. Font[a,b], K.L.A. Chan[c], F.J. Kelly[a,b]

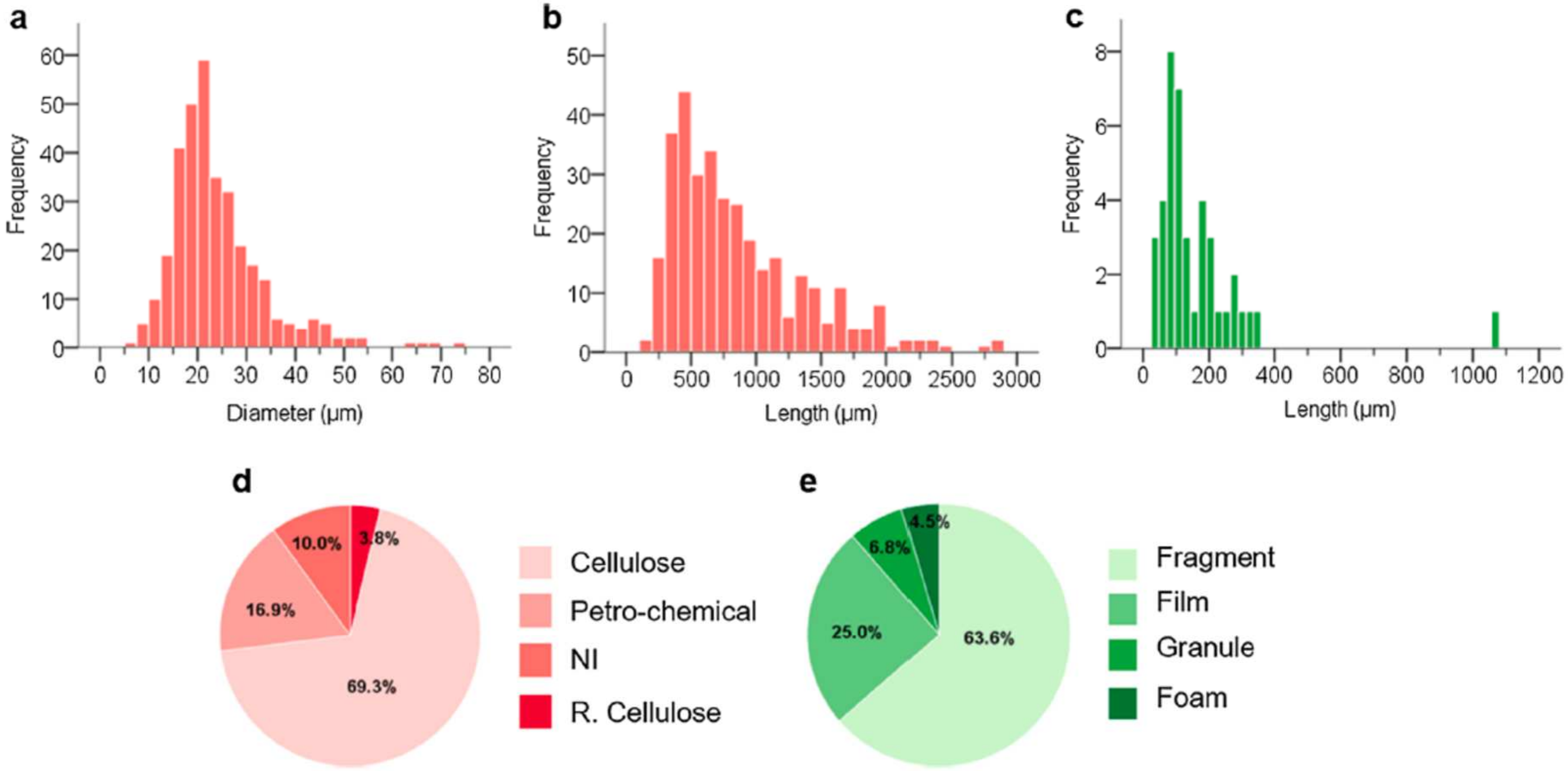


Fig. 2. The profile of fibres and microplastics in total atmospheric deposition. (A) the size distribution of fibrous particle diameters (µm) based on 10% of fibres randomly intercepted on each sample filter; (B) the size distribution of fibrous particle lengths (µm) based on 10% of fibres randomly intercepted on each sample filter; (C) the size distribution of non-fibrous microplastic maximum dimensions (µm); (D) the proportional distribution of fibre materials; and (E) the proportional distribution of non-fibrous microplastic morphologies. NI = non-identifiable; R. Cellulose = regenerated cellulose.

Atmospheric microplastic deposition in an urban environment and an evaluation of transport

Environment International, https://doi.org/10.1016/j.envint.2019.105411

S.L. Wright[a,b,1,*], J. Ulke[a,1,2], A. Font[a,b], K.L.A. Chan[c], F.J. Kelly[a,b]

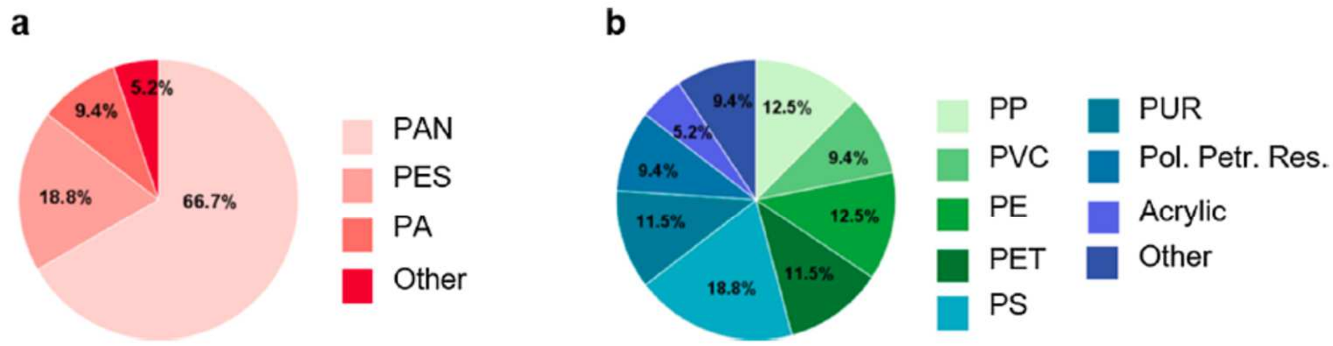


Fig. 3. The composition of microplastics in total atmospheric deposition. (A) The proportional distribution of the identified petro-chemical-based fibrous microplastics; (B) the proportional distribution of the identified petro-chemical-based non-fibrous microplastics. PAN = polyacrylonitrile; PES = polyester, PA = polyamide; PP = polypropylene; PVC = polyvinylchloride; PE = polyethylene; PET = polyethylene terephthalate; PS = polystyrene; PUR = polyurethane; Pol. Petr. Res = polymerised petroleum resin.

Microplastics generated when opening plastic packaging

SCIENTIFIC REPORTS | (2020) 10:4841

Zahra Sobhani[1], Yongjia Lei[1,2], Youhong Tang[3], Liwei Wu[3,4], Xian Zhang[5], Ravi Naidu[1,6], Mallavarapu Megharaj[1,6] & Cheng Fang[1,6*]

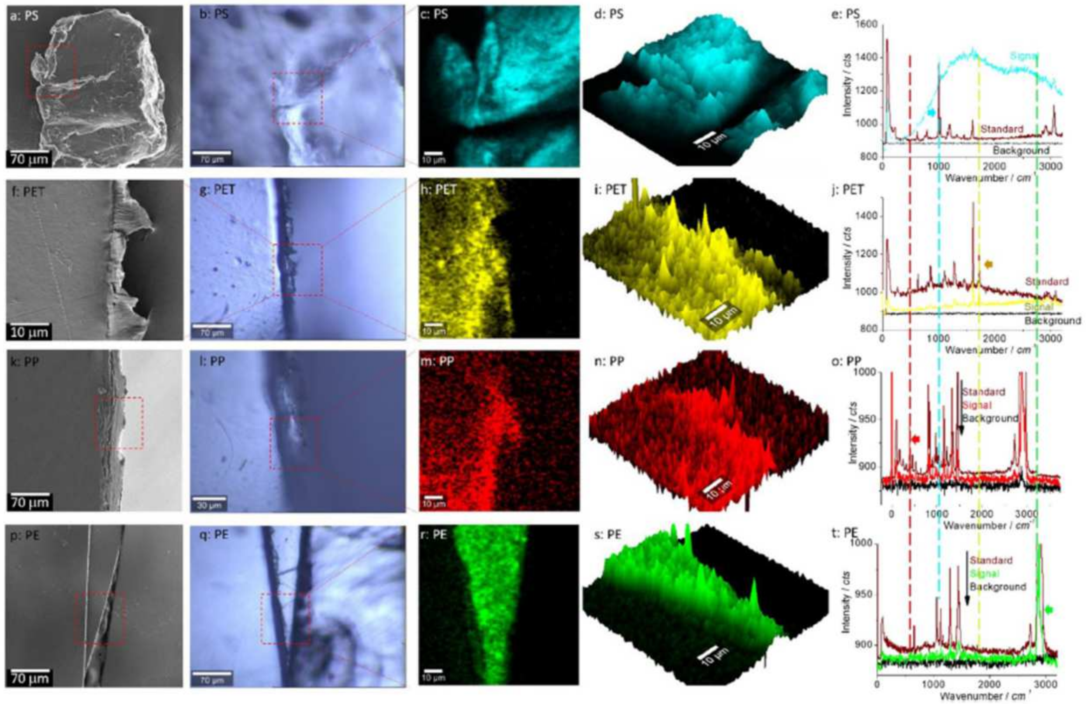


Figure 2. Microplastics confirmed by SEM and Raman spectra. Microplastics particles (**a–e**) are generated by patting packing foam (PS), (**f–j**) by scissoring a drinking-water bottle (PET), (**k–o**) by manually tearing a plastic cup (PP) and (**p–t**) by knife-cutting a plastic bag (PE). From the left column to the right, they are SEM images (showing the boundaries of cutting) (column 1), photo images (column 2), Raman mapping images (columns 3 and 4), and typical Raman spectra (column 5). The laser scanning areas for Raman mapping are suggested by red dashed squares. The characteristic peaks and the typical Raman spectra for Raman mapping and plastic identification are indicated by filled arrows and dashed lines. For comparison, the typical background curve (corresponding to the dark area in the Raman images) and the standard Raman spectra used to identify the type of plastic are also presented.

Microplastics in the environment: A critical review of current understanding and identification of future research needs☆

Environmental Pollution 254 (2019) 113011

Zeynep Akdogan, Basak Guven*

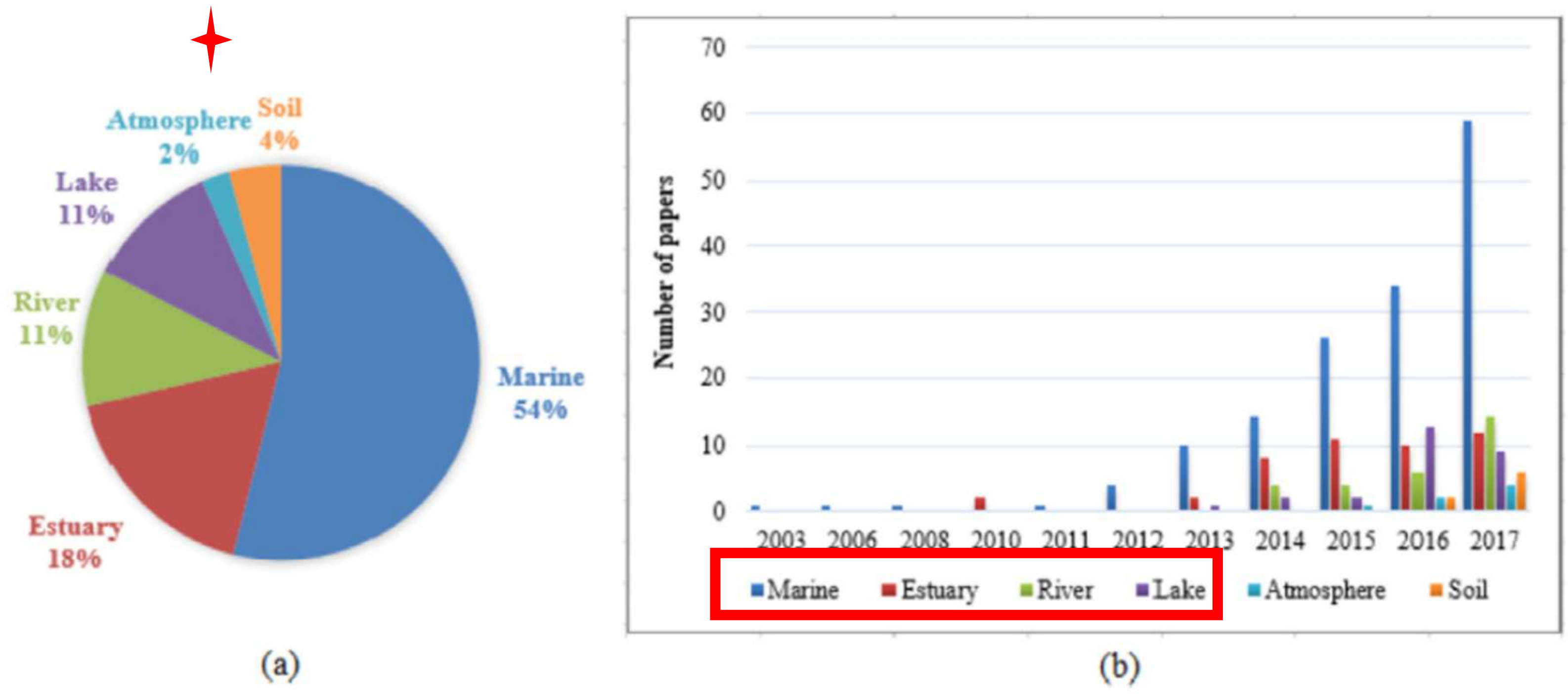


Fig. 2. Microplastic related research in Web of Science database (retrieved on 15/11/2018). (a) Distribution in environmental systems (b) number of publications by year.

Seafloor microplastic hotspots controlled by deep-sea circulation

Cite as: I. A. Kane *et al.*, *Science* 10.1126/science.aba5899 (2020).

Ian A. Kane[1*], Michael A. Clare[2], Elda Miramontes[3,4], Roy Wogelius[1], James J. Rothwell[5], Pierre Garreau[6], Florian Pohl[7]

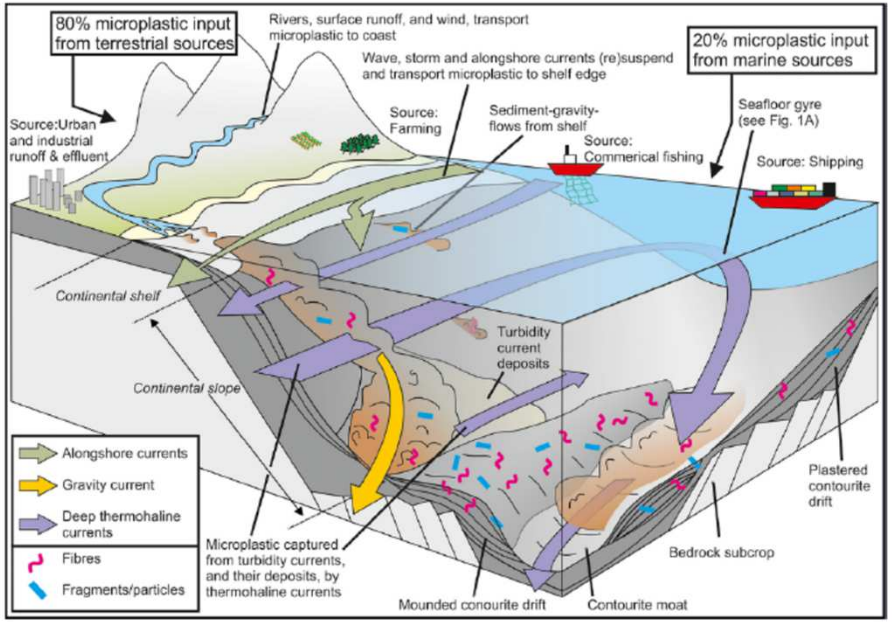


Fig. 5. Bottom currents control the deep-sea fate of microplastics. Schematic diagram illustrating the role of near bed currents in the transfer, concentration and storage of microplastic in the deep sea. Along shelf currents disperse microplastics, powerful gravity flows effectively flush microplastic to the deep sea, while thermohaline-drive bottom currents segregate microplastics into localized hotspots of high concentration; the effectiveness of their long-term sequestration depends upon the intensity of subsequent bottom current activity and rate of burial.

Occurrence and identification of microplastics in tap water from China

Huiyan Tong *, Qianyi Jiang , Xingshuai Hu , Xiaocong Zhong

Chemosphere 252 (2020) 126493

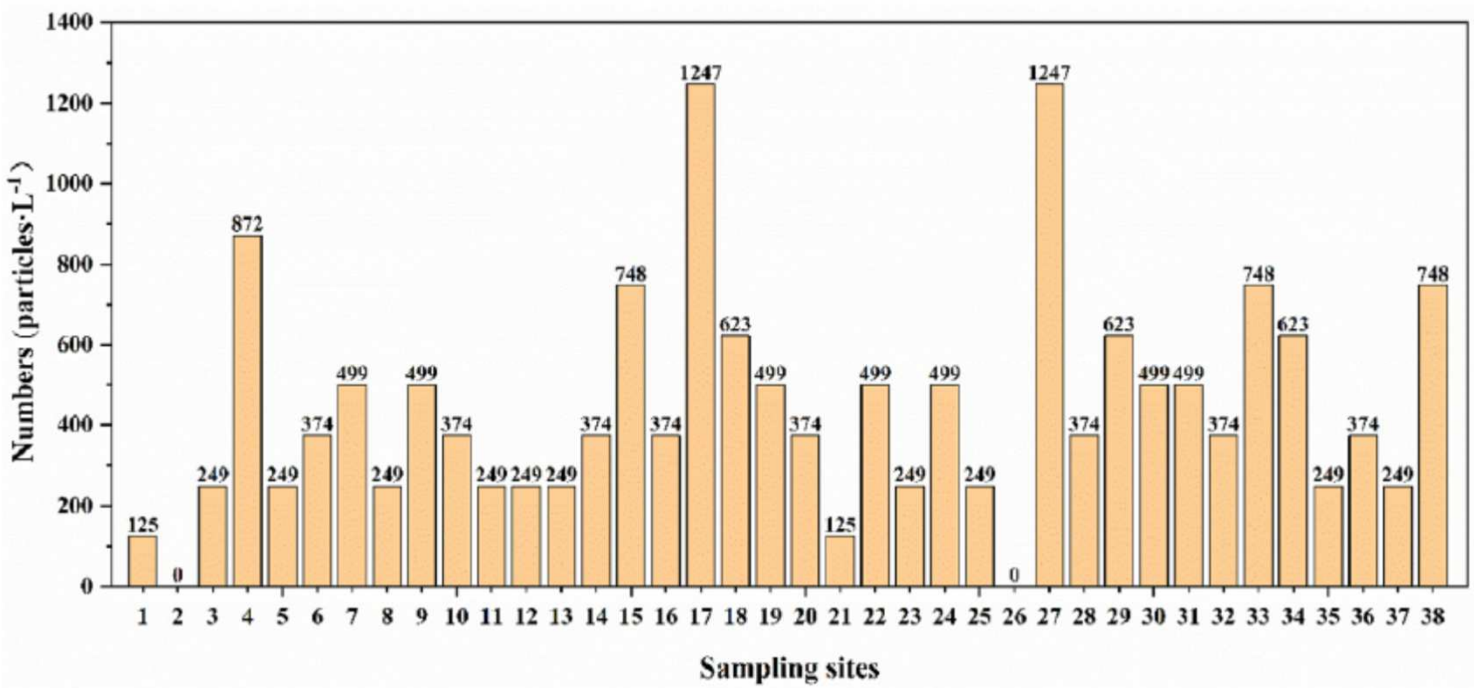
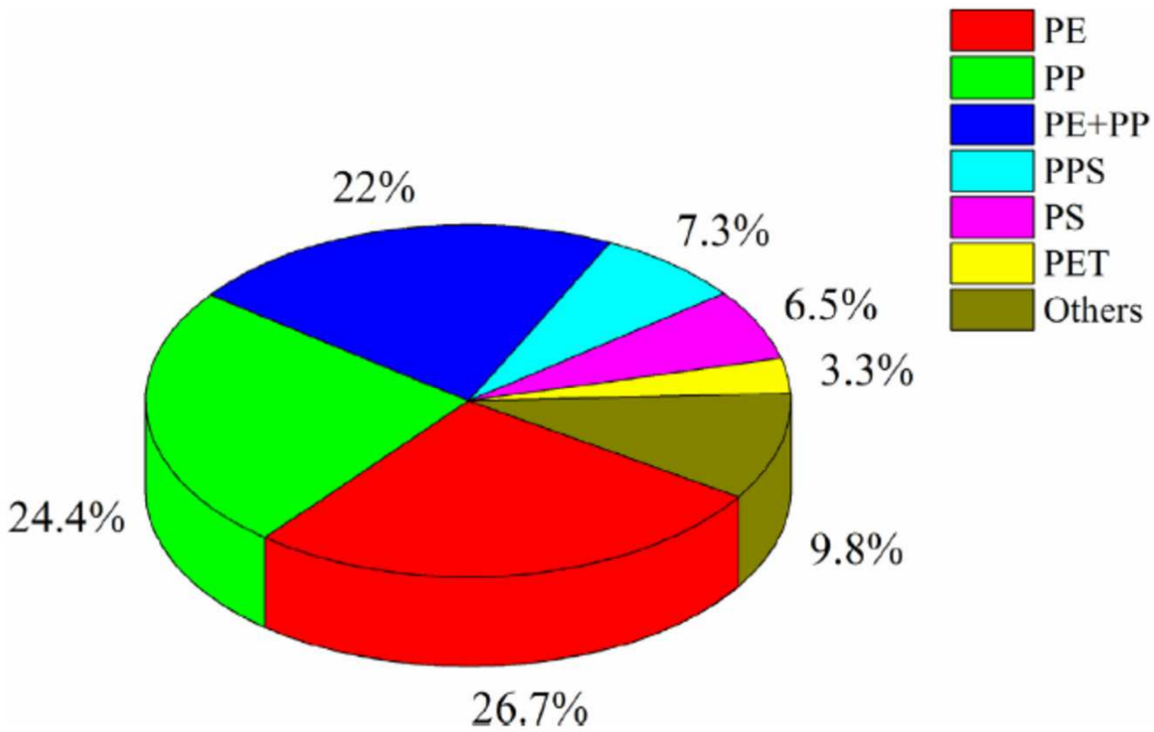


Fig. 2. Microplastic abundance in tap water samples.

Occurrence and identification of microplastics in tap water from China

Huiyan Tong *, Qianyi Jiang , Xingshuai Hu , Xiaocong Zhong

Chemosphere 252 (2020) 126493



in pipes in drinking water distribution systems

Fig. 5. Material composition of the detected microplastics in tap water samples. Others: sum of PMS, PTFE, PC, PMMA, PBT, PB, nylon, PVC.

Come arrivano nel nostro corpo ?

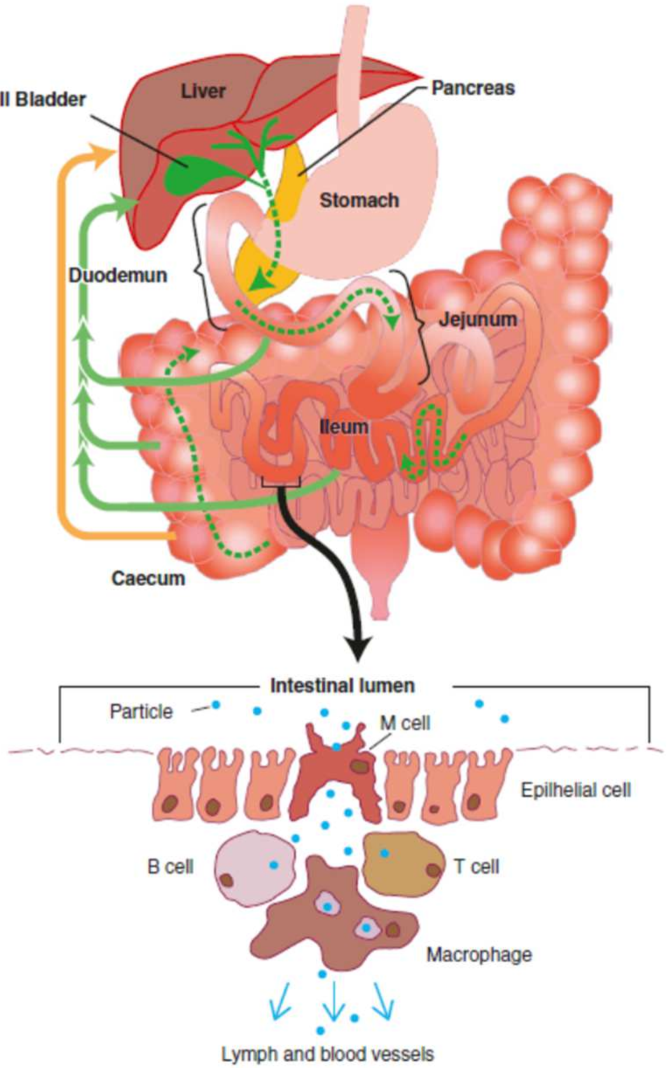


Fig. 13.1 A diagram illustrating a proposed recirculation pathway for polymer nanoparticles (ammonium palmitoyl glycol chitosan) after oral administration. The nanoparticles are taken up into the blood from the gut through M cells, and from there through the lymphatic system (shown in *yellow*) and into the liver and gall bladder. Particles are then re-released into the gut together with bile (shown in *green*) before excretion in faeces and urine. Adapted from Garrett et al. (2012)

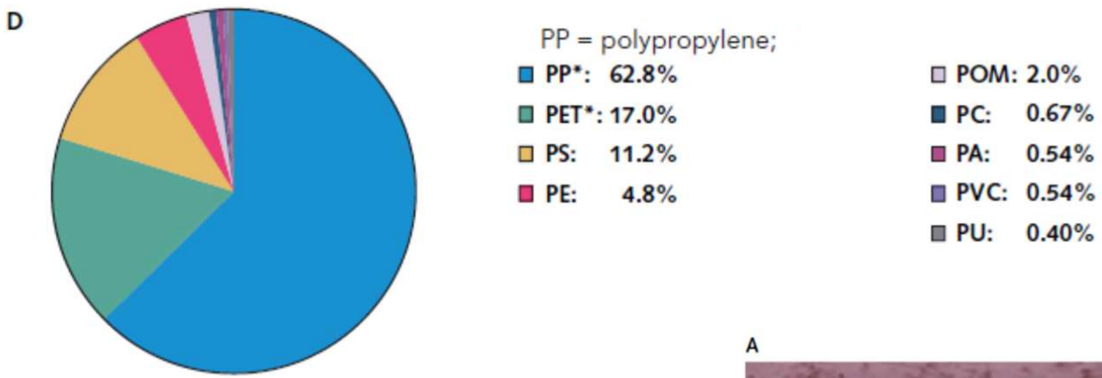
1°

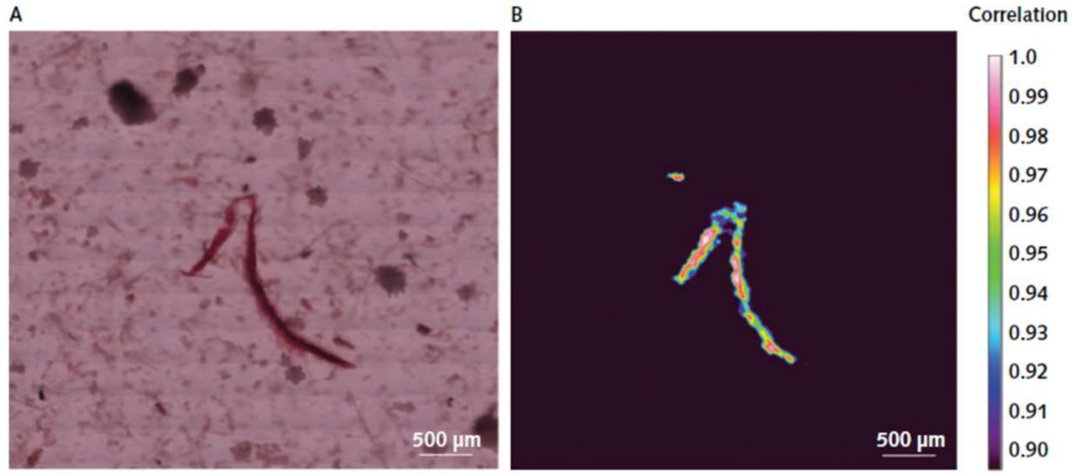
Detection of Various Microplastics in Human Stool

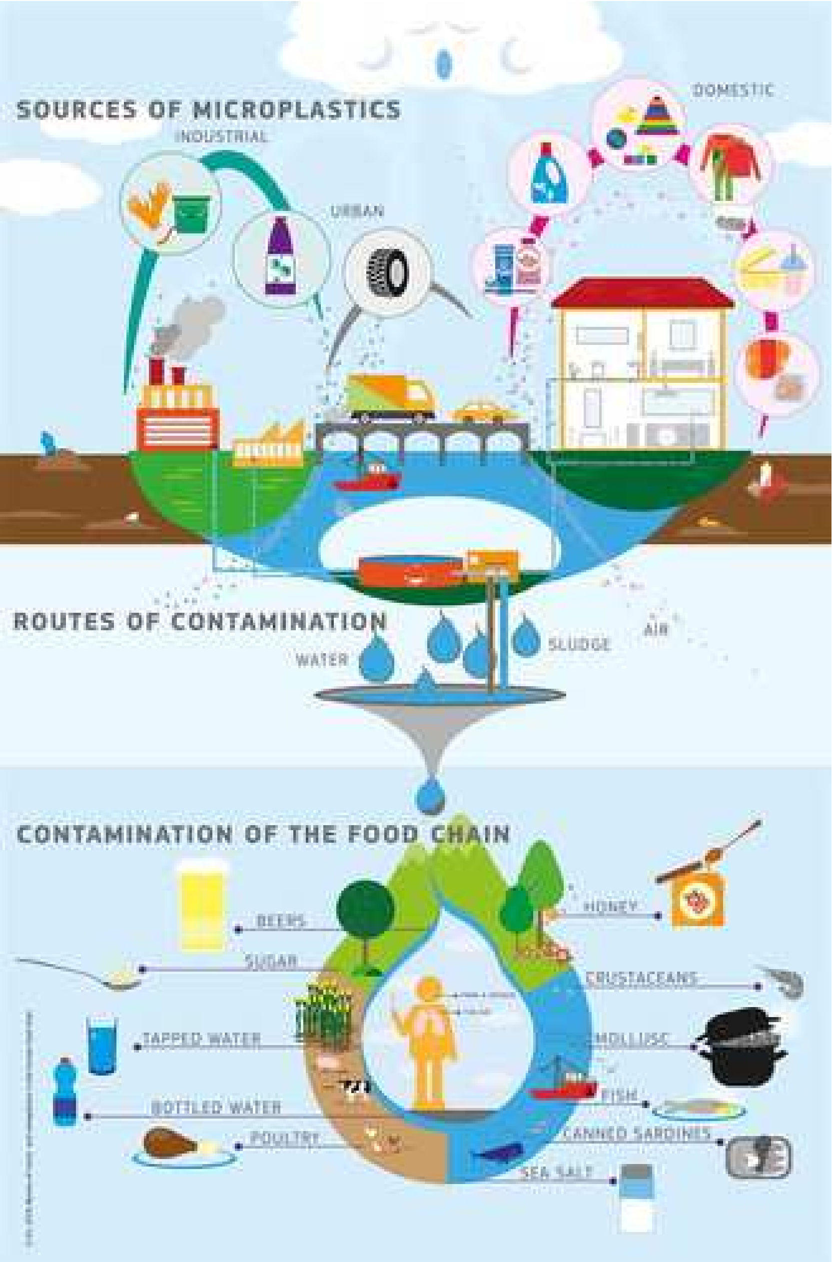
Ann Intern Med. 2019;171:453-457. doi:10.7326/M19-0618

A Prospective Case Series

Philipp Schwabl, MD; Sebastian Köppel, Dipl-Ing(FH); Philipp Königshofer, DVM; Theresa Bucsics, MD; Michael Trauner, MD; Thomas Reiberger, MD; and Bettina Liebmann, PhD







Review of micro- and nanoplastic contamination in the food chain

Brigitte Toussaint*, Barbara Raffael*, Alexandre Angers-Loustau, Douglas Gilliland, Vikram Kestens, Mauro Petrillo, Iria M. Rio-Echevarria and Guy Van den Eede

FOOD ADDITIVES & CONTAMINANTS: PART A
2019, VOL. 36, NO. 5, 639–673

Trophic transfer of microplastics and mixed contaminants in the marine food web and implications for human health

Maddison Carbery[a], Wayne O'Connor[b], Palanisami Thavamani[a,*]

Environment International 115 (2018) 400–409

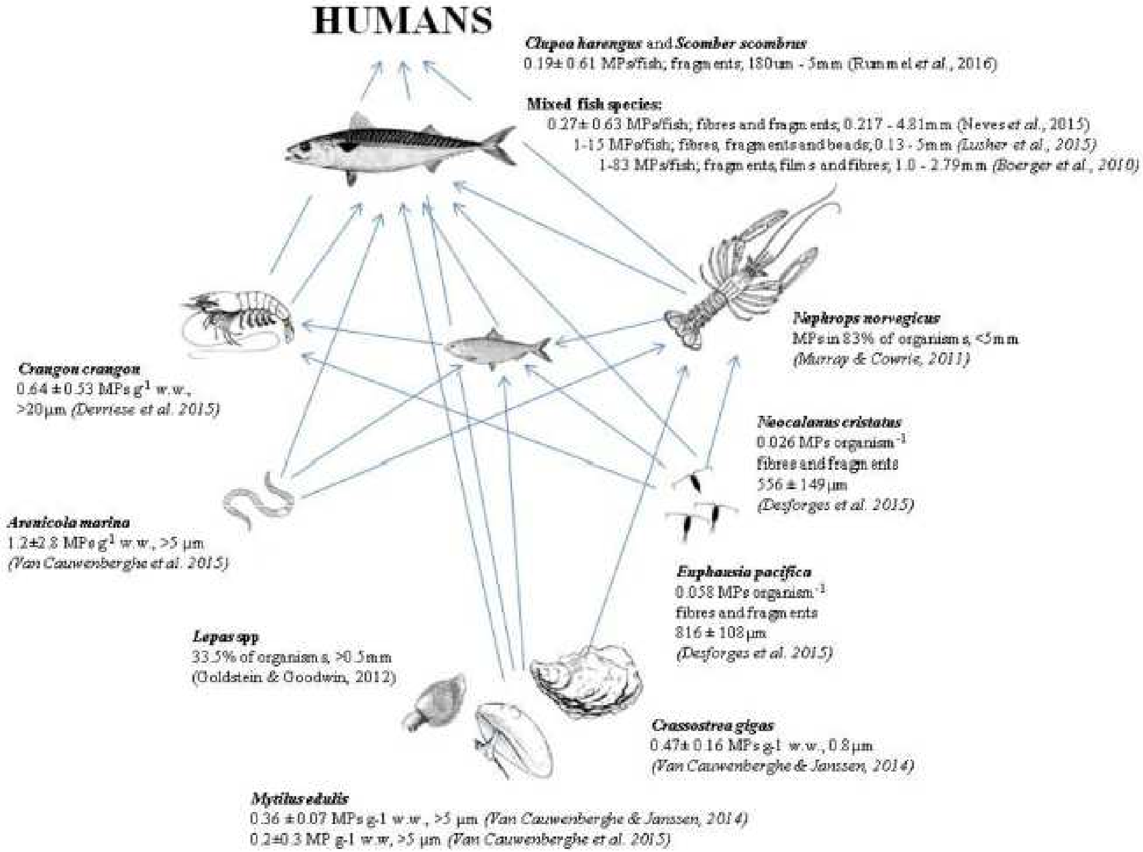


Fig. 1. A model marine food web indicating the load, size and shape of microplastics present in organisms across different trophic levels collected from the natural environment.

The presence of microplastics in commercial salts from different countries

Ali Karami[1], Abolfazl Golieskardi[1], Cheng Keong Choo[2], Vincent Larat[3], Tamara S. Galloway[4] & Babak Salamatinia[2]

SCIENTIFIC REPORTS | 7:46173 | DOI: 10.1038/srep46173

Country of origin	Brand	Packaging material	Salt type
Australia	A	PE[1]+PET[2]	Sea
	B	PE	Sea
France	C	PP[3]	Sea
	D	PP	Sea
	E	PET	Sea
	F	Glass	Sea
	G	PE+PP	Sea
	H	PET	Sea
Iran	I	PP+Hostasol green	Lake
Japan	J	PE+PET	Sea
Malaysia	K	PP	Sea
	L	PP	Lake
New Zealand	M	PE	Unidentified
Portugal	N	PET	Sea
	O	PP	Sea
	P	Glass	Sea
South Africa	Q	PET	Sea

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SCIENTIFIC REPORTS | 7:46173 | DOI: 10.1038/srep46173

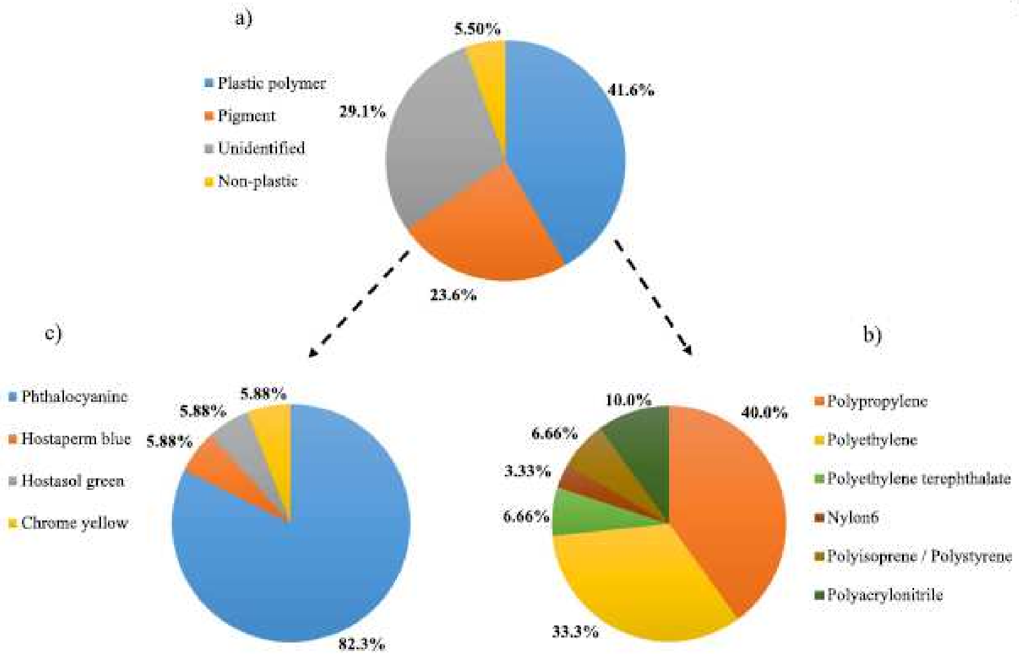
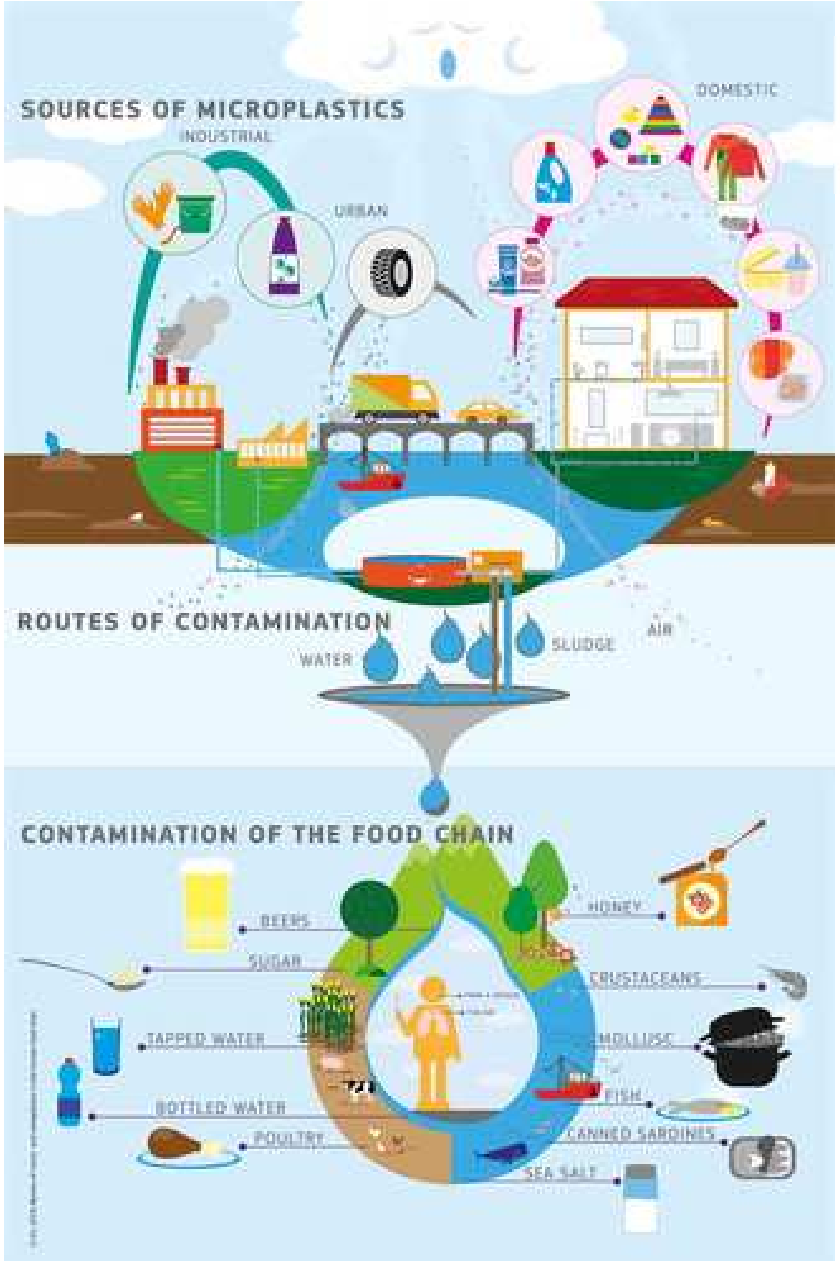


Figure 2. Chemical composition of the isolated particles. (**a**) Pie chart of the chemical composition of the isolated particles from all salt samples and the corresponding proportion of different (**b**) plastic polymers and (**c**) pigments.



Review of micro- and nanoplastic contamination in the food chain

Brigitte Toussaint*, Barbara Raffael*, Alexandre Angers-Loustau, Douglas Gilliland, Vikram Kestens, Mauro Petrillo, Iria M. Rio-Echevarria and Guy Van den Eede

FOOD ADDITIVES & CONTAMINANTS: PART A
2019, VOL. 36, NO. 5, 639–673

Branded milks – Are they immune from microplastics contamination?

Science of the Total Environment 714 (2020) 136823

Gurusamy Kutralam-Muniasamy [a], Fermín Pérez-Guevara [a,b], I. Elizalde-Martínez [c], V.C. Shruti [c,*]

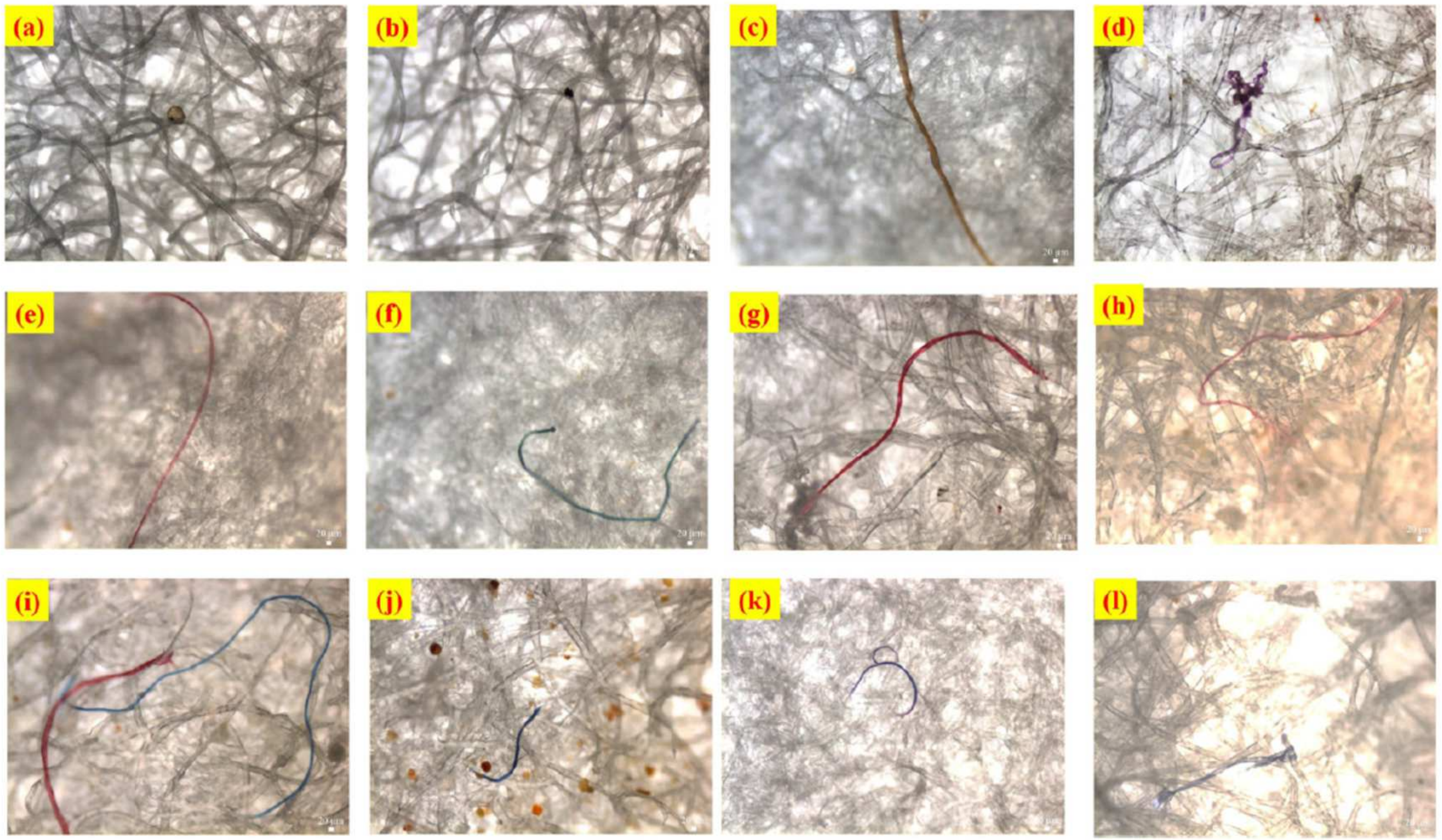


Fig. 1. Microscopical photographs of typical microplastics found in branded milk samples are shown. (a–b) Particles observed in blank filters used for microplastics extraction. c-h images represent fiber particles. c- brown; d- violet; e- pink; f– green; g–h- red and i–l- blue.

Branded milks – Are they immune from microplastics contamination?

Science of the Total Environment 714 (2020) 136823

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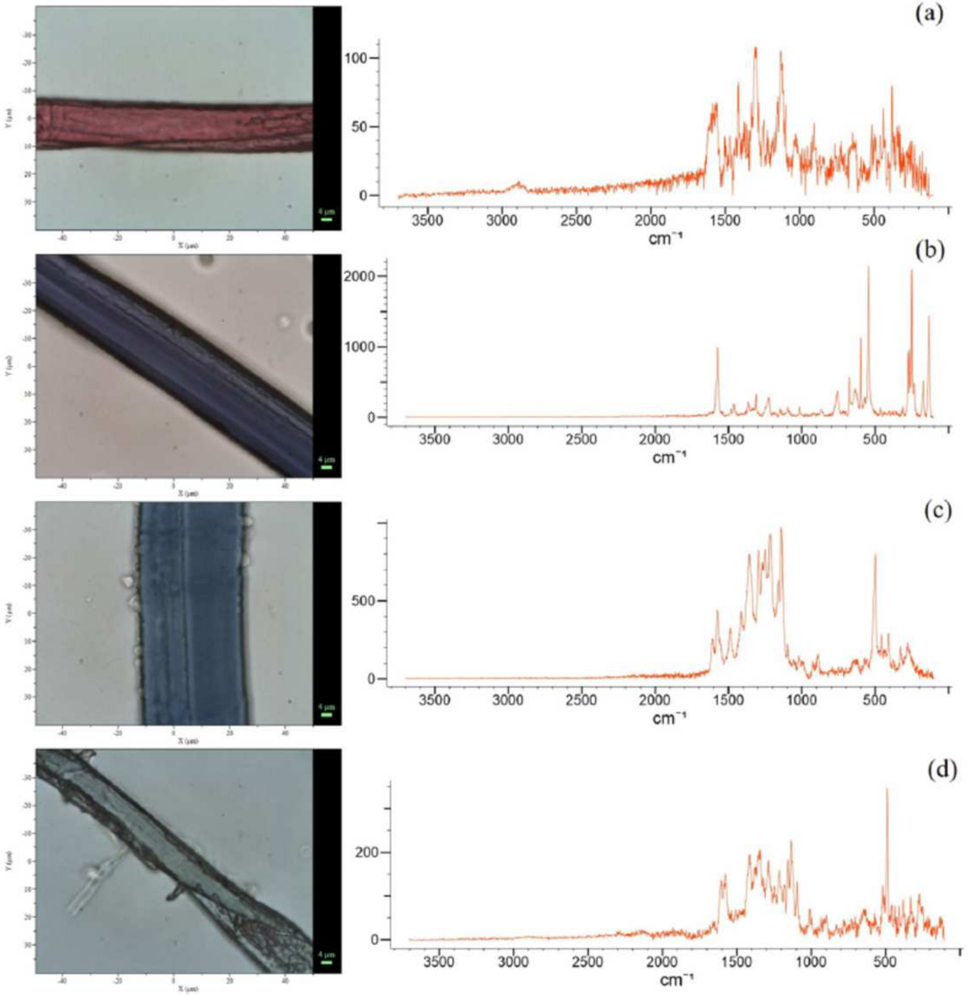


Fig. 4. Raman spectroscopy results of the microplastics collected in this study. a, c, d – polyethersulfone and b – polysulfone.

First study of its kind on the microplastic contamination of soft drinks, cold tea and energy drinks - Future research and environmental considerations

Science of the Total Environment 726 (2020) 138580

V.C. Shruti [a], Fermín Pérez-Guevara [b,c], I. Elizalde-Martínez [a], Gurusamy Kutralam-Muniasamy [b,*]

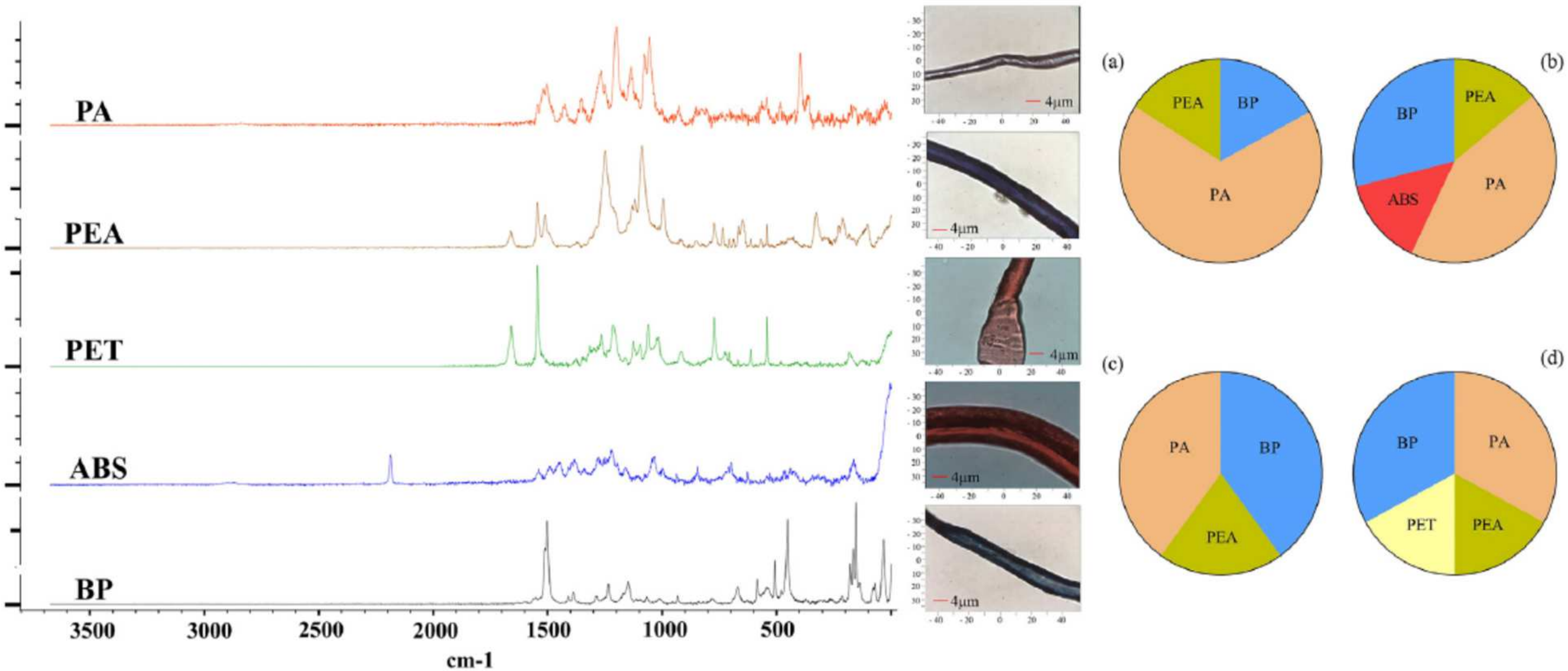
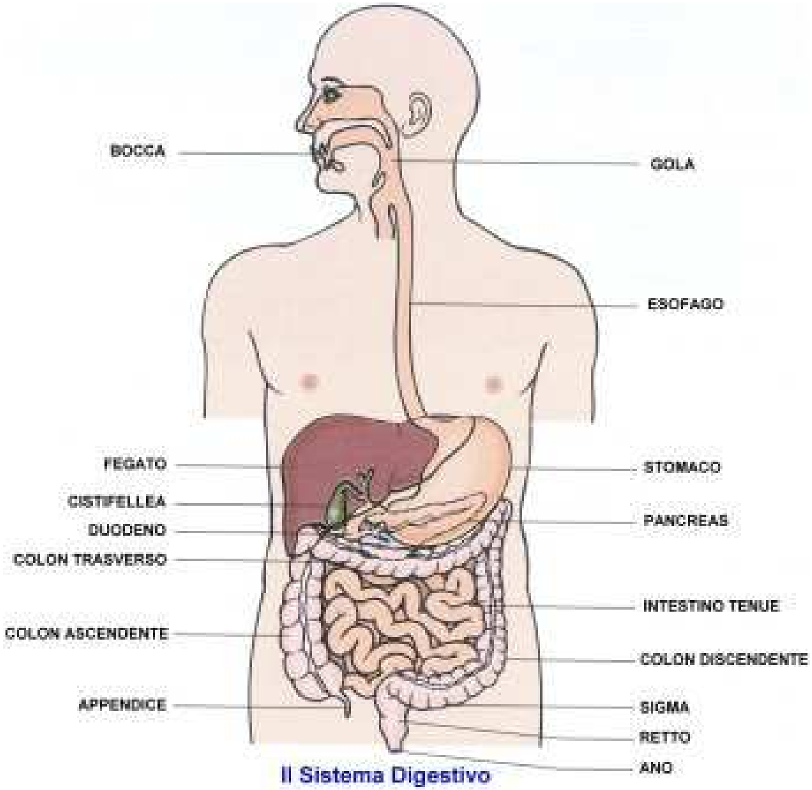
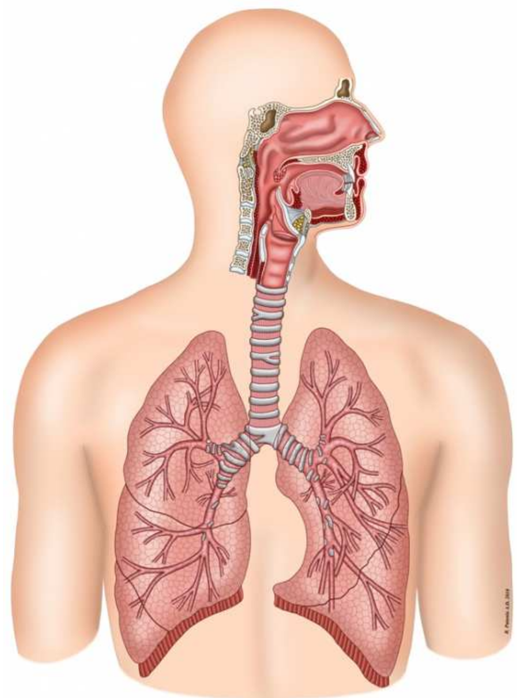


Fig. 3. Pie chart showing the distribution of microplastic polymers identified from cold tea (a), soft drinks (b), energy drinks (c) and beers (d) of Mexico. PA = Polyamide; PET = Poly (ethylene-terephthalate); PEA = Poly(ester-amide); ABS = Acrylonitrile-butadiene-styrene; BP = Blue pigment.

MICROBIOME
Research Hub


BOCCA
GOLA
ESOFAGO
FEGATO
STOMACO
CISTIFELLEA
PANCREAS
DUODENO
COLON TRASVERSO
INTESTINO TENUE
COLON ASCENDENTE
COLON DISCENDENTE
APPENDICE
SIGMA
RETTO
ANO
Il Sistema Digestivo



2°

A first overview of textile fibers, including microplastics, in indoor and outdoor environments☆

Environmental Pollution 221 (2017) 453–458

Rachid Dris [a,*], Johnny Gasperi [a,**], Cécile Mirande [a], Corinne Mandin [b], Mohamed Guerrouache [c], Valérie Langlois [c], Bruno Tassin [a]

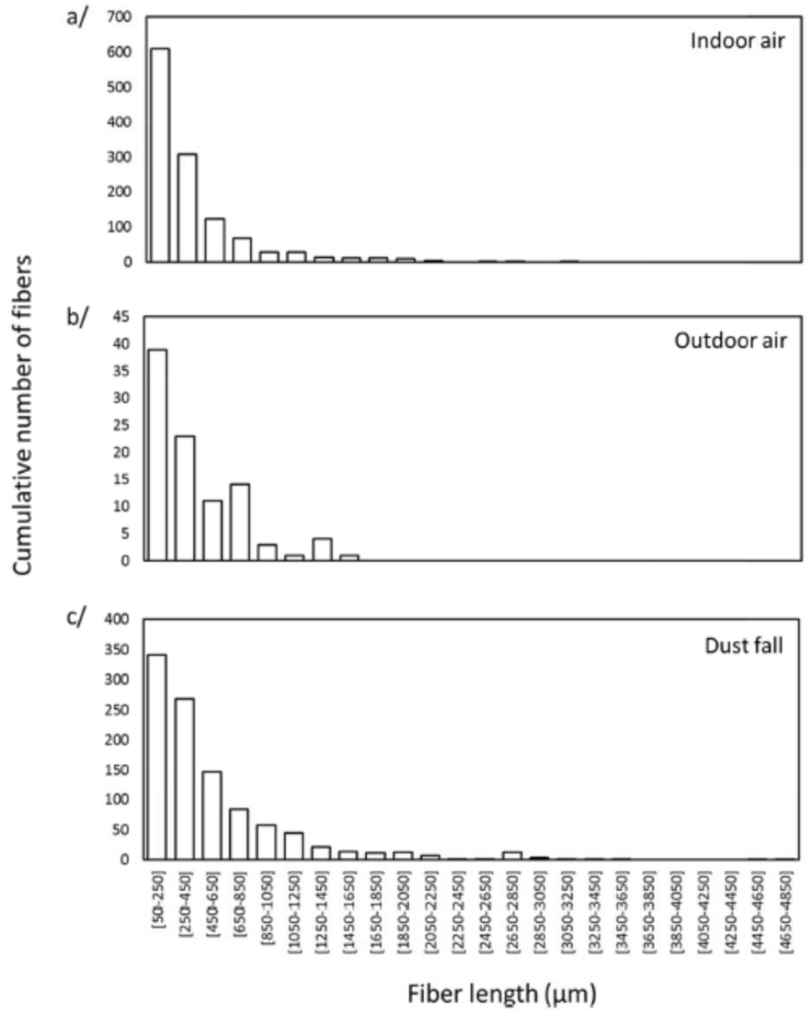


Fig. 2. Cumulative number of fibers observed in each size range between 50 and 4850 µm in various samples, a/indoor air, b/outdoor air, c/dust fall.

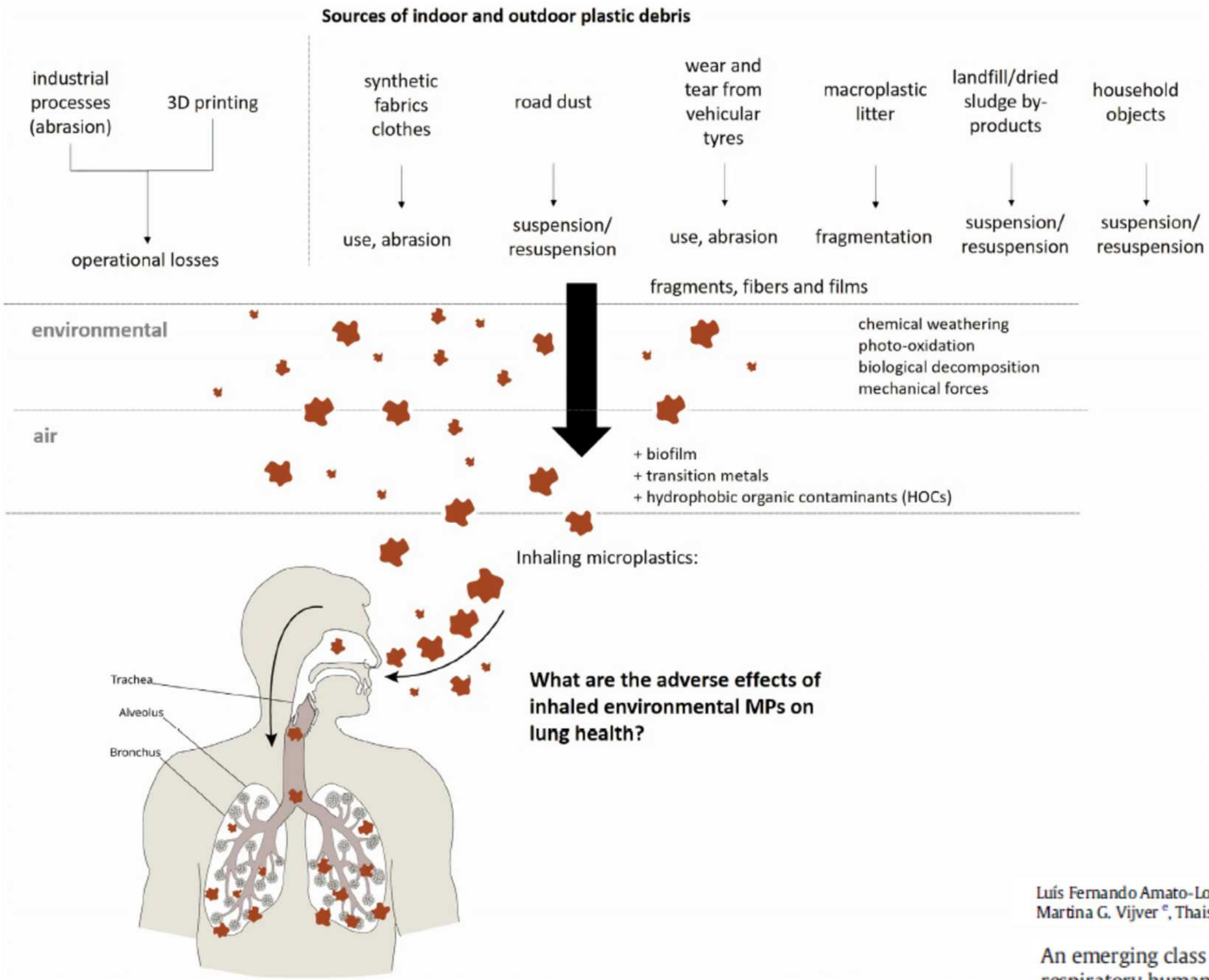


Fig. 1. Main sources of indoor and outdoor plastic debris released into the air and subject to human inhalation.

Science of the Total Environment 749 (2020) 141676

Luís Fernando Amato-Lourenço [a,b,*], Luciana dos Santos Galvão [c], Letty A. de Weger [d], Pieter S. Hiemstra [d], Martina G. Vijver [e], Thais Mauad [a,b]

An emerging class of air pollutants: Potential effects of microplastics to respiratory human health?

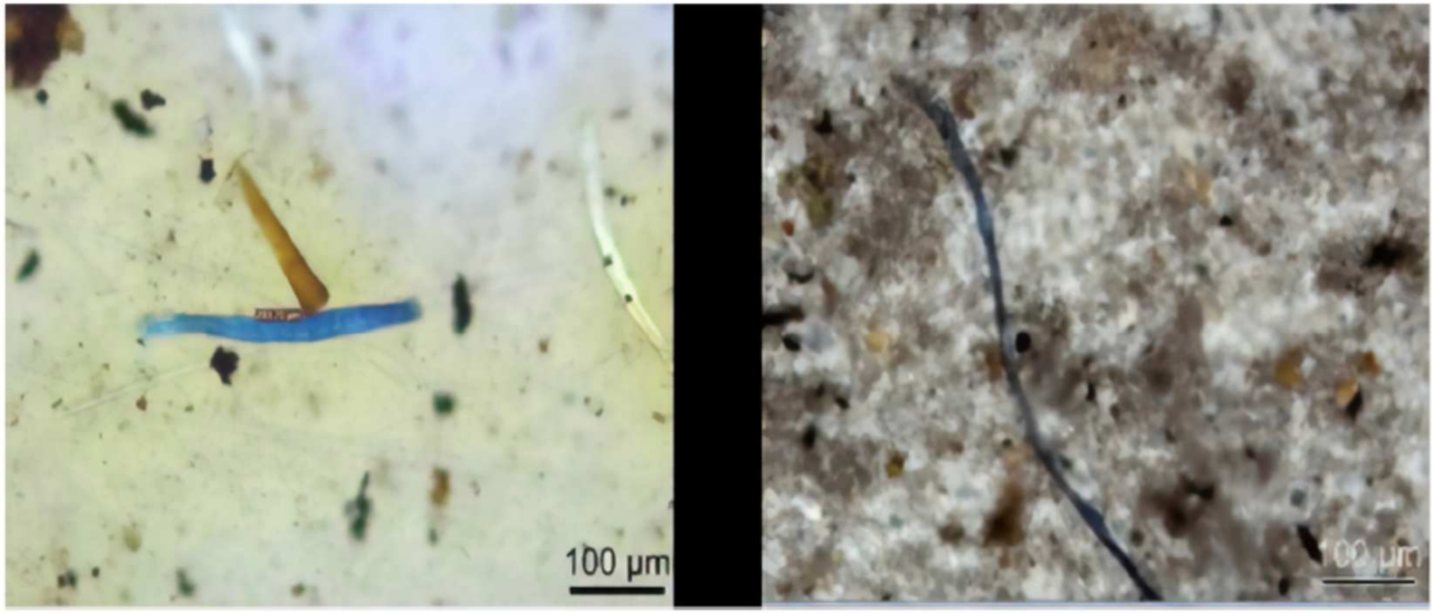


Fig. 2. Fragments of polymer particles present in the air in the city of São Paulo analysed by transmission microscopy and infrared spectroscopy attached to the microscope (by Luciana dos Santos Galvão, Chemical Analyses Laboratory, Institute for Technological Research (IPT), São Paulo, Brazil).

Science of the Total Environment 749 (2020) 141676

Luís Fernando Amato-Lourenço [a,b,*], Luciana dos Santos Galvão [c], Letty A. de Weger [d], Pieter S. Hiemstra [d], Martina G. Vijver [e], Thais Mauad [a,b]

An emerging class of air pollutants: Potential effects of microplastics to respiratory human health?

Environmental fate, toxicity and risk management strategies of nanoplastics in the environment: Current status and future perspectives

Liuwei Wang[a], Wei-Min Wu[b], Nanthi S. Bolan[c], Daniel C.W. Tsang[d], Yang Li[e], Muhan Qin[a], Deyi Hou[a,*]

Journal of Hazardous Materials 401 (2021) 123415

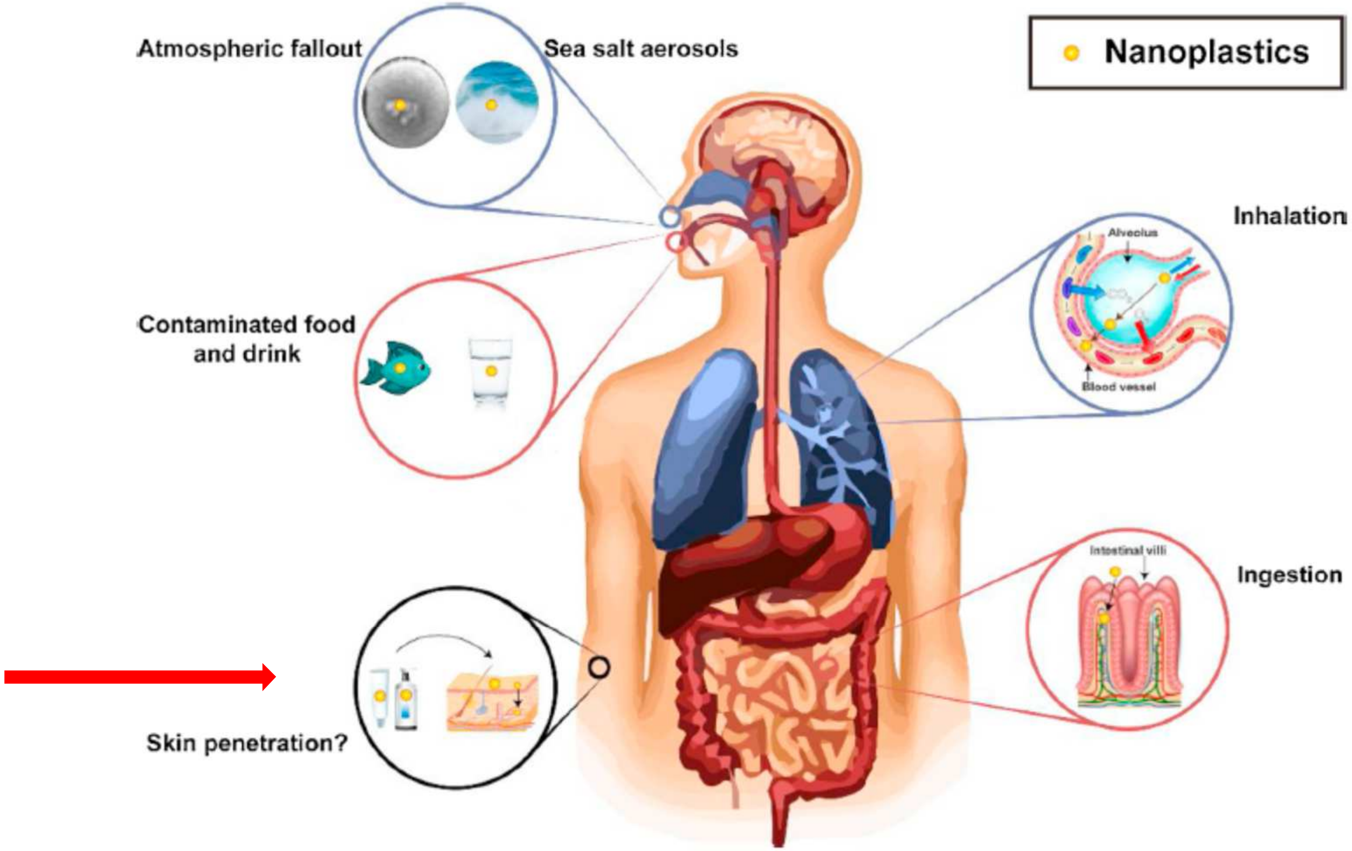


Fig. 4. Human exposure pathways of NPs. Blue – inhalation; red – ingestion; black – dermal.

Review

A Detailed Review Study on Potential Effects of Microplastics and Additives of Concern on Human Health

Claudia Campanale *, Carmine Massarelli, Ilaria Savino, Vito Locaputo and Vito Felice Uricchio

Int. J. Environ. Res. Public Health **2020**, *17*, 1212;

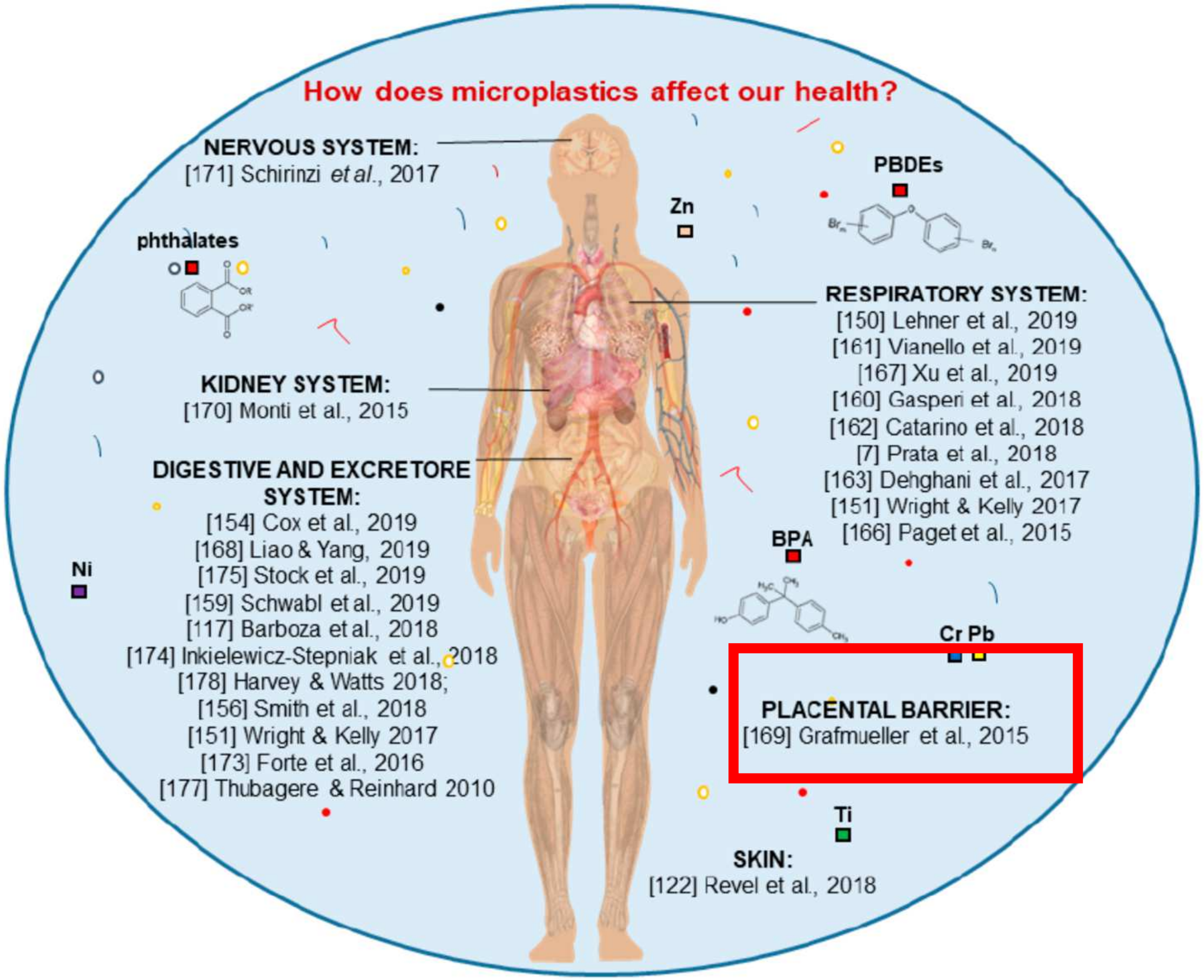


Figure 6. Overview of scientific studies focused on the effects of micro and nanoplastics on human health. Colored squares represent pollutants (organic and inorganic) that could be present in environmental matrices (free or associated with micro and nanoplastics) and that could enter into the human body through different entry routes.

Quante ne introduciamo ?

Human Consumption of Microplastics

Kieran D. Cox,[*,†,‡] Garth A. Covernton,[†] Hailey L. Davies,[†] John F. Dower,[†] Francis Juanes,[†] and Sarah E. Dudas[†,‡,§]

Environ. Sci. Technol. 2019, 53, 7068–7074

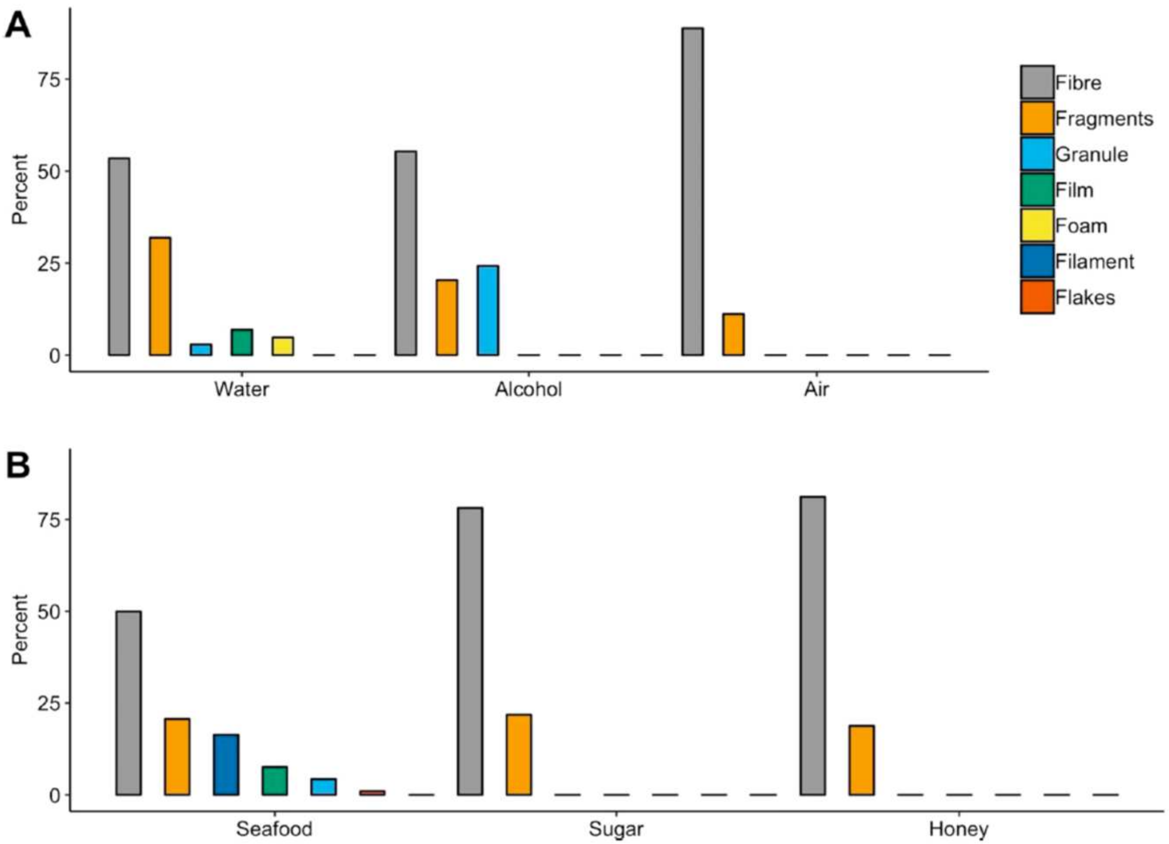


Figure 3. Average percent microplastic particle (MP) types including fibers, fragments, granules, film, foam, filaments, and flakes in (A) water, alcohol (beer), and indoor air and (B) seafood, salt, sugar, and honey.

Human Consumption of Microplastics

Kieran D. Cox,[*,†,‡] Garth A. Covernton,[†] Hailey L. Davies,[†] John F. Dower,[†] Francis Juanes,[†]
and Sarah E. Dudas[†,‡,§]

Environ. Sci. Technol. 2019, 53, 7068–7074

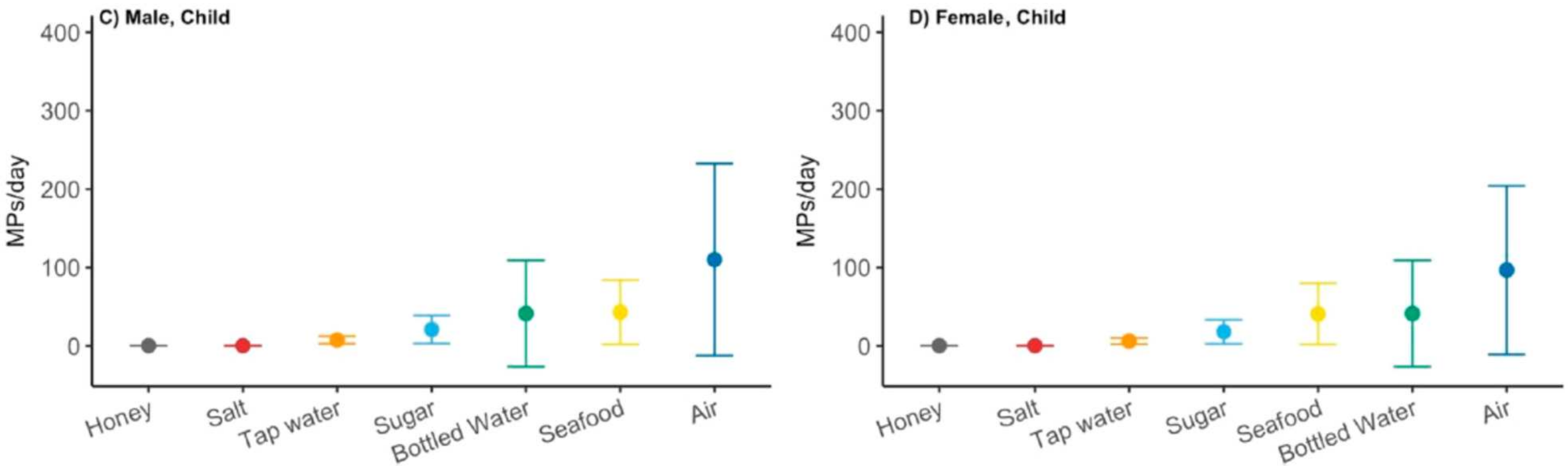


Figure 2. Mean and standard deviation of microplastic concentration within each source of ingested microplastic particles (MPs) including salt, alcohol (beer), seafood (fish, shellfish and crustaceans), added sugars (sugar and honey), water (bottled and tap), and air in (A) male adults, (B) female adults, (C) male children, and (D) female children.

Human Consumption of Microplastics

Kieran D. Cox,[*,†,‡] Garth A. Covernton,[†] Hailey L. Davies,[†] John F. Dower,[†] Francis Juanes,[†]
and Sarah E. Dudas[†,‡,§]

Environ. Sci. Technol. 2019, 53, 7068–7074

Our estimates of American consumption of microplastics are likely drastic underestimates overall. Our current analysis indicated that meeting approximately 15% of a person's caloric intake is associated with the consumption of up to 52000 microplastics annually. Extrapolating the number of microplastics consumed with the remaining 85% of calories is not possible; however, if our findings are remotely representative, annual microplastic consumption could exceed several hundred thousand.

Human Consumption of Microplastics

Kieran D. Cox,[*,†,‡] Garth A. Covernton,[†] Hailey L. Davies,[†] John F. Dower,[†] Francis Juanes,[†] and Sarah E. Dudas[†,‡,§]

Environ. Sci. Technol. 2019, 53, 7068–7074

Table 1. Daily and Annual Consumption and Inhalation of Microplastic Particles for Female and Male, Children and Adults[a]

	Daily		Annual		Total	
	Consumed	Inhaled	Consumed	Inhaled	Daily	Annually
Male Children	113	110	41106 ± 7124	40225 ± 44730	223	81331
Male Adults	142	170	51814 ± 8172	61928 ± 68865	312	121664
Female Children	106	97	38722 ± 6977	35338 ± 39296	203	74060
Female Adults	126	132	46013 ± 7755	48270 ± 53676	258	98305

[a] Points and error bars represent the summation (total) and average standard deviation of all microplastics consumed.

Quali rischi per la salute ?

WHO calls for more research into microplastics and a crackdown on plastic pollution

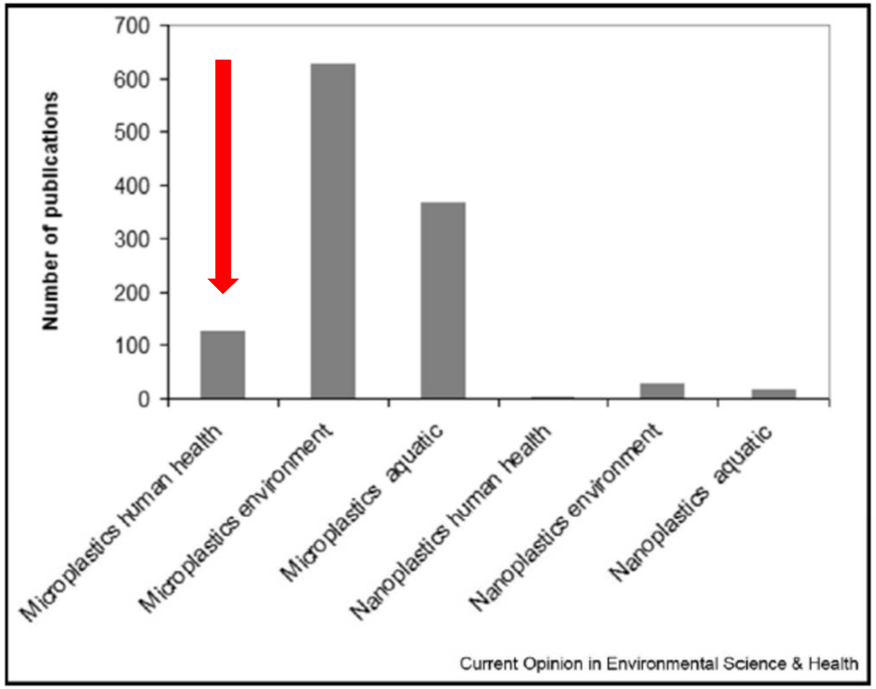
22 August 2019

Micro(nano)plastics: A threat to human health?

Messika Revel, Amélie Châtel and Catherine Mouneyrac

Current Opinion in Environmental Science & Health 2018, **1**:17–23

Fig. 1



Search results on micro/nanoplastics and environmental or human health depending on word selection at 14/09/2017.

Trophic transfer of microplastics and mixed contaminants in the marine food web and implications for human health

Maddison Carbery[a], Wayne O'Connor[b], Palanisami Thavamani[a,*]

Environment International 115 (2018) 400–409

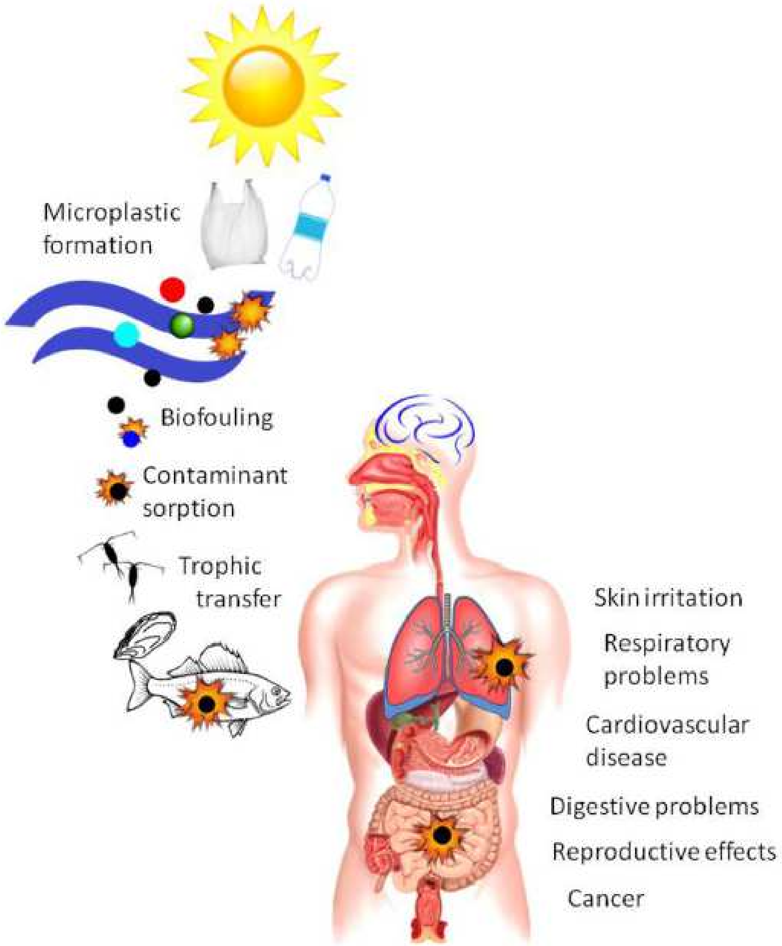


Fig. 3. Potential health effects resulting from the bioaccumulation and biomagnification of microplastics and chemical contaminants in the human body.

Potent Impact of Plastic Nanomaterials and Micromaterials on the Food Chain and Human Health

Int. J. Mol. Sci. **2020**, *21*, 1727

Yung-Li Wang [1], Yu-Hsuan Lee [2], I-Jen Chiu [1,3], Yuh-Feng Lin [1,3,*] and Hui-Wen Chiu [1,3,*]

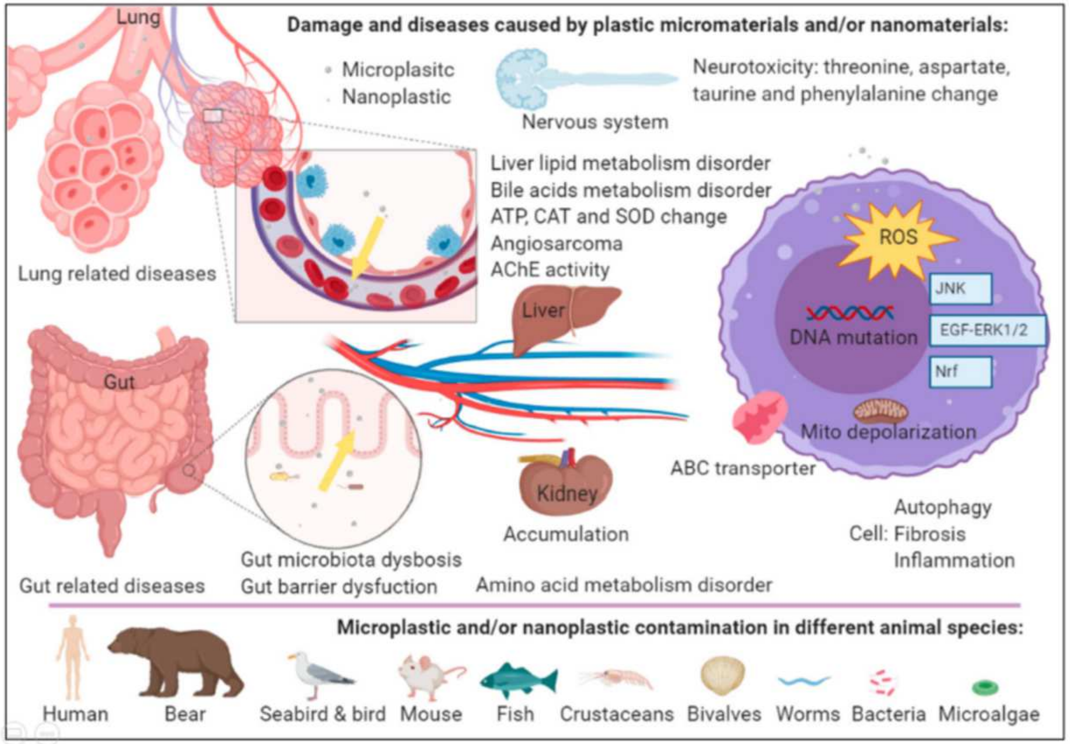


Figure 3. Impact of plastic micromaterials and nanomaterials in organisms. Microplastics and/or nanoplastics can enter the circulation from the gut and lungs and accumulate in the gut, liver, and kidney resulting in several diseases. At the cell level, microplastics or nanoplastics can inhibit the efflux pump and mitochondria depolarization, induce reactive oxygen species (ROS). They also affect several signaling pathways, cause fibrosis, autophagy, and even DNA mutations. Many animal species have been contaminated by microplastics and/or nanoplastics. The figure was created with BioRender.com.

Potential health impact of environmental micro- and nanoplastics pollution

Xiaoru Chang | Yuying Xue | Jiangyan Li | Lingyue Zou | Meng Tang

J Appl Toxicol. 2020;40:4–15.

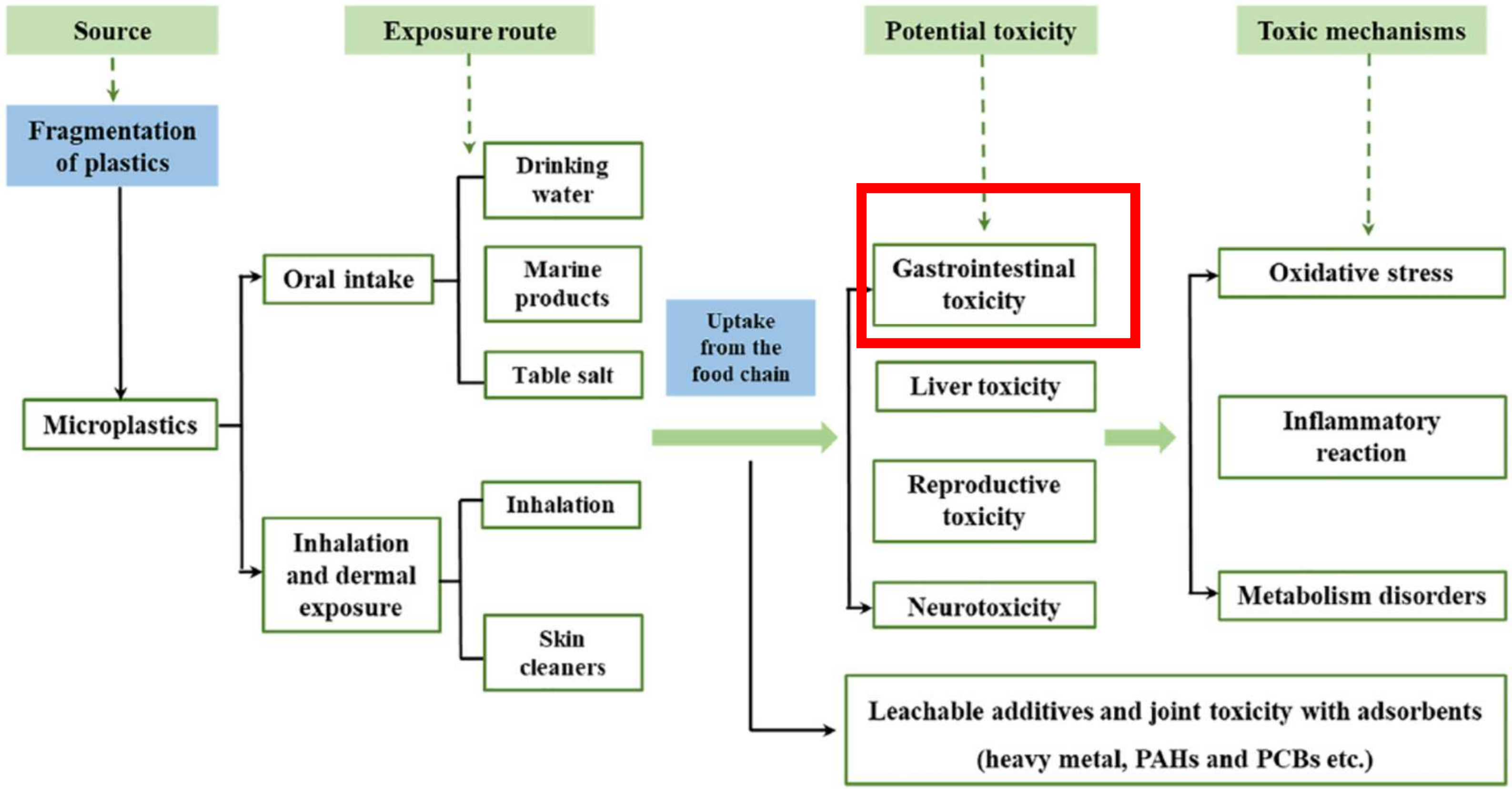


FIGURE 1 Summary of the main findings. Oral intake is the main route for human exposure to microplastics and nanoplastics as well as through inhalation and dermal exposure. The potential risks for human health are focused on their gastrointestinal toxicity, liver toxicity, reproductive toxicity, neurotoxicity and the joint toxicity of their adsorbed contaminants, which mechanisms could be involved in oxidative stress, inflammatory reaction and metabolism disorders

Microplastics and the gut microbiome: How chronically exposed species may suffer from gut dysbiosis

Gloria Fackelmann*, Simone Sommer

Marine Pollution Bulletin 143 (2019) 193–203

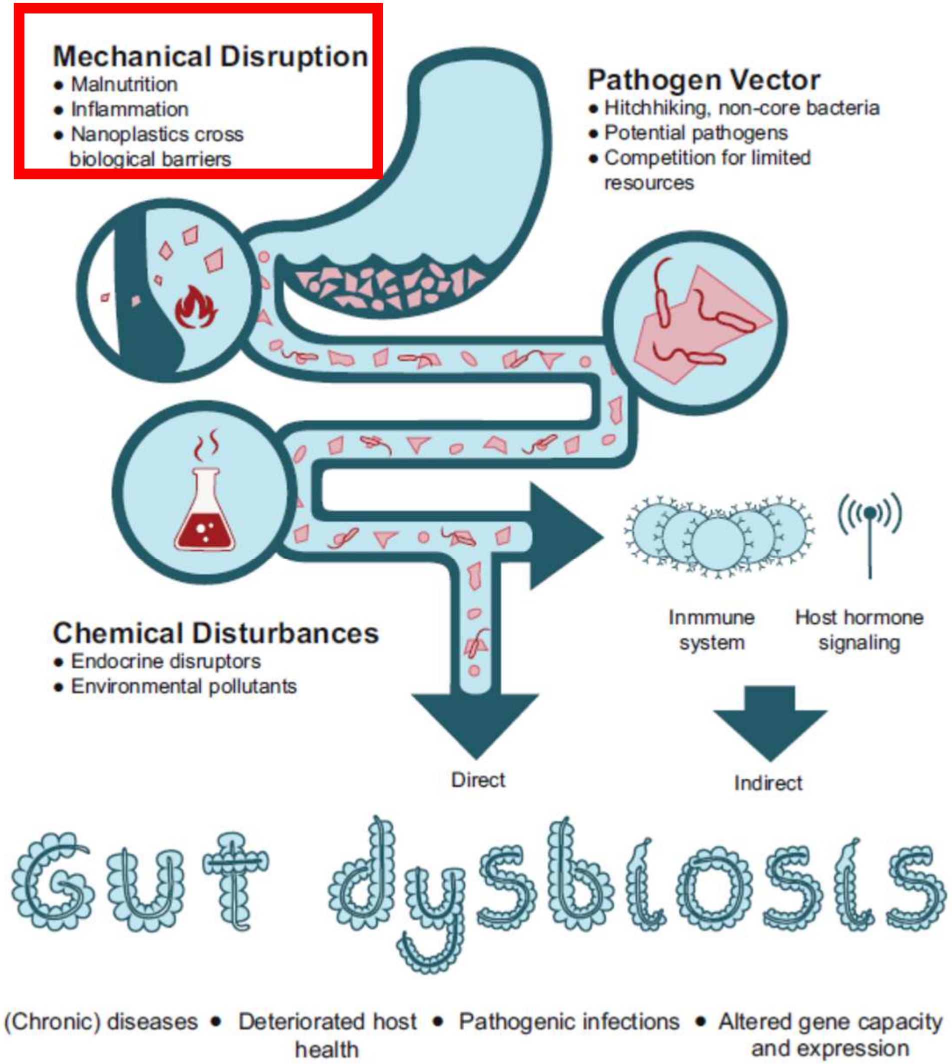


Fig. 1. Conceptual model of the possible impact points of microplastic ingestion on the gut microbiome and the mechanisms which could lead to gut dysbiosis. Microplastics can 1) cause mechanical disruption, leading to malnourished individuals, inflammation of the gastrointestinal tract, and the breakdown of microplastics to form nanoplastics able to cross biological barriers; 2) act as a vector for potential pathogens and foreign, non-core bacteria, leading to competition for limited resources with resident bacteria; 3) harbor chemicals known to disrupt the endocrine system and environmental chemicals such as persistent organic pollutants (POPs), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and dichlorodiphenyltrichloroethane (DDT). These factors may either directly or indirectly induce gut dysbiosis, the latter of which may involve the immune system, activated by inflammatory processes or pathogens; or host hormone signaling, engaged by endocrine disruptors. The disruption of the symbiosis between host and gut microbiome may trigger the onset of (chronic) diseases, deteriorate host health, promote pathogenic infections, and alter the gene capacity and expression of gut microbiota, leading to consequences not yet fathomed.

Presence of microplastics and nanoplastics in food, with particular focus on seafood

EFSA Journal

ADOPTED: 11 May 2016

Nanoplastics can enter cells;

Plastic and Human Health: A Micro Issue?

Stephanie L. Wright*[†,‡] and Frank J. Kelly[‡]

DOI: 10.1021/acs.est.7b00423
Environ. Sci. Technol. 2017, 51, 6634−6647

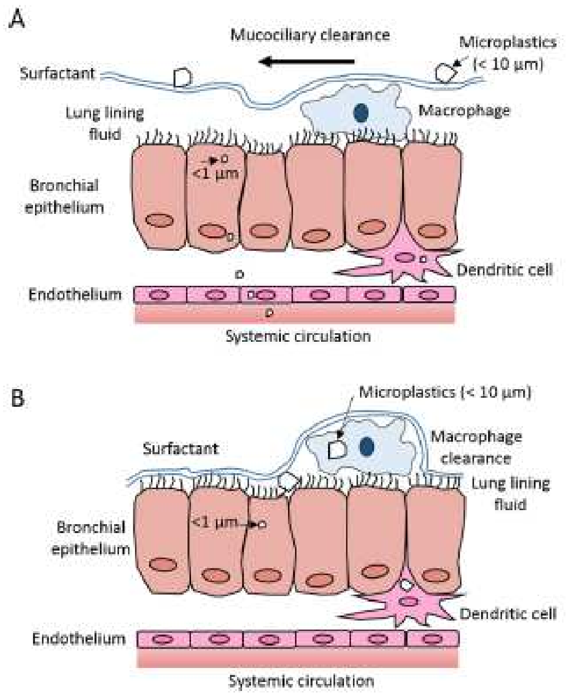


Figure 1. Potential microplastic (0.1 > 10 μm) uptake and clearance mechanisms in the lung. (A) The chance of microplastic displacement by the lung lining fluid (surfactant and mucus) is reduced in the upper airway, where the lining is thick (central lung). Here mucociliary clearance is likely for particles >1 μm. For particles <1 μm, uptake across the epithelium is possible.[107] (B) If the aerodynamic diameter of a microplastic permits deposition deeper in the lung, it may penetrate the thinner lung lining fluid and contact the epithelium, translocating via diffusion or active cellular uptake (adapted from ref 162). Reprinted from Ruge, C. A.; Kirch, J.; Lehr, C. M. Pulmonary drug delivery: From generating aerosols to overcoming biological barriers-therapeutic possibilities and technological challenges. *Lancet. Respir. Med.* 2013, 1(5), 402−413.[162] Copyright 2013 Elsevier.

Microplastics and the gut microbiome: How chronically exposed species may suffer from gut dysbiosis

Gloria Fackelmann*, Simone Sommer

Marine Pollution Bulletin 143 (2019) 193–203

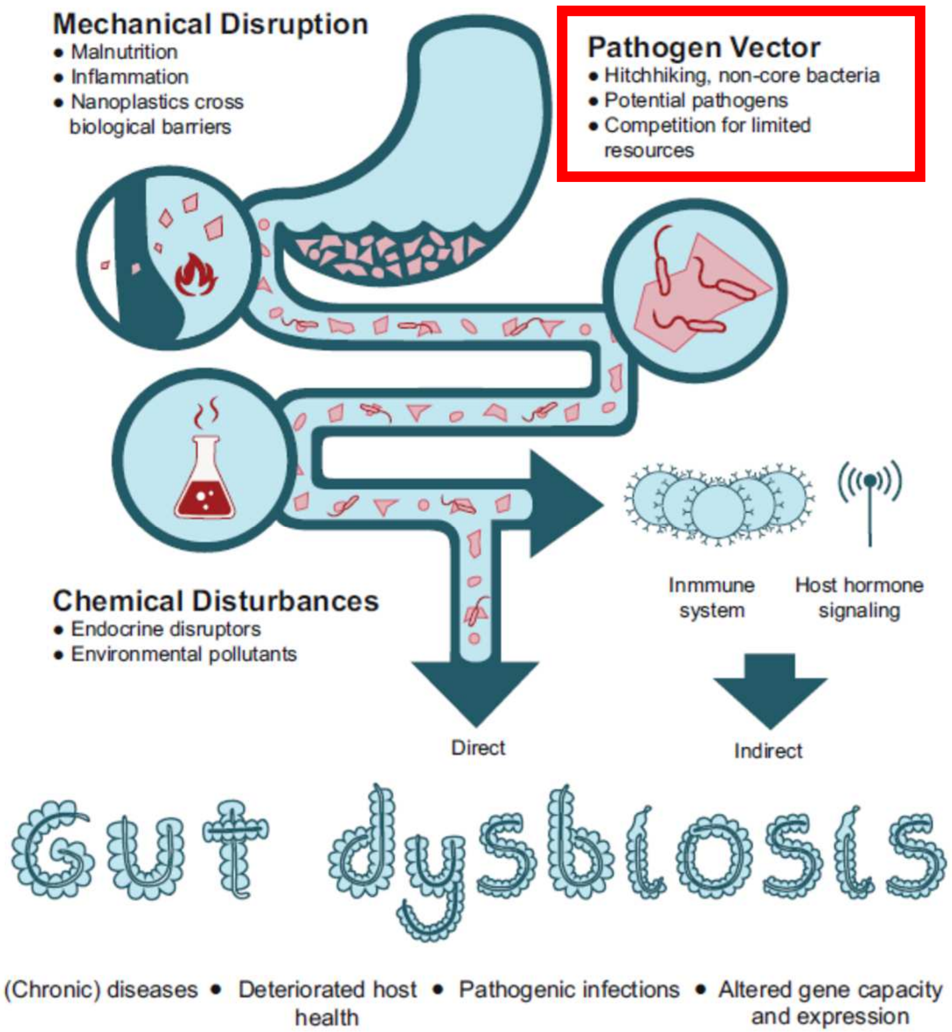


Fig. 1. Conceptual model of the possible impact points of microplastic ingestion on the gut microbiome and the mechanisms which could lead to gut dysbiosis. Microplastics can 1) cause mechanical disruption, leading to malnourished individuals, inflammation of the gastrointestinal tract, and the breakdown of microplastics to form nanoplastics able to cross biological barriers; 2) act as a vector for potential pathogens and foreign, non-core bacteria, leading to competition for limited resources with resident bacteria; 3) harbor chemicals known to disrupt the endocrine system and environmental chemicals such as persistent organic pollutants (POPs), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and dichlorodiphenyltrichloroethane (DDT). These factors may either directly or indirectly induce gut dysbiosis, the latter of which may involve the immune system, activated by inflammatory processes or pathogens; or host hormone signaling, engaged by endocrine disruptors. The disruption of the symbiosis between host and gut microbiome may trigger the onset of (chronic) diseases, deteriorate host health, promote pathogenic infections, and alter the gene capacity and expression of gut microbiota, leading to consequences not yet fathomed.

Microplastics and the gut microbiome: How chronically exposed species may suffer from gut dysbiosis

Gloria Fackelmann*, Simone Sommer

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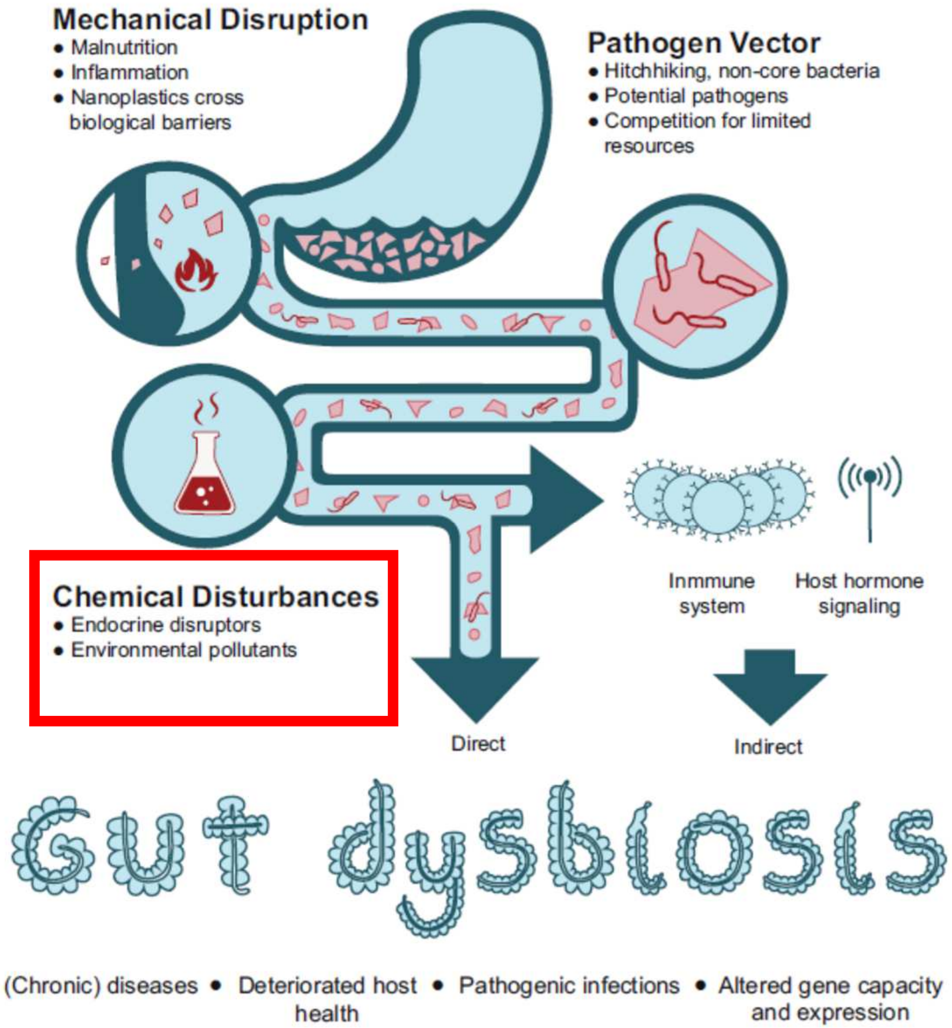


Fig. 1. Conceptual model of the possible impact points of microplastic ingestion on the gut microbiome and the mechanisms which could lead to gut dysbiosis. Microplastics can 1) cause mechanical disruption, leading to malnourished individuals, inflammation of the gastrointestinal tract, and the breakdown of microplastics to form nanoplastics able to cross biological barriers; 2) act as a vector for potential pathogens and foreign, non-core bacteria, leading to competition for limited resources with resident bacteria; 3) harbor chemicals known to disrupt the endocrine system and environmental chemicals such as persistent organic pollutants (POPs), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and dichlorodiphenyltrichloroethane (DDT). These factors may either directly or indirectly induce gut dysbiosis, the latter of which may involve the immune system, activated by inflammatory processes or pathogens; or host hormone signaling, engaged by endocrine disruptors. The disruption of the symbiosis between host and gut microbiome may trigger the onset of (chronic) diseases, deteriorate host health, promote pathogenic infections, and alter the gene capacity and expression of gut microbiota, leading to consequences not yet fathomed.

Potential health impact of environmental micro- and nanoplastics pollution

Xiaoru Chang | Yuying Xue | Jiangyan Li | Lingyue Zou | Meng Tang

J Appl Toxicol. 2020;**40**:4–15.

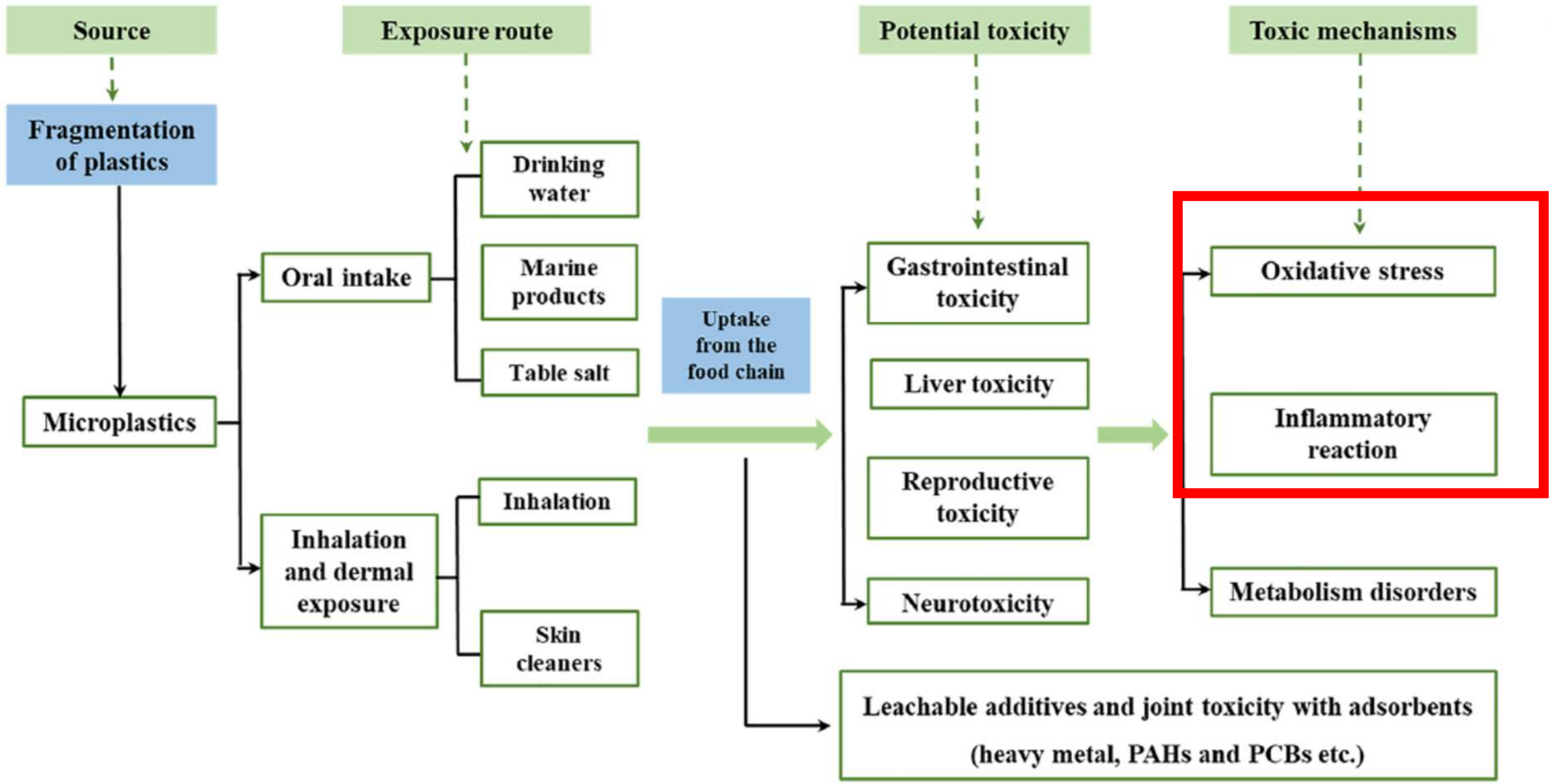


FIGURE 1 Summary of the main findings. Oral intake is the main route for human exposure to microplastics and nanoplastics as well as through inhalation and dermal exposure. The potential risks for human health are focused on their gastrointestinal toxicity, liver toxicity, reproductive toxicity, neurotoxicity and the joint toxicity of their adsorbed contaminants, which mechanisms could be involved in oxidative stress, inflammatory reaction and metabolism disorders

Airborne microplastics: Consequences to human health?☆

Joana Correia Prata

Environmental Pollution 234 (2018) 115–126

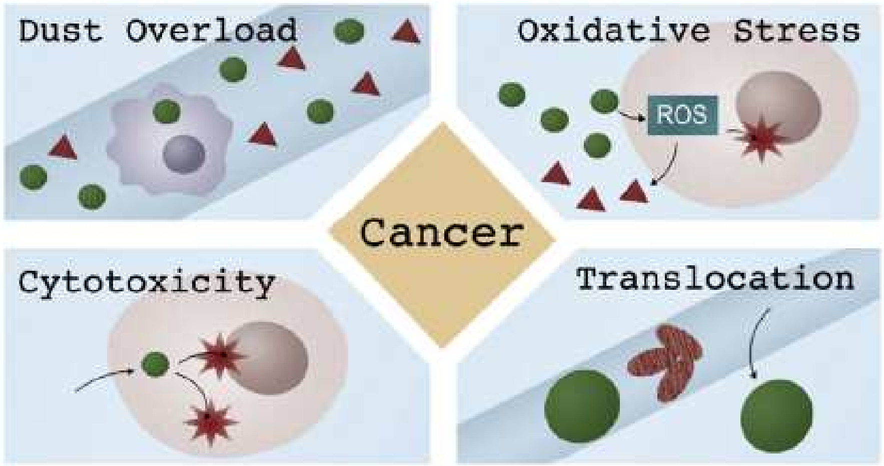
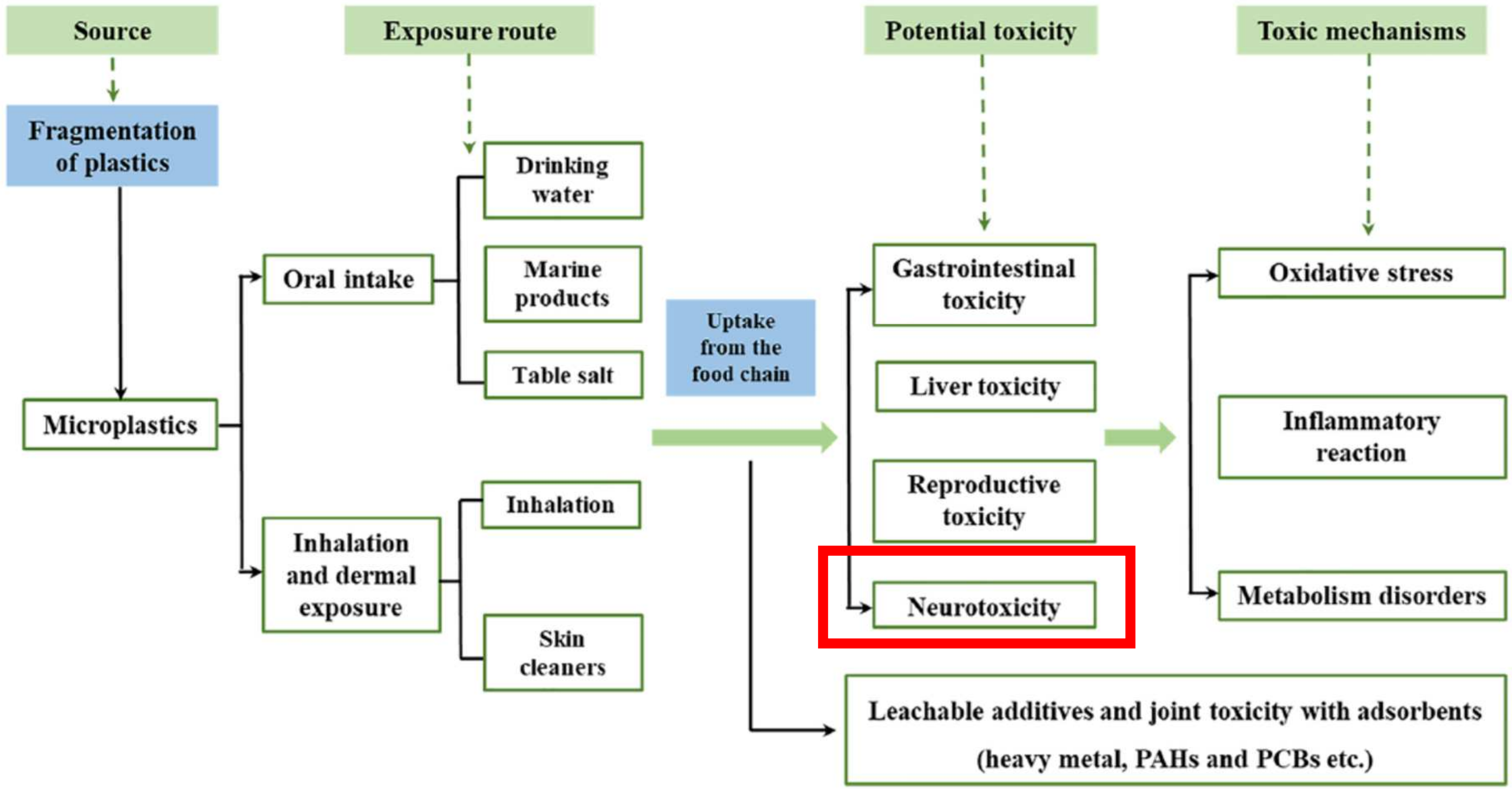


Fig. 2. Mechanisms of inhaled particle injury include dust overload (high surface particles induce high chemotactic gradients that prevent macrophage migration) (Tran et al., 2000), oxidative stress (production of radical oxygen species, or ROS, induce cell injury and the release of inflammatory mediators) (Churg and Brauer, 2000; Donaldson et al., 2002; Donaldson and Tran, 2002; Chang, 2010; Xia et al., 2006)., cytotoxicity (free intracellular particles may damage cellular structures) (Geiser et al., 2005), translocation (injury of secondary sites and vascular occlusion by particles or increased coagulability) (Galloway, 2015; Hamoir et al., 2003; Yacobi et al., 2008). Cancer may result from chronic inflammation or from gene mutation (Beckett, 2000; Chang, 2010; Churg and Brauer, 2000; Donaldson et al., 2002; Donaldson and Tran, 2002; Marsh et al., 1994; Mastrangelo et al., 2002; Valic and Zuskin, 1977).

Potential health impact of environmental micro- and nanoplastics pollution

Xiaoru Chang | Yuying Xue | Jiangyan Li | Lingyue Zou | Meng Tang

J Appl Toxicol. 2020;40:4–15.



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Particle and Fibre Toxicology (2020) 17:24

The plastic brain: neurotoxicity of micro- and nanoplastics

Minne Prüst, Jonelle Meijer and Remco H. S. Westerink*

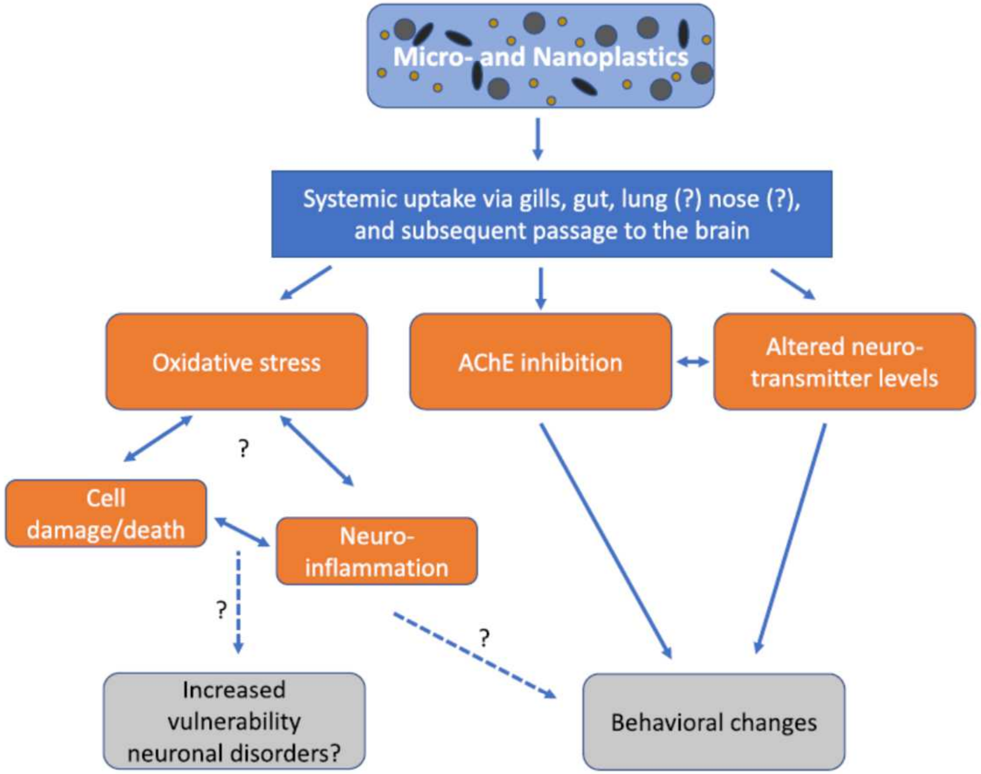
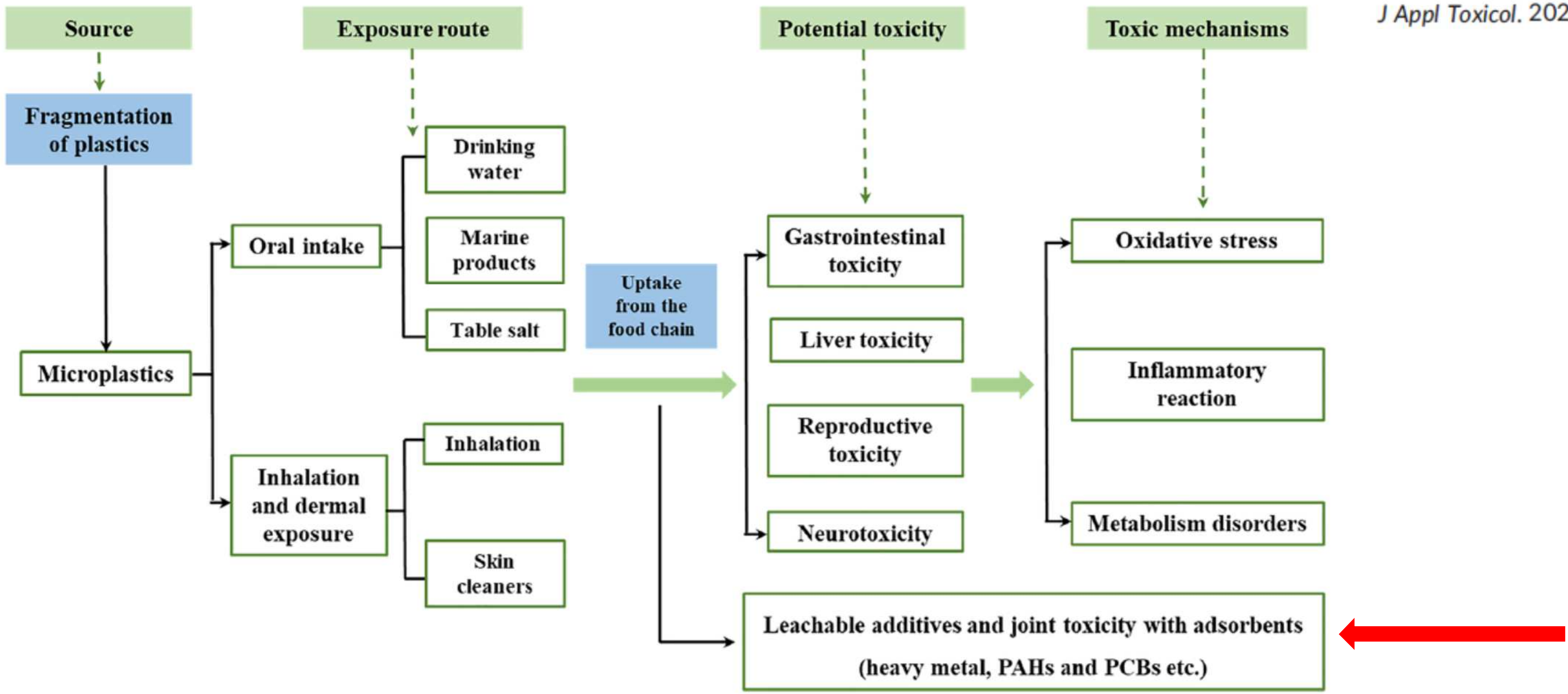


Fig. 1 Overview of the neurotoxic effects of micro- and nanoplastics. Plastic particles can reach the systemic circulation and ultimately the brain via uptake through the gills, gut and possibly also the lungs or directly via the nasal cavity. Once in the brain, micro- and nanoplastics can induce oxidative stress, potentially resulting in cellular damage and neuroinflammation, which may ultimately increase onset and development of neurodevelopmental and/or neurodegenerative disorders. Micro- and nanoplastics in the brain can also results in inhibition of AChE and changes in neurotransmitter levels, which likely contribute to the observed behavioral changes. It should be noted though that most evidence is fragmentary and obtained from different, mainly aquatic species, highlighting the need for extensive systematic research to fully elucidate the neurotoxic potential of micro- and nanoplastics. See Table 1 for details

Potential health impact of environmental micro- and nanoplastics pollution

Xiaoru Chang | Yuying Xue | Jiangyan Li | Lingyue Zou | Meng Tang

J Appl Toxicol. 2020;40:4–15.



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Risks of Plastic Debris: Unravelling Fact, Opinion, Perception, and Belief

DOI: 10.1021/acs.est.7b02219
Environ. Sci. Technol. 2017, 51, 11513−11519

Albert A. Koelmans,*[,†,‡] Ellen Besseling,[†,‡] Edwin Foekema,[‡,§] Merel Kooi,[†] Svenja Mintenig,[∥,⊥] Bernadette C. Ossendorp,[#] Paula E. Redondo-Hasselerharm,[†] Anja Verschoor,[#] Annemarie P. van Wezel,[∥,⊥] and Marten Scheffer[†]

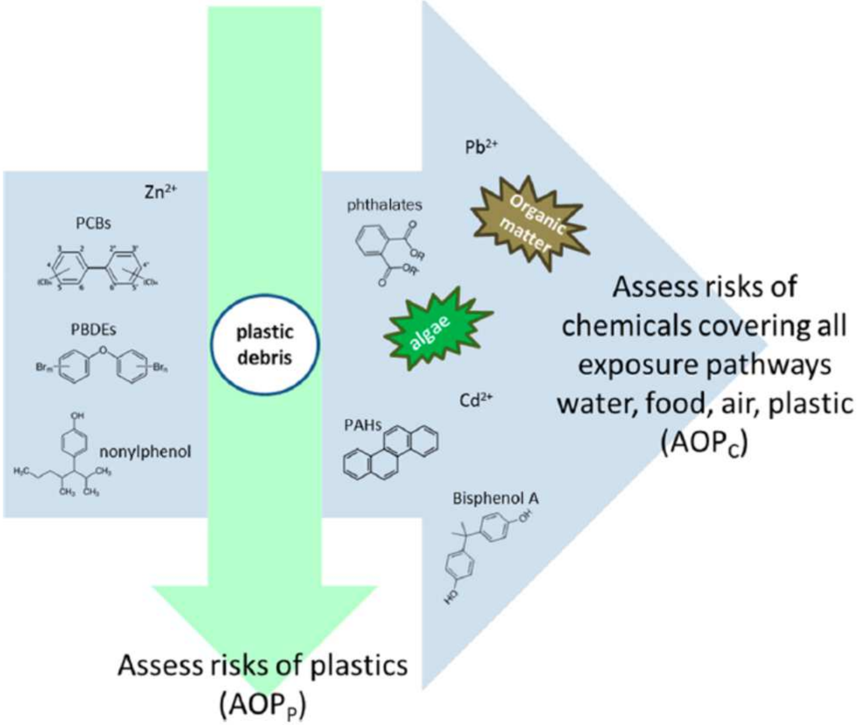


Figure 3. Separating the chemical component (horizontal arrow) from the physical component (vertical arrow) of the risk of plastic debris. If a certain type of plastic particle causes an adverse effect on an organism different from that of another type of particle, then it needs another ERM. Risk assessment of the plastic particle proceeds following adapted versions of existing frameworks for chemicals and/or particles.

Recent advances in toxicological research of nanoplastics in the environment: A review☆

Environmental Pollution 252 (2019) 511–521

Maocai Shen [1], Yaxin Zhang [1], Yuan Zhu [1], Biao Song [1], Guangming Zeng*, Duofei Hu, Xiaofeng Wen, Xiaoya Ren

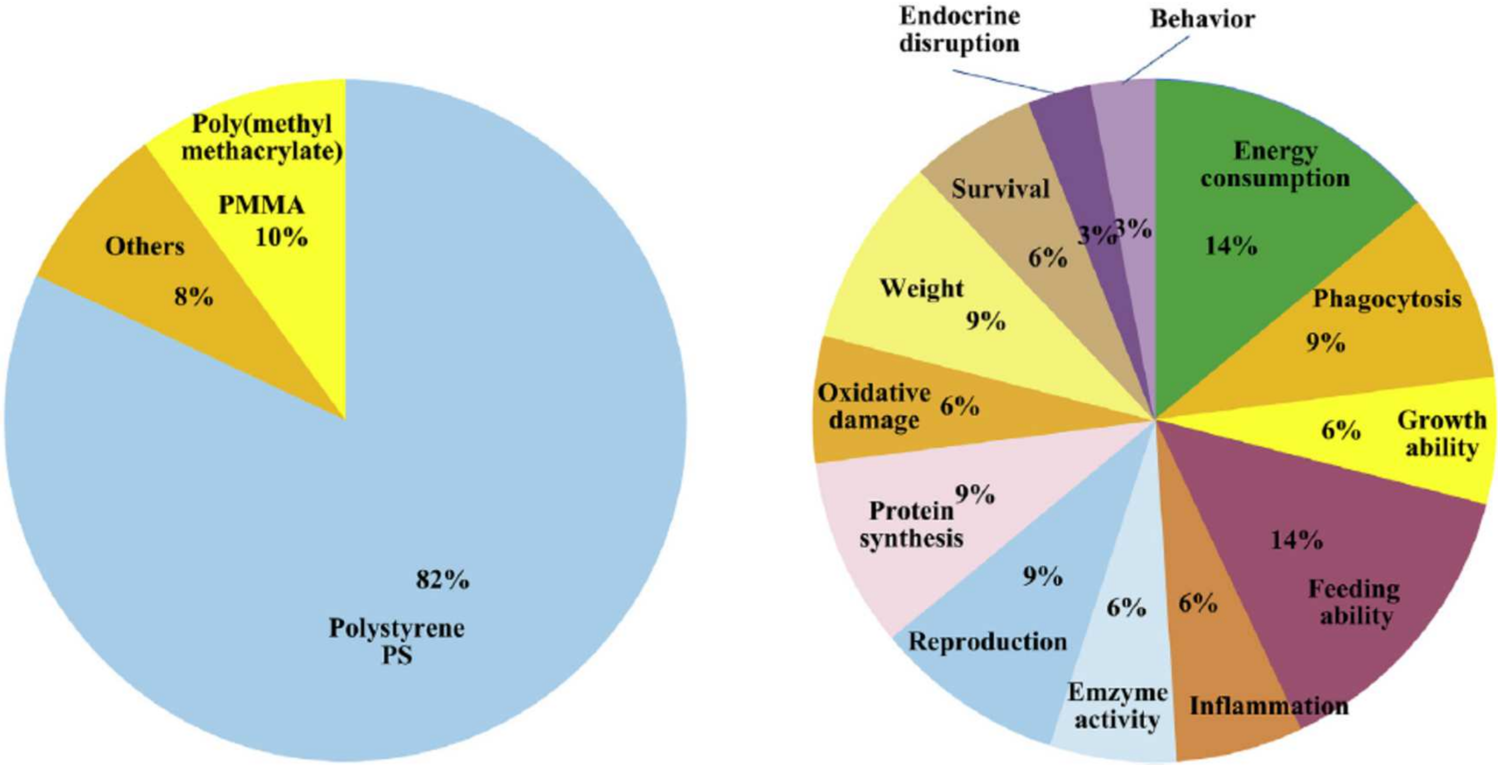


Fig. 2. Analysis of nanoplastics toxic effects to test subjects. The left refers different polymers used in experiments, and the right refers different toxic endpoints observed in tests. Polystyrene nanoplastic particles were commonly used in tests, and the toxic effects of nanoplastics were mainly evaluated at sub-lethal levels, such as energy consumption, feeding ability, reproduction, growth rate, oxidative damage, oviposition, enzyme activity and behavioral abnormalities.

Potential Health Impact of Environmentally Released Micro- and Nanoplastics in the Human Food Production Chain: Experiences from Nanotoxicology

Hans Bouwmeester,* Peter C. H. Hollman, and Ruud J. B. Peters

DOI: 10.1021/acs.est.5b01090
Environ. Sci. Technol. 2015, 49, 8932–8947

Table 2. Leachable Chemicals from Plastics.[17,36]

type of additive	function
Phthalates	Plasticizer
monomethyl phthalate (MMP)	
dimethyl phthalate (DMP)	
diethylhexyl phthalate (DEHP)	
butylbenzyl phthalate (BBzP)	
monobutyl phthalate (MBP)	
dibutyl phthalate (DBP)	
Alkylphenols	Plastizer/Stabilizer
trisnonylphenol phosphites (TNP)	
nonylphenol (NP)	
octylphenol (OP)	
Bisphenol A (BPA)	Monomer/Additive
Organotin Compounds	Stabilizer
mono- en dialkyltin carboxylates	
tin mercaptans	
tin sulfides	
Polybrominated Diphenyl Ethers (PBDEs)	Flame Retardant
tetrabromobisphenol A (TBBPA)	

DEFINIZIONE

- **Sostanza o materiale esogeno che possa alterare una o più funzioni del sistema endocrino e conseguentemente causare effetti avversi sulla salute di un organismo sano e della sua progenie**
    - ***European Commission***

- **Qualsiasi sostanza esogena in grado di interferire con la sintesi, la secrezione, il trasporto, il metabolismo, il legame recettoriale o l'escrezione di una sostanza endogena con azione ormonale normalmente in grado di garantire l'omeostasi, il normale sviluppo e la funzione riproduttiva di un individuo**
    - ***U. S. Environmental Protection Agency***

DOVE SI TROVANO ?

Emergent contaminants: Endocrine disruptors and their laccase-assisted degradation – A review

Carlos Barrios-Estrada [a], Magdalena de Jesús Rostro-Alanis [a], Blanca Delia Muñoz-Gutiérrez [a], Hafiz M.N. Iqbal [a,*], Soundarapandian Kannan [b], Roberto Parra-Saldívar [a,*]

Science of the Total Environment 612 (2018) 1516–1531

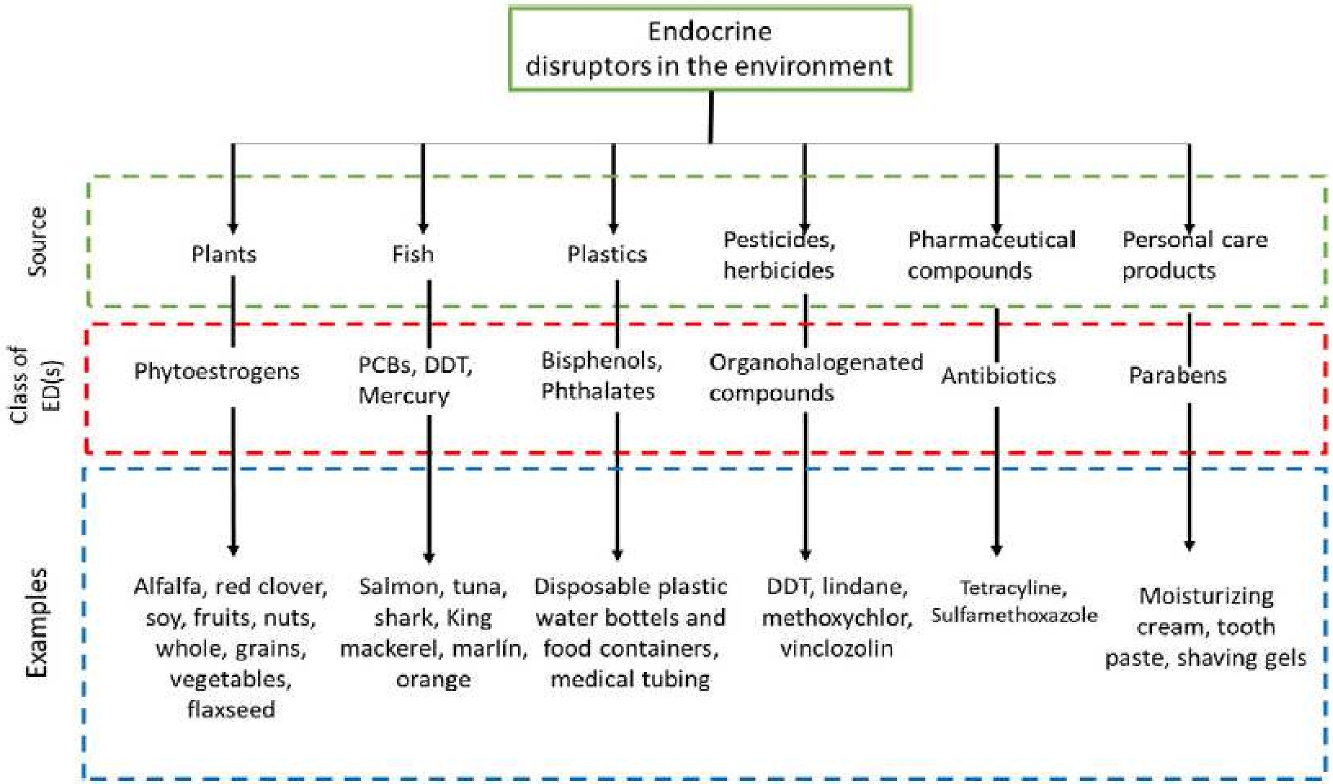


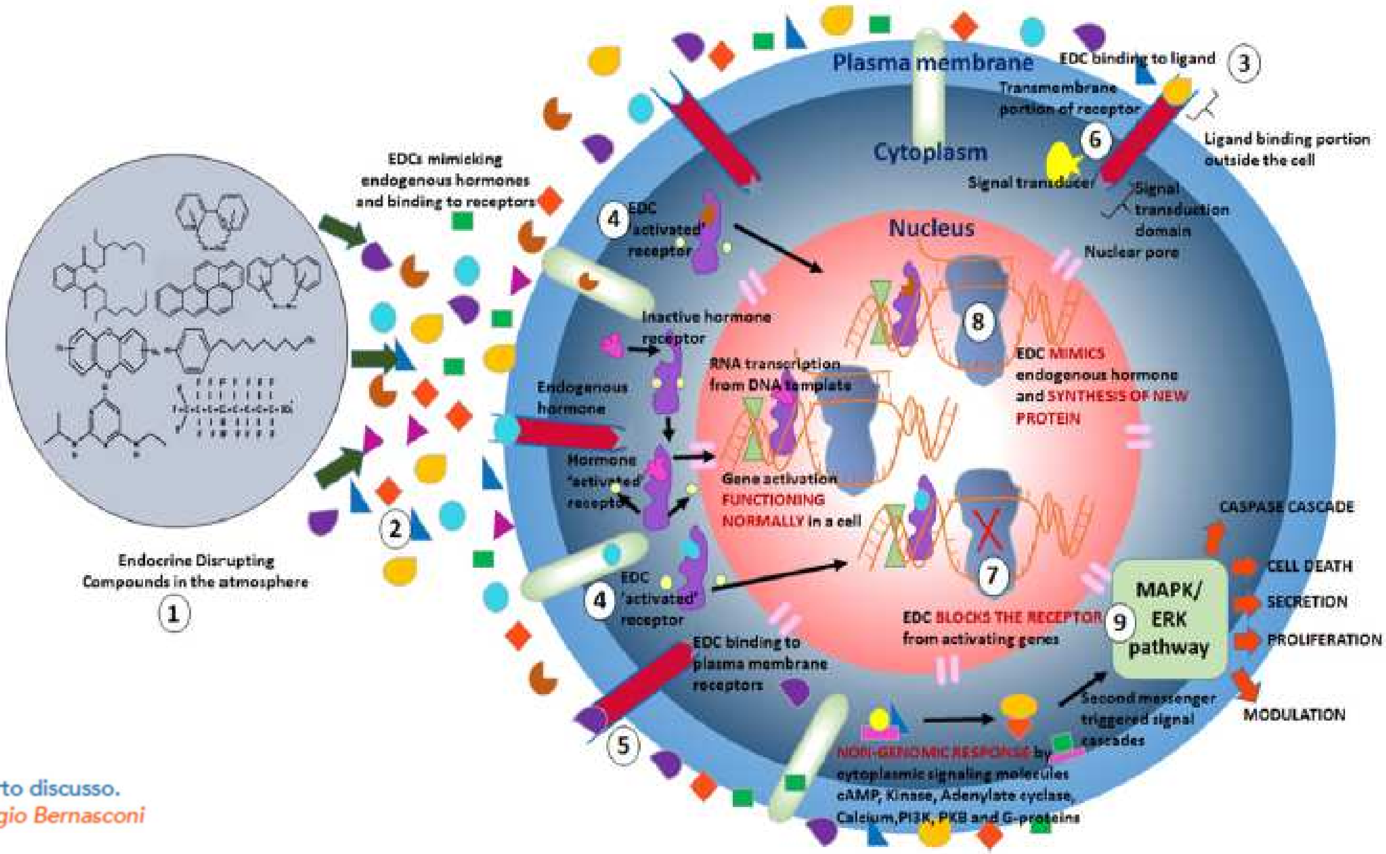
Fig. 2. Common sources of EDs in the environment.

MECCANISMO D'AZIONE

Endocrine disrupting chemicals in the atmosphere: Their effects on humans and wildlife

Jayshree Annamalai *, Vasudevan Namasivayam

Environment International 76 (2015) 78–97



IMPATTO SULLA SALUTE ?

EDC-2: The Endocrine Society's Second Scientific Statement on Endocrine-Disrupting Chemicals

A. C. Gore, V. A. Chappell, S. E. Fenton, J. A. Flaws, A. Nadal, G. S. Prins, J. Toppari, and R. T. Zoeller

Figure 1.

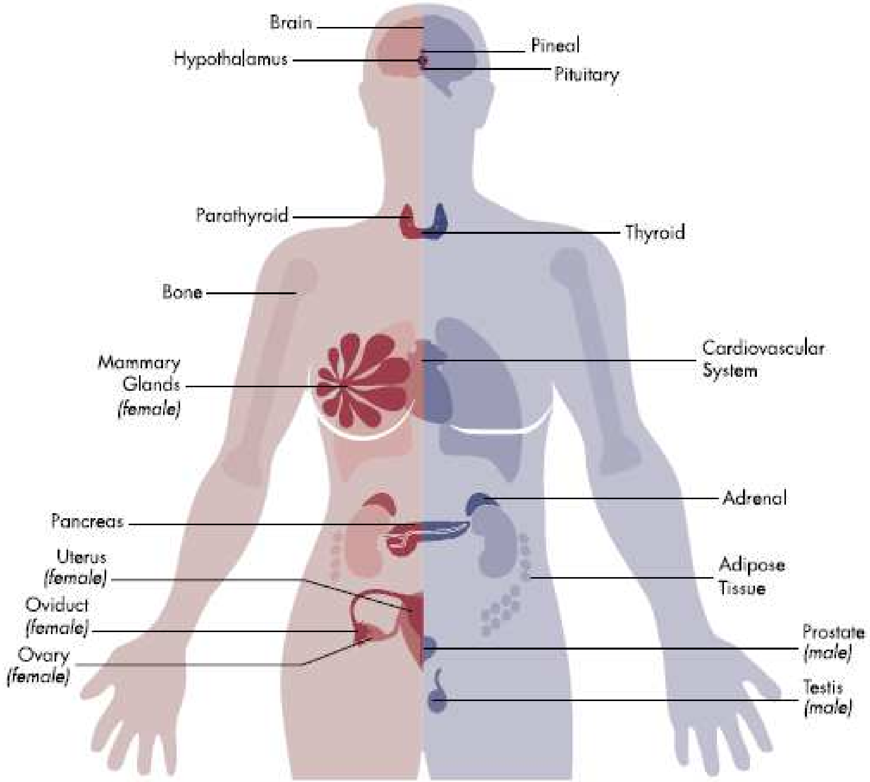


Figure 1. Diagram of many of the body's endocrine glands in females (left) and males (right).

Endocrine Disruptors: Time to Act

Curr Envir Health Rpt (2014) 1:325–332

**Mariana F. Fernández · Marta Román ·
Juan Pedro Arrebola · Nicolás Olea**

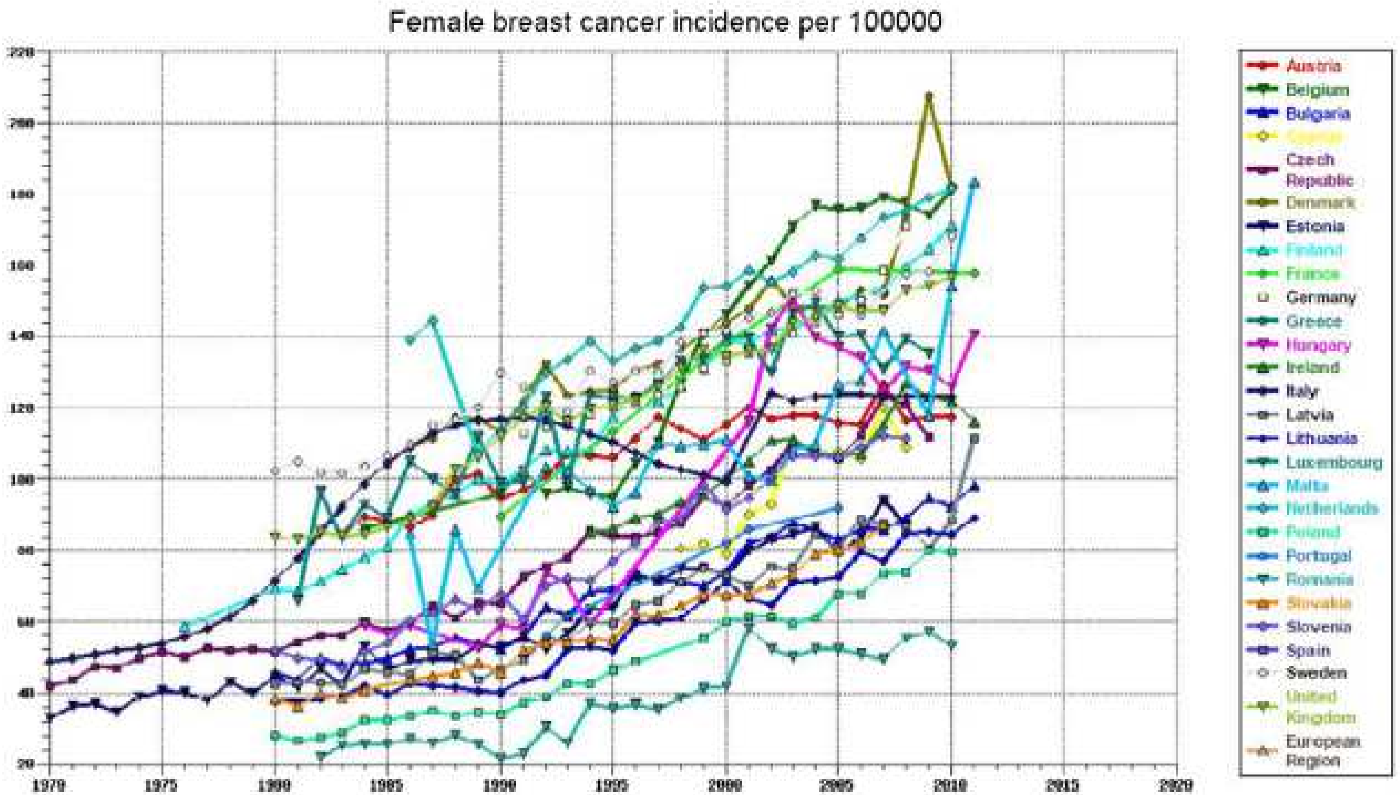


Fig. 2 Trends in breast cancer incidence in 27 European countries. Analysis of the European health for all database (online database). Copenhagen, WHO Regional Office for Europe, 2014 (http://data.euro.who.int/hfadb/)

Adipocytes under assault: Environmental disruption of adipose physiology☆

Biochimica et Biophysica Acta 1842 (2014) 520–533

Shane M. Regnier [a], Rc

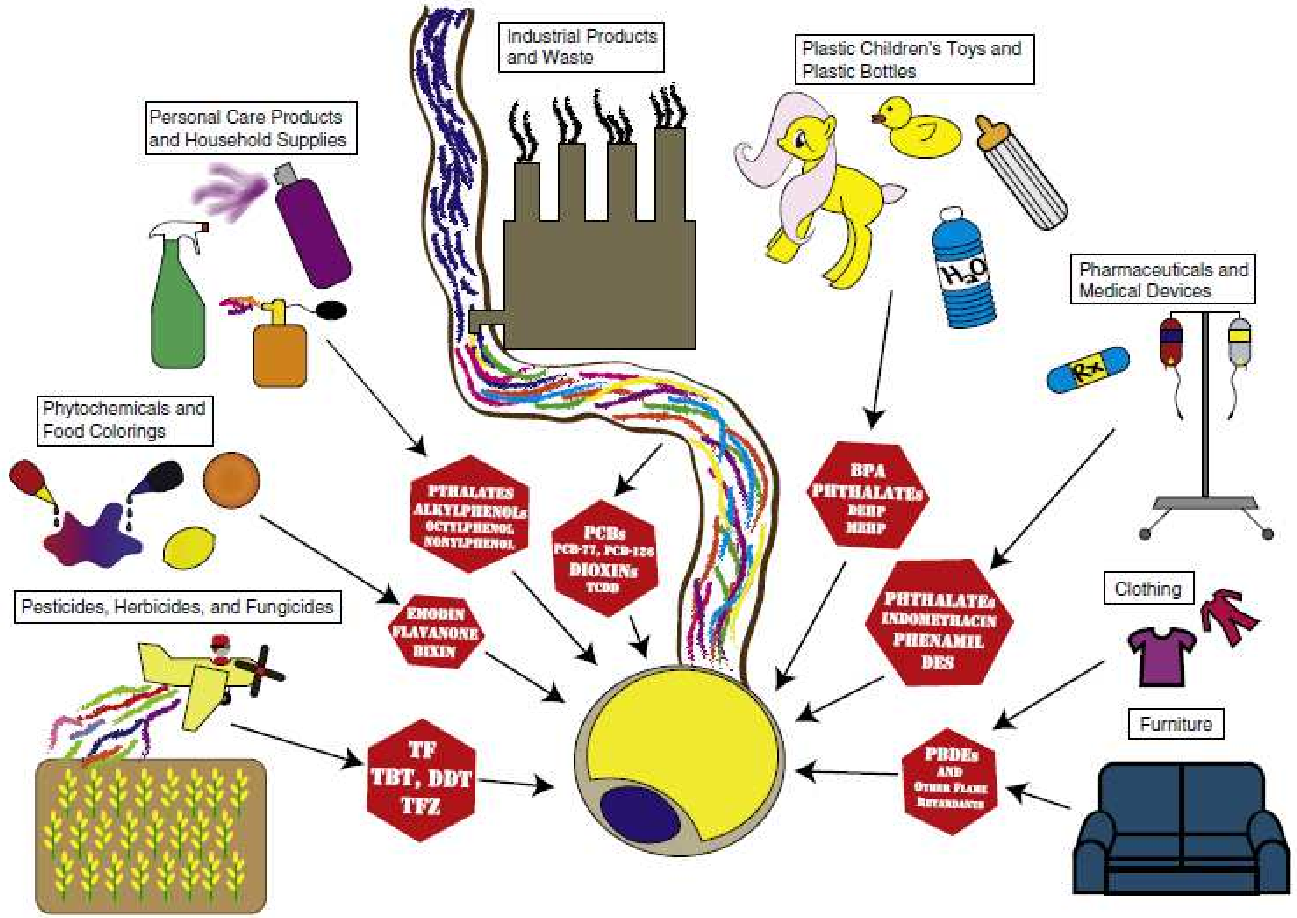


Fig. 1. Adipocytes Under Assault: endocrine disrupting chemicals and their sources. BPA, bisphenol A; DDT, dichlorodiphenyltrichloroethane; DEHP, di-2-ethylhexyl phthalate; DES, diethylstilbestrol; MEHP, mono-ethylhexyl phthalate; 4-NP, 4-nonylphenol; PBDEs, polybrominated diphenyl ethers; PCB, polychlorinated biphenyl; TF, tolylfluanid; TBT, tributyltin; TCDD, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin; TFZ, triflumizole.

International Federation of Gynecology and Obstetrics opinion on reproductive health impacts of exposure to toxic environmental chemicals☆

International Journal of Gynecology and Obstetrics 131 (2015) 219–225

Gian Carlo Di Renzo [a], Jeanne A. Conry [b], Jennifer Blake [c], Mark S. DeFrancesco [b], Nathaniel DeNicola [b], James N. Martin Jr. [b], Kelly A. McCue [b], David Richmond [d], Abid Shah [d], Patrice Sutton [e], Tracey J. Woodruff [e,*], Sheryl Ziemin van der Poel [f], Linda C. Giudice [g]

Box 1

Adverse health outcomes linked with preconception and prenatal exposure to environmental chemicals.[a]

Neurodevelopment

- Impaired cognitive and neurodevelopment, increase in attention problems and attention deficit hyperactivity disorder behaviors at age 5 years, and reduction in working memory capabilities at age 7 years with pesticides [74–77]
- Impaired neurodevelopment in girls and reduction in executive function at age 4–9 years with phthalates [78,79]
- Intellectual impairment with lead [80]
- Reduced cognitive performance, impaired neurodevelopment, and reduced psychomotor outcomes with methyl mercury [81–85]
- Decreased placental expression of genes implicated in normal neurodevelopmental trajectories with increasing in utero exposure to fine particle air pollution [86]
- Reduced intelligence quotient score and a wide range of attention and executive function deficits with PCBs [87–91]
- Impaired neurodevelopment and reduction in sustained attention with polybrominated diphenol ethers [92,93]
- Attention problems at age 6–7 years with polycyclic aromatic hydrocarbons [94,95]
- Aggression and hyperactivity in girls, and reduction in executive functioning skills in girls aged 3 years with bisphenol A [96,97]

Elucidating the Links Between Endocrine Disruptors and Neurodevelopment

(*Endocrinology* 156: 1941–1951, 2015)

Thaddeus T. Schug, Ashley M. Blawas, Kimberly Gray, Jerrold J. Heindel, and Cindy P. Lawler

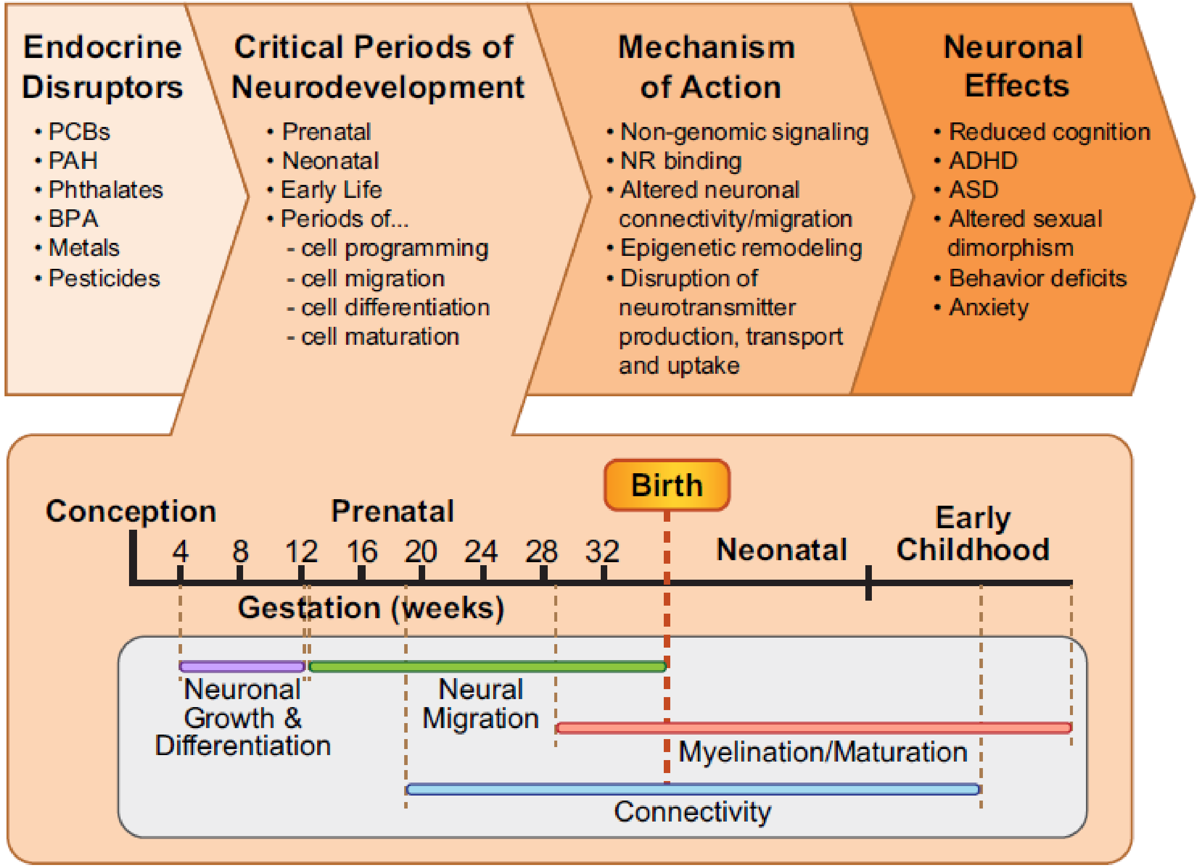


Figure 2. Schematic diagram illustrating how exposure to EDCs during critical periods of development can lead to neurodevelopmental disease.

IMPATTO SULLA SALUTE ?

Early Life Exposure to Endocrine Disrupting Chemicals and Childhood Obesity and Neurodevelopment

Joseph M. Braun[1]
[1]Department of Epidemiology, Brown University, Providence, RI 02912

Nat Rev Endocrinol. 2017

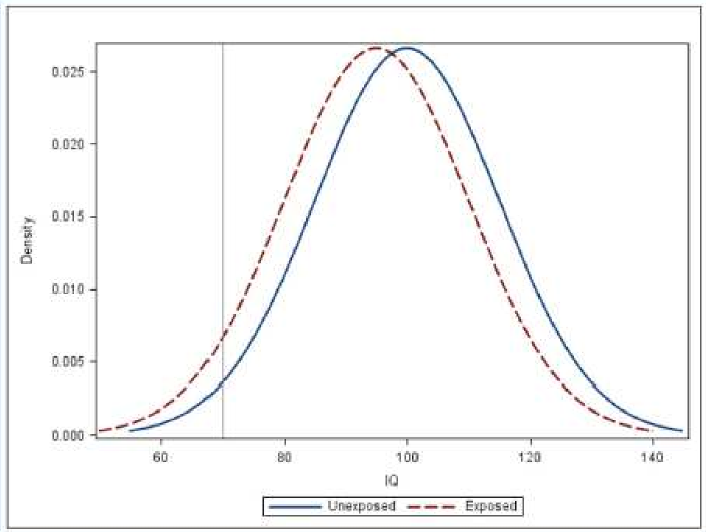


Figure B1.
Density Distribution of IQ in EDC Unexposed and Exposed Populations
Figure B1 represents the distribution of IQ in two populations of one million individuals each. The grey line signifies the threshold for IQ scores consistent with intellectual disabilities (IQ<70).
In the unexposed population, the mean IQ is 100 (standard deviation=15), while in the exposed population the mean IQ is 95 (standard deviation=15). This 5-point shift in IQ results in nearly a doubling in the proportion of people with IQ scores consistent with intellectual disabilities (IQ<70) in the exposed population (4.48%) compared to the unexposed population (2.27%).

Minireview: Transgenerational Epigenetic Inheritance: Focus on Endocrine Disrupting Compounds

Endocrinology, August 2014, 155(8):2770–2780

Emilie F. Rissman and Mazhar Adli

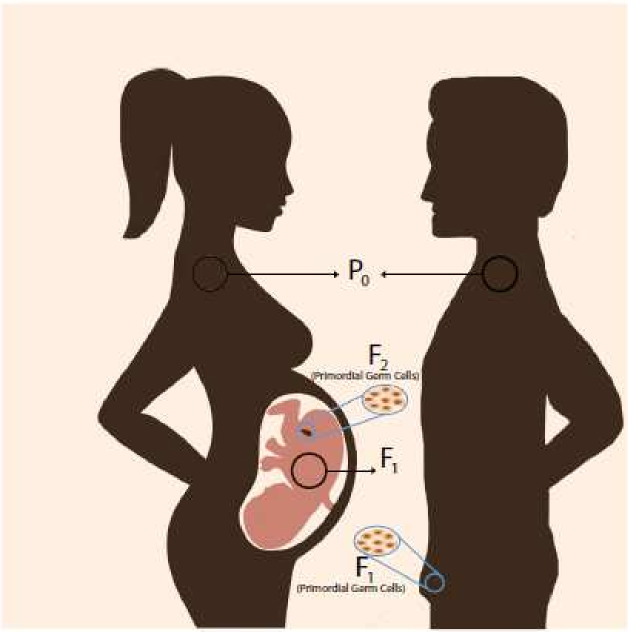


Figure 1. A cartoon of the multiple generations comprising transgenerational inheritance. A pregnant woman (P0) carries genetic and epigenetic information for up to the F2 generation. Her fetus (F1) and its germ cells (F2) may be affected by environmental exposures such as EDCs. For any changes in the F1 phenotype or epigenetic state to be considered transgenerational, the aberrant epigenetic state has to be sustained until at least the F3 generation. In contrast to females, EDC exposure in males (P0) will potentially change his germ cells, which will be the F1 generation. However, because the F2 germ cells are not exposed, any phenotypic or epigenetic changes noted in F2 can be considered transgenerational.

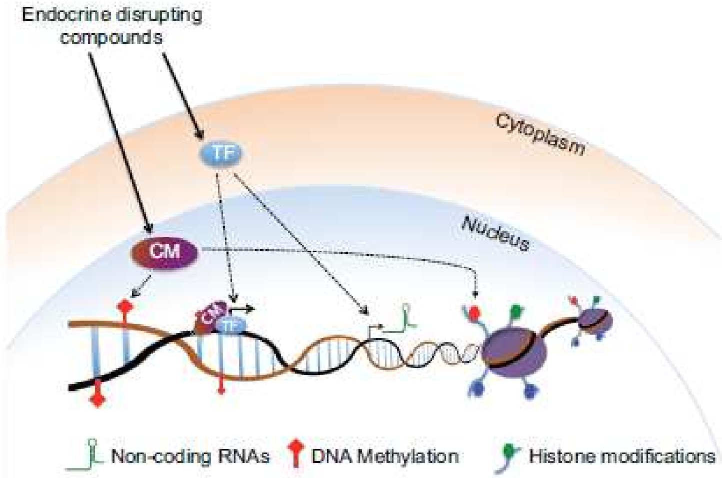


Figure 3. A general model depicting epigenetic alterations upon exposure to EDCs. EDCs bind to steroid receptors, and other TFs, thereby changing the local chromatin states and expression of various chromatin modifiers (CM) such as histone and DNA modifiers or ncRNAs. Moreover, EDCs can change the composition or the activity of epigenetic chromatin regulator complexes and thereby act directly on the global epigenome.

INTERFERENTI ENDOCRINI

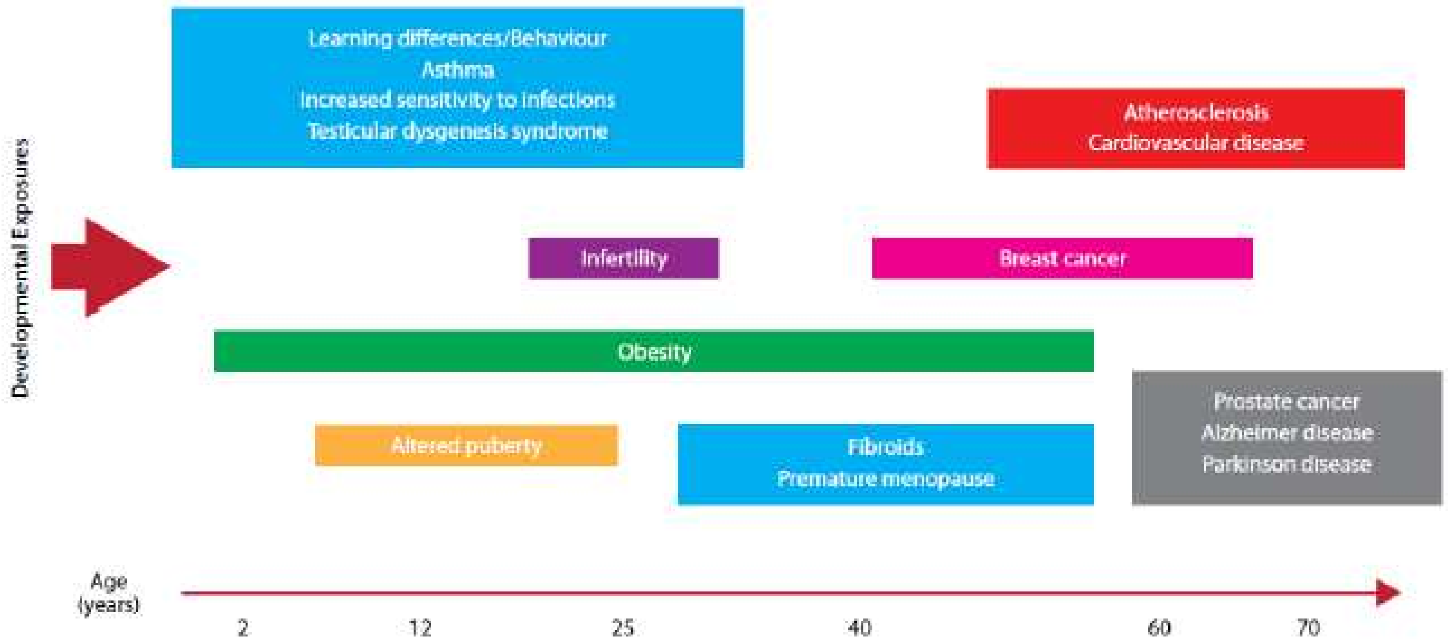


Figure 2: Several diseases and dysfunctions across all ages are linked to early exposure to endocrine disrupting chemicals (source: WHO. (2012). State of Science of Endocrine Disrupting Chemicals).

This article is produced with financial support of the Life+ programme of DG Environment of the European Commission.

Controversie

Evidence to Practice

Endocrine-Disrupting Chemicals

Andrea C. Gore, PhD

JAMA Internal Medicine November 2016 Volume 176, Number 11

Limitations of the Evidence

Several challenges remain in the field of EDCs and endocrine health and disease. First, the ability to directly relate an exposure to a disease outcome is virtually impossible, especially when the lag time can be years.

Controversie

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Endocrine-Disrupting Chemicals

Andrea C. Gore, PhD

JAMA Internal Medicine November 2016 Volume 176, Number 11

Limitations of the Evidence

Several challenges remain in the field of EDCs and endocrine health and disease. First, the ability to directly relate an exposure to a disease outcome is virtually impossible, especially when the lag time can be years. Second endogenous hormonal actions at one dosage do not necessarily predict effects at another; such nonmonotonic dose-response curves are probably the norm for both physiological systems and for EDC actions.

MICROBIOME Research Hub

Controversie

Evidence to Practice

Endocrine-Disrupting Chemicals

Andrea C. Gore, PhD

JAMA Internal Medicine November 2016 Volume 176, Number 11

Limitations of the Evidence

Third, EDCs are not pure agonists or antagonists of a single hormone receptor or pathway.

Controversie

Evidence to Practice

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JAMA Internal Medicine November 2016 Volume 176, Number 11

Fourth humans are typically exposed to EDCs at low dosages and in diverse mixtures. While some have questioned whether low-dose EDC exposures are relevant, the facts that (1) hormone receptors have exquisitely high sensitivity to endogenous hormones, (2) most EDCs do not interact with binding proteins, and (3) EDCs may be resistant to metabolic breakdown means that EDCs have greater bioavailability and persistence, causing very low dosages to have biological effects. These areas warrant further exploration.

MICROBIOME Research Hub

PESTICIDI NELLE MELE		BIO		NON BIO	
PUNTO VENDITA e indirizzo	**Tipo di negozio**	**Numero di pesticidi**	**Entro i limiti di legge?**	**Numero di pesticidi**	**Entro i limiti di legge?**
MILANO					
BIOMÌ via E. de Marchi 59	negozio biologico	0	sì	non in vendita	
NATURA SÌ viale Fulvio Testi 111 (Cinisello Balsamo)	negozio biologico	0	sì	non in vendita	
PORTANATURA.IT	online	0	sì	non in vendita	
ESSELUNGA viale Zara 123	supermercato	0	sì	4	sì
IL GIGANTE viale Italia (Sesto S.G.)	supermercato	0	sì	3	sì
IPER via don Luigi Palazzolo 20	ipermercato	0	sì	3	sì
IPERCOOP viale Sarca (Sesto S.G.)	ipermercato	0	sì	3	sì
FRUTTA E VERDURA LEONELLI ILEANA via Ornato	fruttivendolo	non in vendita		3	sì
JABALE NOOR via Zuretti	ambulante	non in vendita		2	sì
ROMA					
CANESTRO viale Gorizia 51	negozio biologico	0	sì	non in vendita	
PIACERE BIO via Giano della Bella 51	negozio biologico	0	sì	non in vendita	
PIÙ BIO viale dei Consoli 165	negozio biologico	0	sì	non in vendita	
CARREFOUR via Ferri 43	ipermercato	0	sì	4	sì
LECLERC CONAD via Arola 55	ipermercato	0	sì	3	sì
PANORAMA via Gino Frontali 14	ipermercato	0	sì	4	sì
SUPER ELITE via Appia Nuova 472/480	supermercato	0	sì	3	sì
BOX 22 UNA MELA AL GIORNO piazza Epiro	ambulante	non in vendita		3	sì
FRUTTA ITALIANA via Collatina 65	fruttivendolo	non in vendita		4	sì
VINCENZO FRUITS via Enea 46/48	fruttivendolo	non in vendita		3	sì

MICROBIOME Research Hub

Controversie

Estimating Burden and Disease Costs of Exposure to Endocrine-Disrupting Chemicals in the European Union

(*J Clin Endocrinol Metab* 100: 0000–0000, 2015)

Table 3. Criteria for Evaluating Toxicological Evidence

Quality of Evidence	Interpretation	Study Design
Strong, group 1 (endocrine disruptor)	There is a strong presumption that the chemical has the capacity to cause the health effect through an endocrine disruptor mechanism.	The animal studies provide clear evidence of the ED effect in the absence of other toxic effects, or if occurring together with other toxic effects, the ED effects should not be a secondary nonspecific consequence of other toxic effects. However, when there is, eg, mechanistic information that raises doubt about the relevance of the effect for humans or the environment, group 2 may be more appropriate. Substances can be allocated to this group based on: Adverse in vivo effects where an ED mode of action is plausible ED mode of action in vivo that is clearly linked to adverse in vivo effects (eg, by read across)
Moderate, group 2a (suspected endocrine disruptor)	There is some evidence from experimental animals, yet the evidence is not sufficiently convincing to place the substance in group 1.	The health effects are observed in the absence of other toxic effects, or if occurring together with other toxic effects, the ED effect should be considered not to be a secondary nonspecific consequence of other toxic effects. Substances can be allocated to this group based on: Adverse effects in vivo where an ED mode of action is suspected ED mode of action in vivo that is suspected to be linked to adverse effects in vivo ED mode of action in vitro combined with toxicokinetic in vivo data (and relevant non-test information such as read across, chemical categorization, and QSAR predictions)
Weak, group 2b (potential endocrine disruptor)	There is some evidence indicating potential for endocrine disruption in intact organisms.	There is some in vitro/in silico evidence indicating a potential for endocrine disruption in intact organisms or effects in vivo that may, or may not, be ED-mediated.

Abbreviations: ED, ●●●●; QSAR, quantitative structure–activity relationship. Adapted from Ref. 36.

Controversie

- ESPOSOMA
- BIOMARKERS
- METABOLOMICA
- PROTEINOMICA
- TRANSCRIPTOMICA
- ALTRE «OMICHE»

Exposures to Endocrine Disrupting Chemicals in Consumer Products—A Guide for Pediatricians

Katelyn H. Wong,[a] and Timur S. Durrani[b,c]

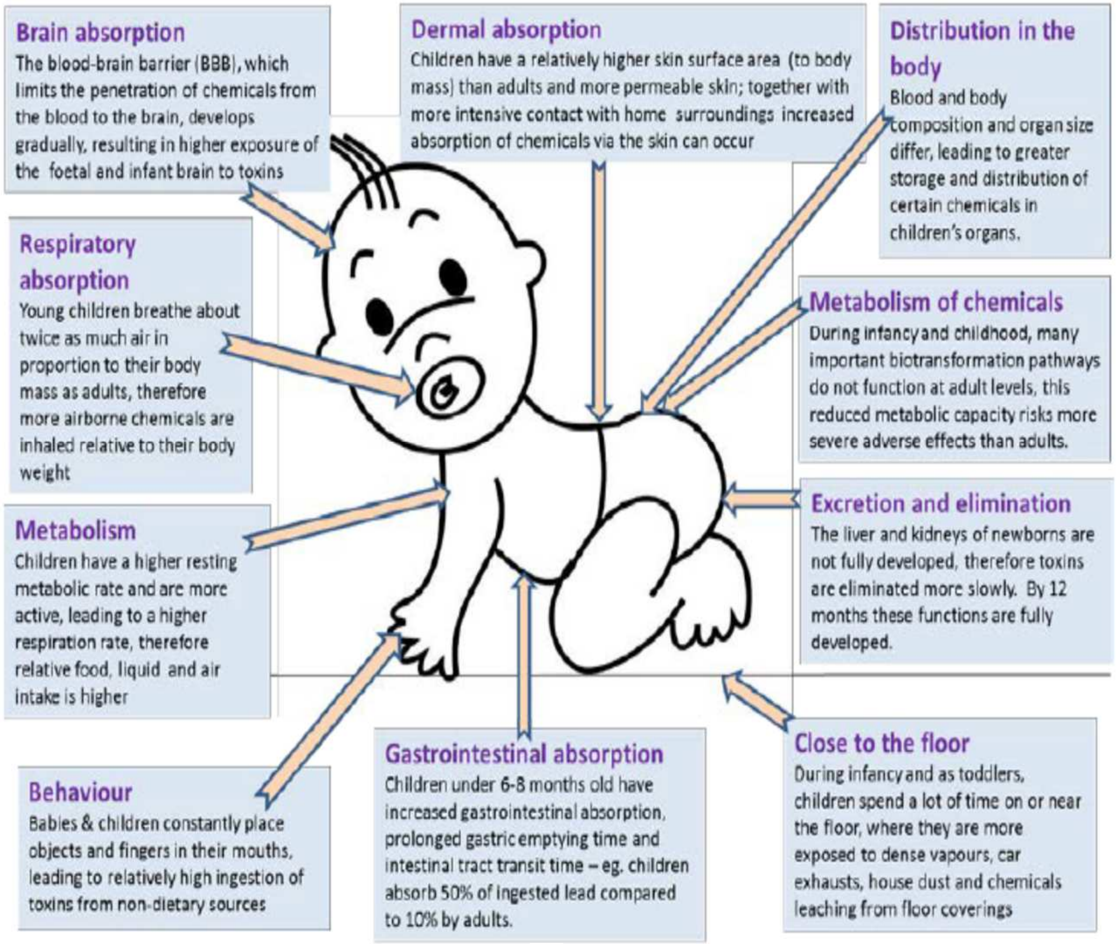
Curr Probl Pediatr Adolesc Health Care 2017;47:107-118

Clinicians should clarify patient concerns (if any) and provide personalized guidance about how to avoid exposure to endocrine disrupting chemicals. It is important to explain to patients that the experts in the field do not have a complete understanding of the effects of endocrine disrupting chemicals in consumer products. However, there is sufficient evidence based on animal studies and epidemiological studies for there to be concerns about exposure to endocrine disrupting chemicals and for the implementation of the precautionary approach to endocrine disrupting chemicals. Using non-medical language, explain the potential health effects of exposure to endocrine disrupting chemicals. Provide prevention strategies that can minimize exposure to endocrine disrupting chemicals.

Periodi critici per l'esposizione

- **Periodo fetale**

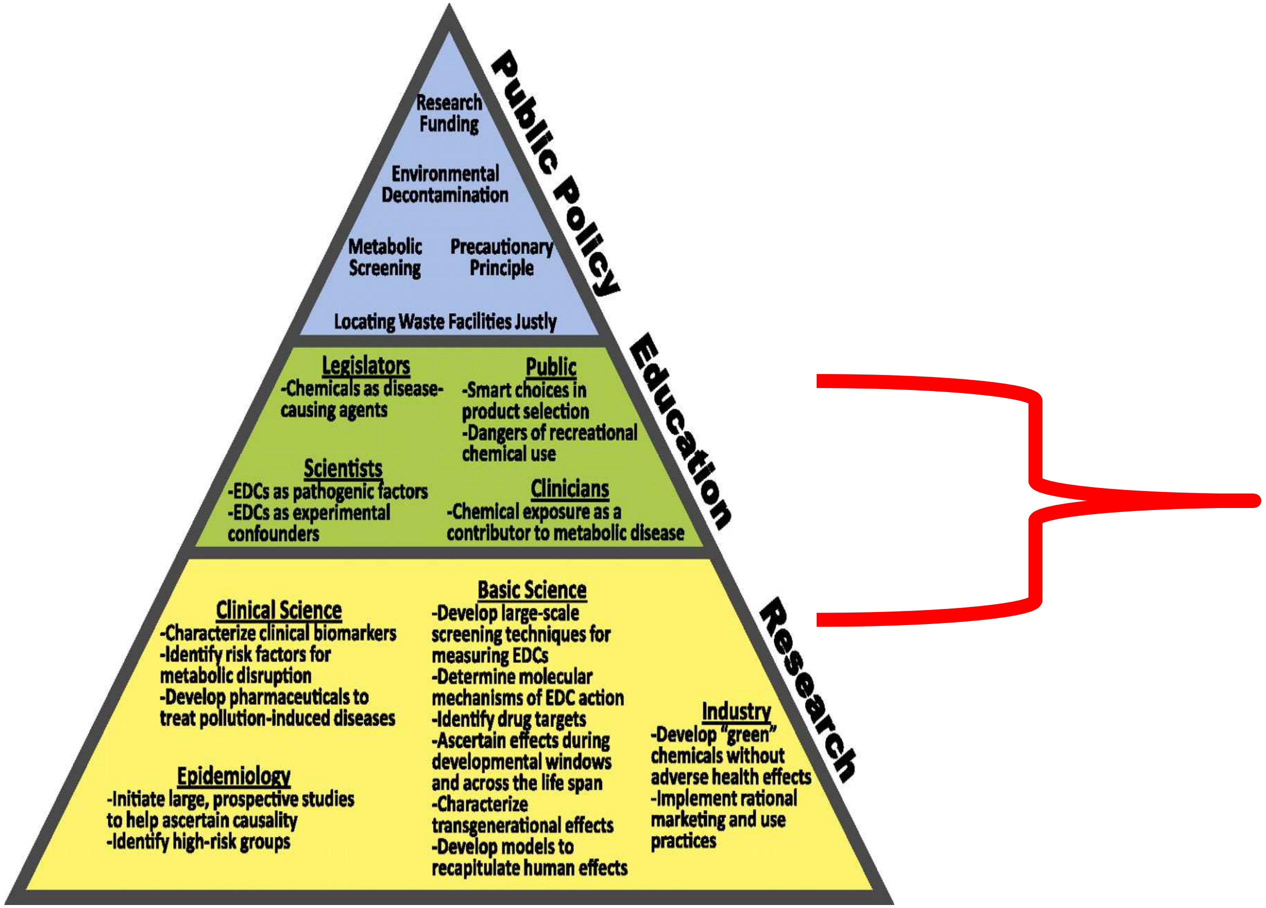
Figure 1. Increased exposure and vulnerability of the developing child to chemicals, Dorey 2003



RUOLO DEL MEDICO

1) aiutare le famiglie a comprendere le problematiche ambientali

Strategies for addressing environmental disruption of metabolism.



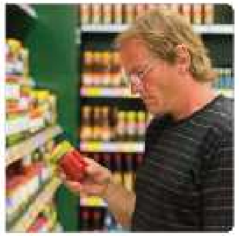
Brian A. Neel, and Robert M. Sargis Diabetes 2011;60:1838-1848

SITI DA CONSULTARE

ITALIA	ESTERO
Istituto Superiore di Sanità Ministero Salute Ministero Ambiente	WWW NRDC.ORG WHO.INT ______________ EPA.GOV NIEHS.NIH.GOV WWFCANADA.ORG ENDOCRINEDISRUPTION.ORG

INTRODUCTION TO ENDOCRINE DISRUPTING CHEMICALS (EDCs)

A GUIDE FOR PUBLIC INTEREST ORGANIZATIONS AND POLICY-MAKERS



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December 2014

ENDOCRINE SOCIETY
Hormone Science to Health

IPEN
a toxics-free future

MINISTERO DELL'AMBIENTE E DELLA TUTELA DEL TERRITORIO E DEL MARE

CONOSCI, RIDUCI, PREVIENI GLI INTERFERENTI ENDOCRINI

UN DECALOGO PER IL CITTADINO

ISTITUTO SUPERIORE DI SANITÀ

ALMA UNIVERSITAS STUDIORUM PARMENSIS A.D. 962

RUOLO DEL MEDICO

1) aiutare le famiglie a comprendere le problematiche ambientali
2) fornire informazioni pratiche

MESSAGGI SPECIFICI

- lavaggio mani
- aspirazione polveri
- scelta prodotti pulizia della casa
- scelta cosmetici e prodotti per igiene personale
- alimentazione
  - latte materno
  - cibi da agricoltura biologica
  - confezionamento
  - preparazione domestica
- indumenti
- arredo

Grazie per l'attenzione

sbernasconi3@gmail.com