

7

Uluslararası

Gıda Güvenliği Kongresi

3-4 Kasım 2022 İstanbul-TÜRKİYE
Grand Cevahir Otel Ve Kongre Merkezi

“ Bugün ve gelecekte güvenli gıda ”

7

Uluslararası

Gıda Güvenliği Kongresi

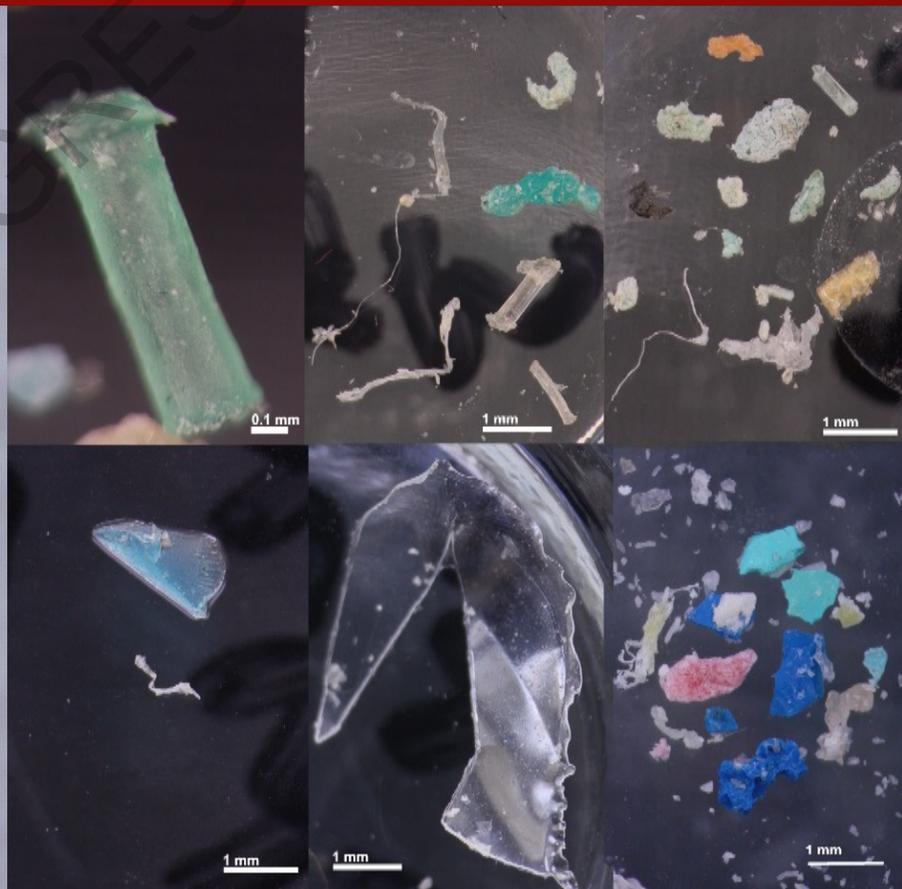
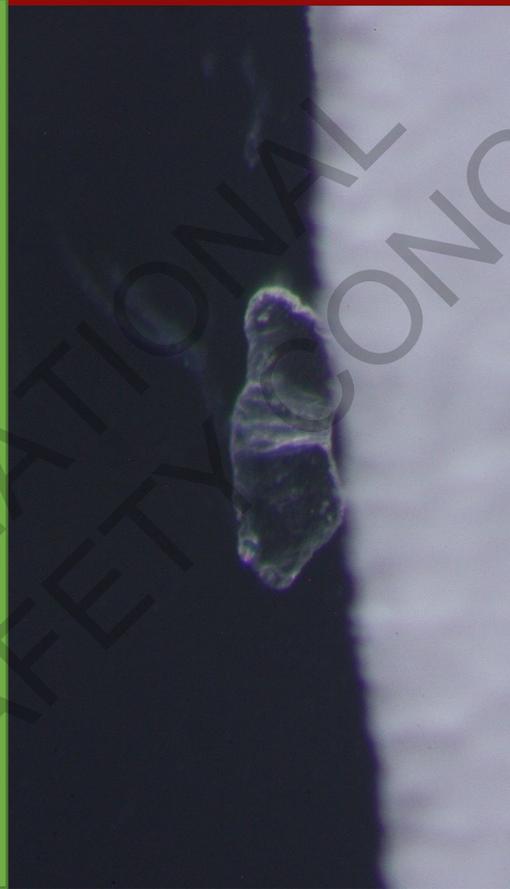
3-4 Kasım 2022 İstanbul-TÜRKİYE
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“ Bugün ve gelecekte güvenli gıda ”



Micro and Nano plastics as an emerging concern for food safety and security

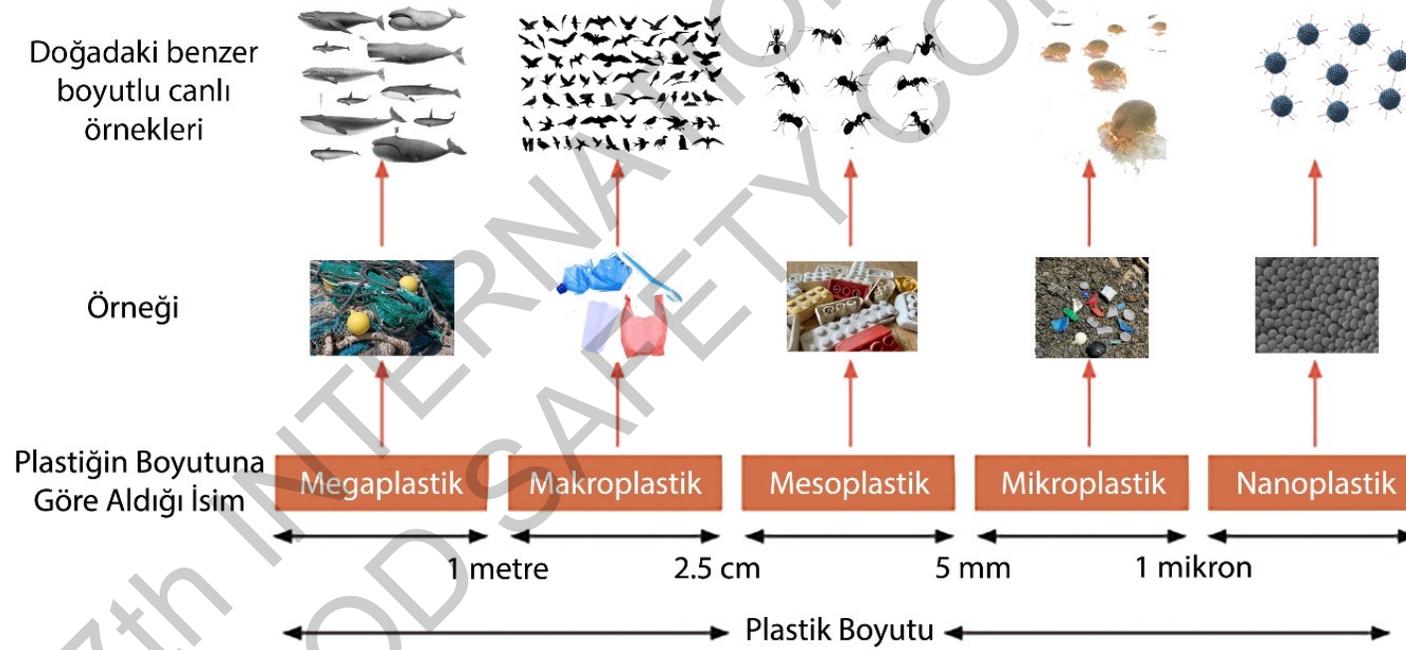
Doç. Dr. Sedat GÜNDOĞDU
Ç.Ü. Su Ürünleri Fakültesi



Plastic Pollution

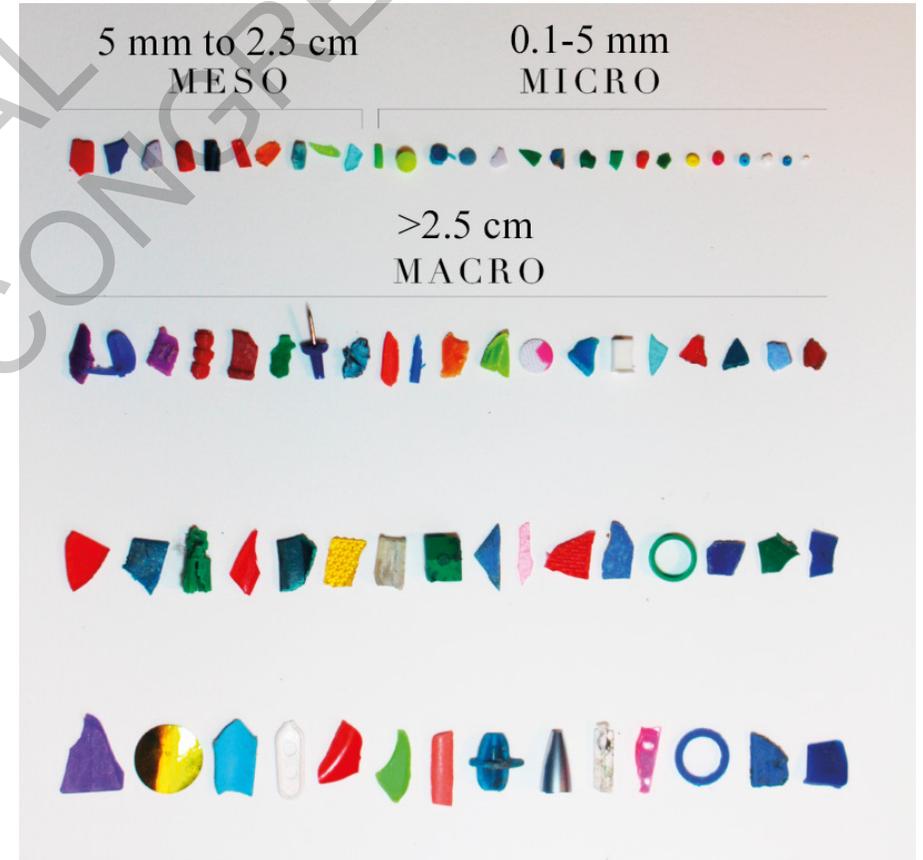
Plastic pollution which is resulted by massive production (400 million tonnes per year) is an important environmental and social problem. As this issue causes growing concern among citizens, it also causes scientists to increase their efforts to study this new type of pollution.

We now understand from the studies that plastic particles is in various sizes and inorganic molecules and microorganisms can be accumulated on them. It is now a fact that plastic can be found in macro, micro and nano sizes in size!



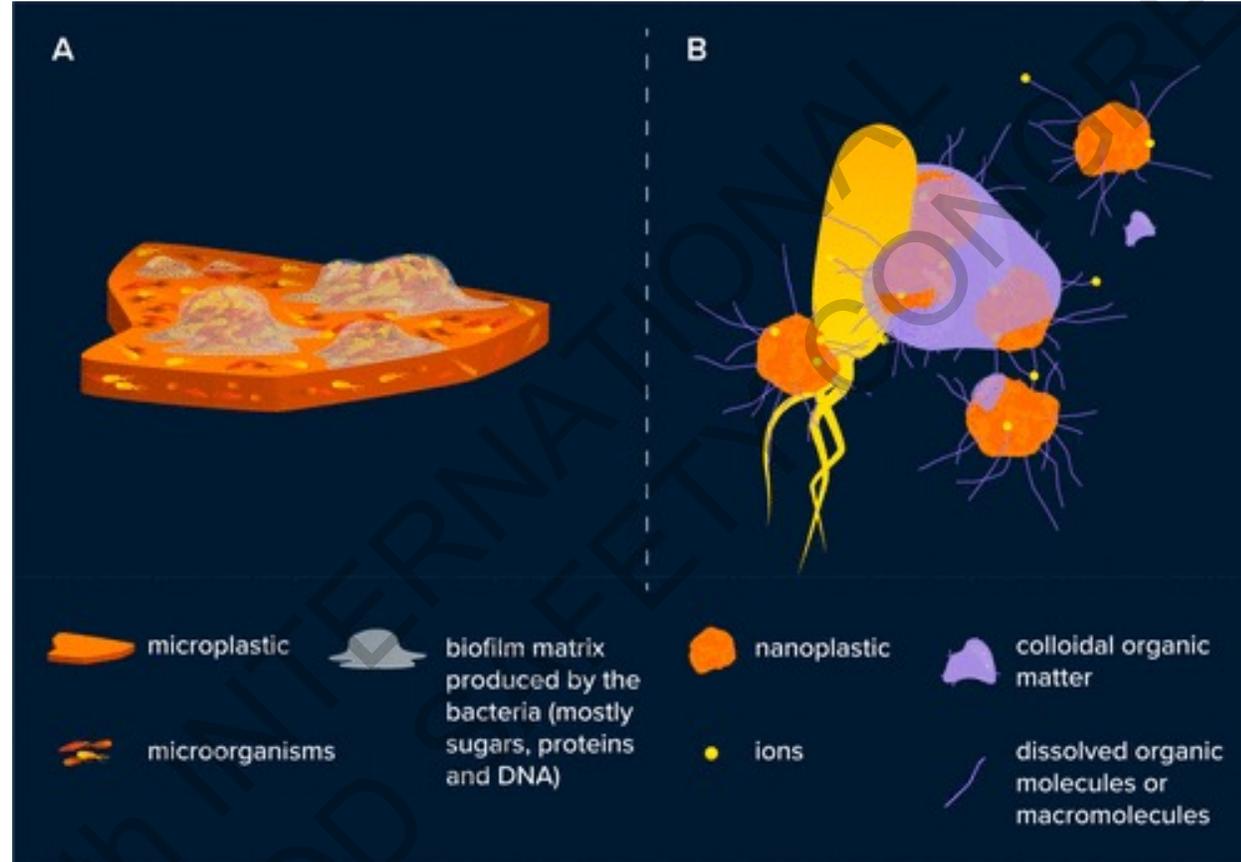
Microplastics

Plastics can be broken down to the tiny particles. The particles that are smaller than 5 mm are called microplastics (Secondary microplastics). Microplastics are also produced directly as an abrasive for use in various cleaning materials and personal care products (Primary Microplastics).



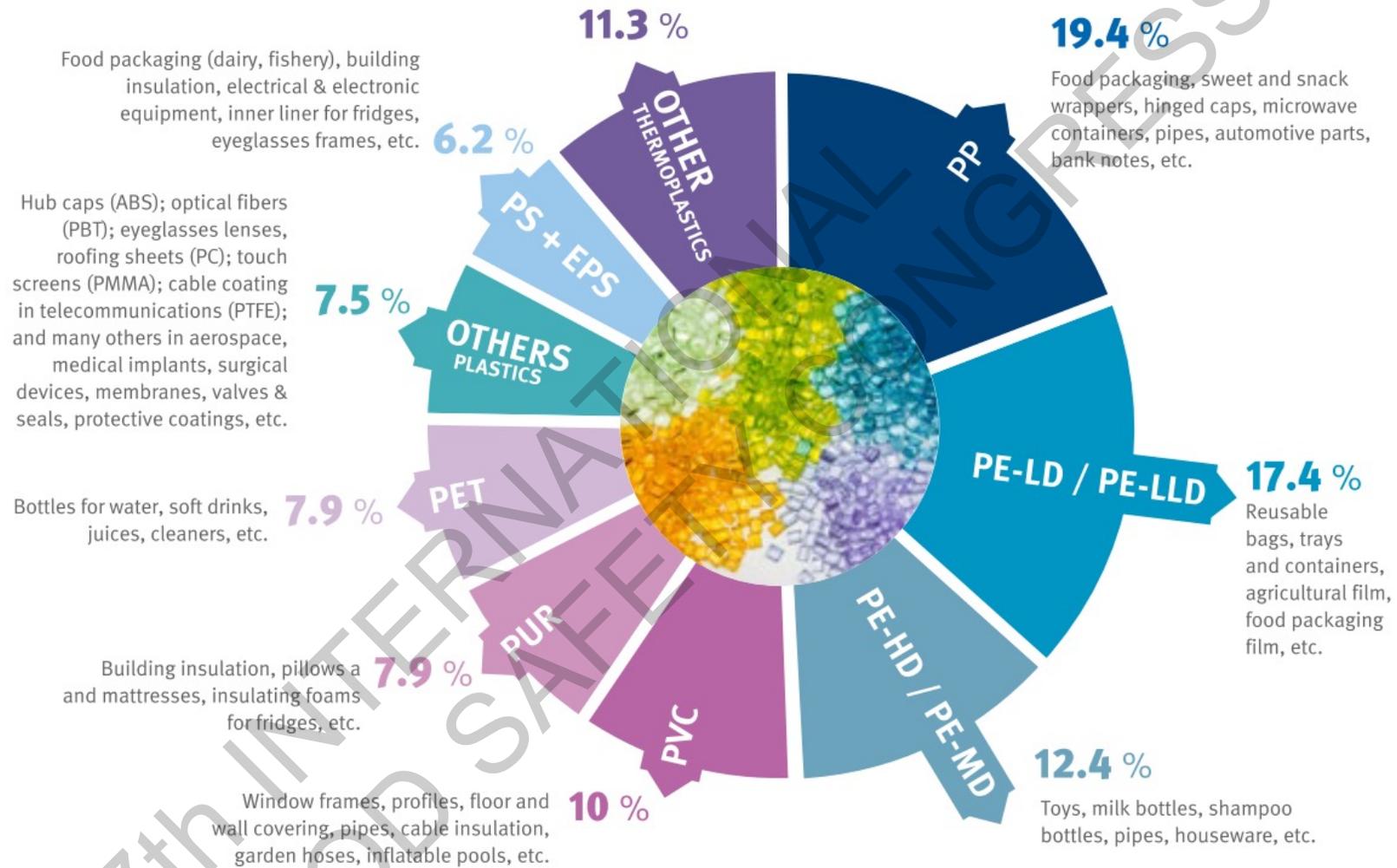
Nanoplastics

The particles in size between 1 nm and 1 μm are called as nanoplastics



Source: <https://pubs.acs.org/doi/10.1021/acs.est.1c04142>

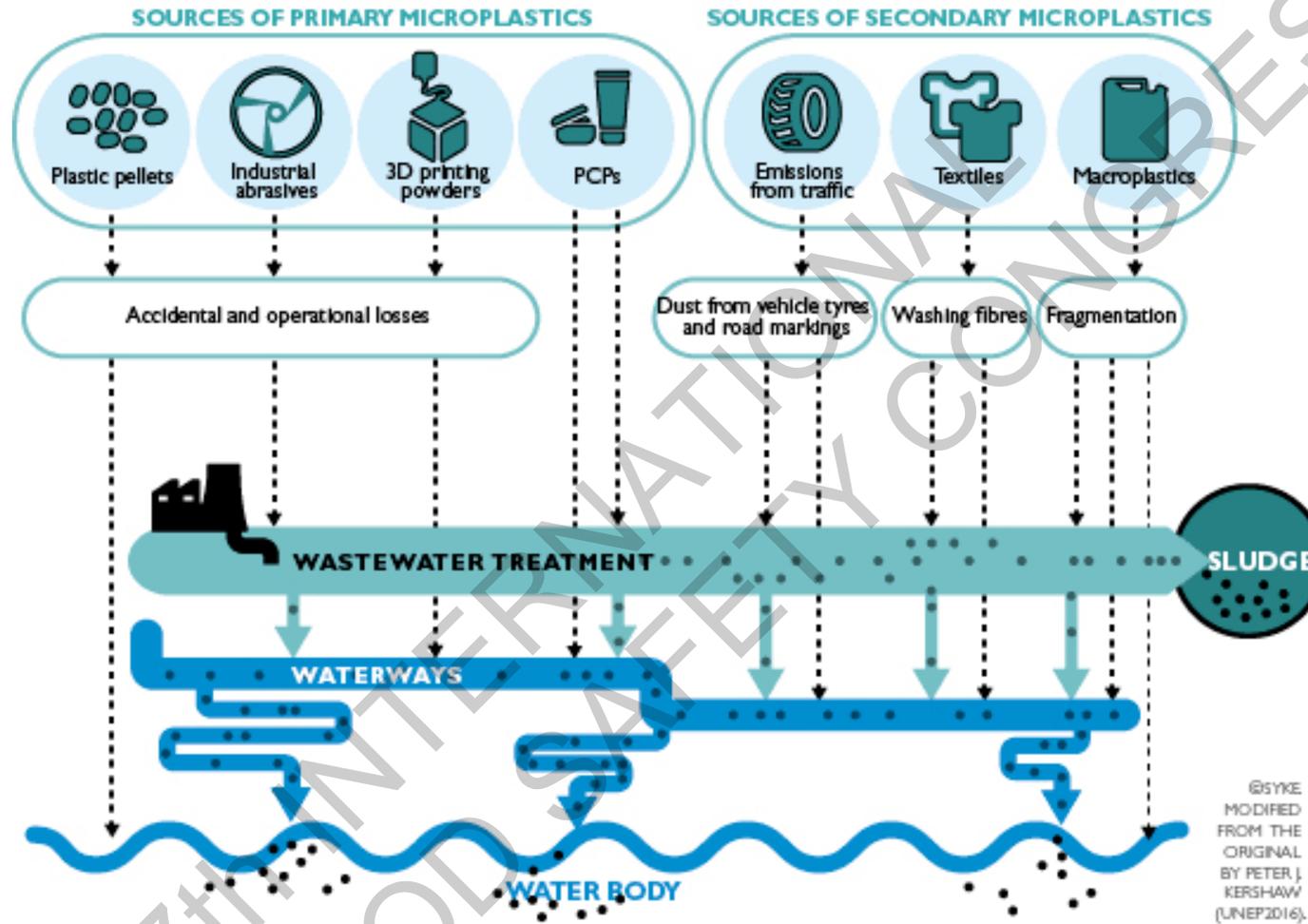
How Micro ve Nano-Plastics (MNPs) Generates?



Micro and Nano plastics as an emerging concern for food safety and security
 Doç. Dr. Sedat GÜNDOĞDU
 Ç.Ü. Su Ürünleri Fakültesi

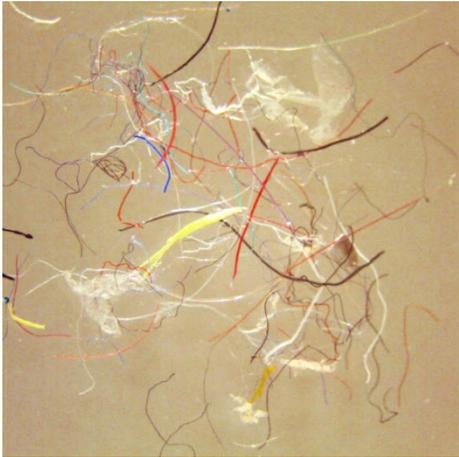


Transportation of Micro ve Nano-Plastics (MNPs) in the Environment?



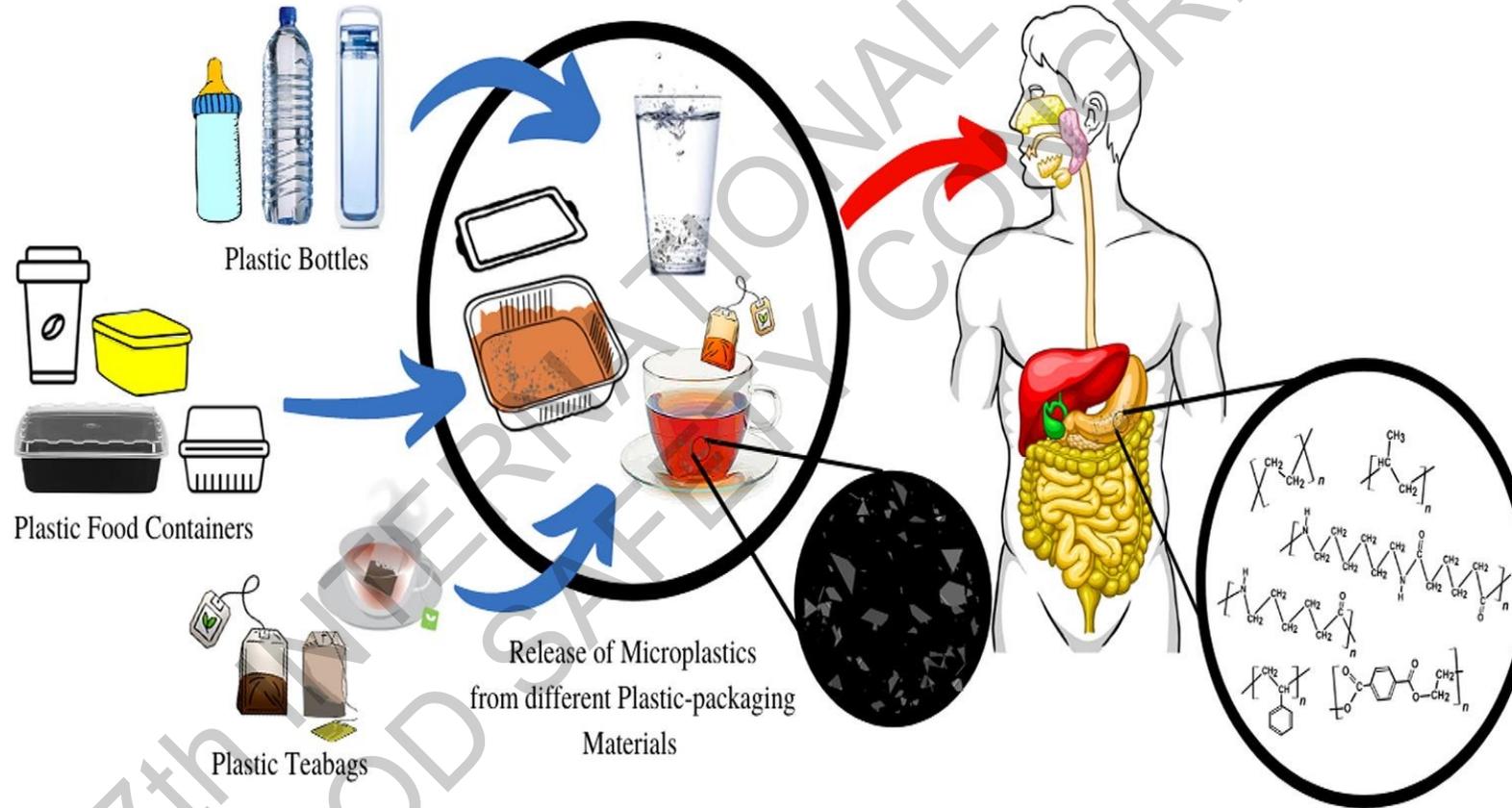
How Micro ve Nano-Plastics (MNPs) Generates?

A regular washing (6-8 kg) can release more than 1 million plastic particles to the waste water system

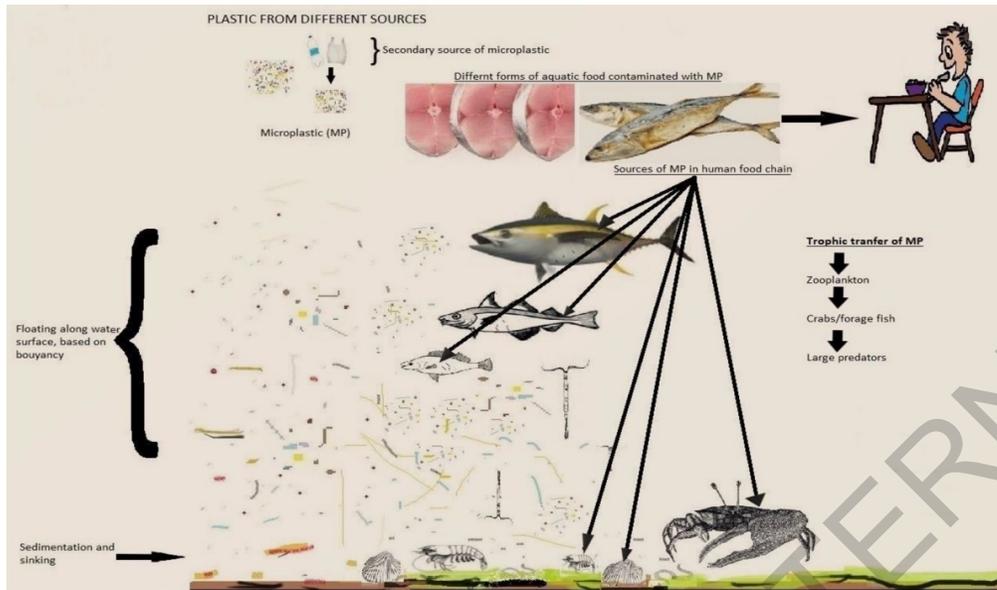


How Micro ve Nano-Plastics (MNPs) Generates?

Food contact materials are materials intended to come into contact with food at any level of the food chain, including processing, preparation, storage and serving. Therefore, they can be the source of various physical, chemical and biological hazards. One of them is MNPs.



MNPs in Foods



CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION
<https://doi.org/10.1080/10408398.2022.2033684>

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REVIEW

The impact of nano/micro-plastics toxicity on seafood quality and human health: facts and gaps

Sedat Gündoğdu^a, Nikheel Rathod^b, Abdo Hassoun^{c,d}, Ewelina Jamroz^e, Piotr Kulawik^f, Cengiz Gokbulut^g, Abderrahmane Ait-Kaddour^h and Fatih Özogulⁱ

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ABSTRACT

Contamination of the food and especially marine environment with nano/micro-plastic particles has raised serious concern in recent years. Environmental pollution and the resulting seafood contamination with microplastic (MP) pose a potential threat to consumers. The absorption rate of the MP by fish is generally considered low, although the bioavailability depends on the physical and chemical properties of the consumed MP. The available safety studies are inconclusive, although there is an indication that prolonged exposure to high levels of orally administered MP can be hazardous for consumers. This review details novel findings about the occurrence of MP, along with its physical and chemical properties, in the marine environment and seafood. The effect of processing on the content of MP in the final product is also reviewed. Additionally, recent findings regarding the impact of exposure of MP on human health are discussed. Finally, gaps in current knowledge are underlined, and the possibilities for future research are indicated in the review. There is an urgent need for further research on the absorption and bioavailability of consumed MP and in vivo studies on chronic exposure. Policymakers should also consider the implementation of novel legislation related to MP presence in food.

KEYWORDS

Analytical methods; food quality; human health; microplastic; seafood



Micro and Nano plastics as an emerging concern for food safety and security
Doç. Dr. Sedat GÜNDOĞDU
Ç.Ü. Su Ürünleri Fakültesi

MNPs in Foods

Fishes

Deniz
canlılarındaki
mikroplastik
oranları

KEFAL
%64.8



BARBUN
%63.0



MIRMİR
%34.3



TEKİR
%32.8



İSTAVRİT
%26.7



MİDYE
%91.2



KARİDES
%18.8



Turkish Journal of Zoology

<http://journals.tubitak.gov.tr/zoology/>

Research Article

Turk J Zool
(2020) 44: 312-323
© TÜBİTAK
doi:10.3906/zoo-2003-49

Occurrence of microplastics in the gastrointestinal tracts of some edible fish species along the Turkish coast

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Received: 30.03.2020 • Accepted/Published Online: 16.06.2020 • Final Version: 13.07.2020



Abstract: Plastics have become an inseparable part of modern life as a consequence of their versatility, low cost, durability, and light-weight. In this study, the presence of microplastics (MPs) in the stomachs and digestive tracts of 243 individuals of leaping mullet (*Chelon saliens* (Risso, 1810)), red mullet (*Mullus barbatus barbatus* Linnaeus, 1758), surmullet (*Mullus surmuletus* Linnaeus, 1758), Mediterranean horse mackerel (*Trachurus mediterraneus* (Steindachner, 1868)), and sand steenbras (*Lithognathus mormyrus* (Linnaeus, 1758)), collected along the Marmara, Aegean, and Mediterranean coasts of Turkey was examined microscopically and through μ -Raman analysis. A total of 283 MP particles were extracted. Among the examined species, the average MP concentration was 1.1 MP per fish (MPs fish⁻¹). The number of MPs detected was 2.5 MPs fish⁻¹ for leaping mullet, 1.1 MPs fish⁻¹ for red mullet, 0.6 MPs fish⁻¹ for sand steenbras, and 0.4 MPs fish⁻¹ for Mediterranean horse mackerel and surmullet. The size of the MPs ranged from 0.028 to 4.909 mm. To determine the polymer types of the MPs, a μ -Raman analysis was conducted. The most frequently detected polymers were polypropylene (26%), polyethylene (21.9%), polyethylene terephthalate/polyester (8.2%), and cellulose (7.5%). The results of this study showed that MP pollution represents an emerging threat to the fish of Turkish marine waters.

Key words: Microplastics, ingestion, Turkish marine waters, plastic pollution



Micro and Nano plastics as an emerging concern for food safety and security
Doç. Dr. Sedat GÜNDOĞDU
Ç.Ü. Su Ürünleri Fakültesi

MNPs in Foods

Ready-to-eat stuffed mussel



İSTANBUL

0.90

İZMİR

0.81

ADANA

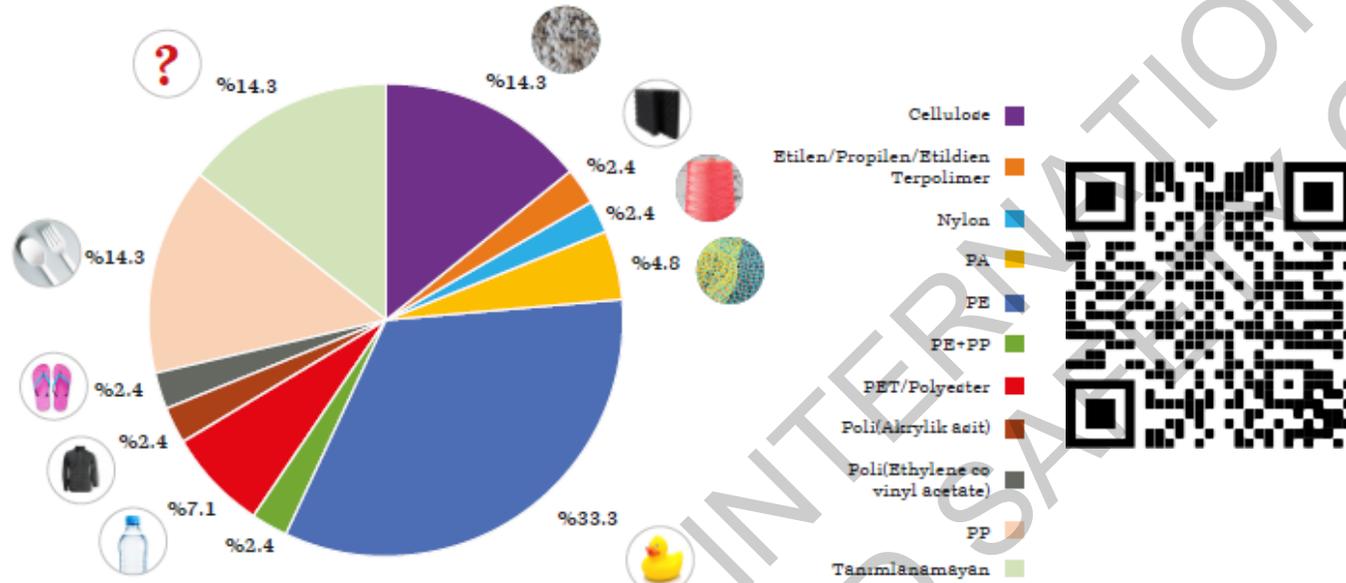
0.68

ANKARA

0.44

BODRUM

0.33



Contents lists available at ScienceDirect

Food Bioscience

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



Stuffed with microplastics: Microplastic occurrence in traditional stuffed mussels sold in the Turkish market

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^b Greenpeace Mediterranean Turkey Office, Istanbul, 34365, Turkey

ARTICLE INFO

Keywords:
 Microplastic
 Stuffed mussel
 Food contamination
Mytilus galloprovincialis
 Plastic pollution

ABSTRACT

Microplastic (MP) pollution is a ubiquitous and persistent pollution problem in the marine environment that is threatening marine life. In this study, the presence of MP in stuffed mussels sold in 5 Turkish cities was examined. The microplastic content of ready-to-eat stuffed mussels purchased from 41 different vendors in 5 different cities was studied using chemical digestion, density separation, and μ -Raman spectroscopy. The average amount of MP in the stuffed mussels was determined as 0.6 ± 0.1 (median = 0.6; IQR = 0.7) MP mussel⁻¹. Among the 5 cities, the highest number of MP was found in Istanbul with 0.9 ± 0.1 MP mussel⁻¹, while the lowest number was found in Bodrum with 0.3 ± 0.1 MP mussel⁻¹. The MP were identified as fiber type 62.7% and fragment type 37.3%. According to the μ -Raman analysis, the largest amounts of identified polymer types were polyethylene 35% and polypropylene 15%. Stuffed mussels purchased from 92% of the vendors contained MP. If an average consumer eats 100 g of stuffed mussels/portion, it is estimated that there is a risk of consuming 5.8 MP/portion. MP pollution is a serious problem in seafood. This study showed that stuffed mussels could be one way in which humans are exposed to MP. Due to the possible increase of MP load in the over-processing of seafood products, the results suggested that the quantification of MP should also be included as a component of food security systems.



Micro and Nano plastics as an emerging concern for food safety and security
 Doç. Dr. Sedat GÜNDOĞDU
 Ç.Ü. Su Ürünleri Fakültesi

MNPs in Foods

Table salts

Sea salt **16-84/kg**, lake salt **8-102/kg** and rock salt **9-16/kg**.

FOOD ADDITIVES & CONTAMINANTS: PART A, 2018
VOL. 35, NO. 5, 1006–1014
<https://doi.org/10.1080/19440049.2018.1447694>



Contamination of table salts from Turkey with microplastics

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ABSTRACT

Microplastics (MPs) pollution has become a problem that affects all aquatic, atmospheric and terrestrial environments in the world. In this study, we looked into whether MPs in seas and lakes reach consumers through table salt. For this purpose, we obtained 16 brands of table salts from the Turkish market and determined their MPs content with microscopic and Raman spectroscopic examination. According to our results, the MP particle content was 16–84 item/kg in sea salt, 8–102 item/kg in lake salt and 9–16 item/kg in rock salt. The most common plastic polymers were polyethylene (22.9%) and polypropylene (19.2%). When the amounts of MPs and the amount of salt consumed by Turkish consumers per year are considered together, if they consume sea salt, lake salt or rock salt, they consume 249–302, 203–247 or 64–78 items per year, respectively. This is the first time this concerning level of MPs content in table salts in the Turkish market has been reported.

ARTICLE HISTORY

Received 21 December 2017
Accepted 17 February 2018

KEYWORDS

Microplastic; table salt; contamination; food security; Turkey

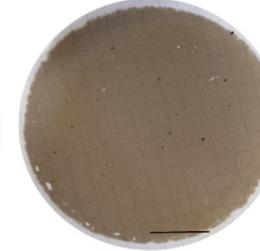


Whole filter paper

Sea Salt



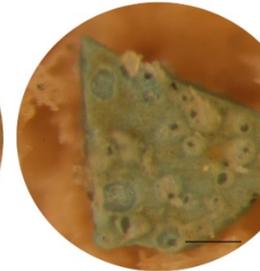
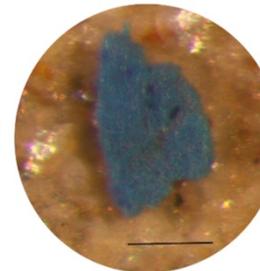
Lake Salt



Rock Salt



Plastic Fragment



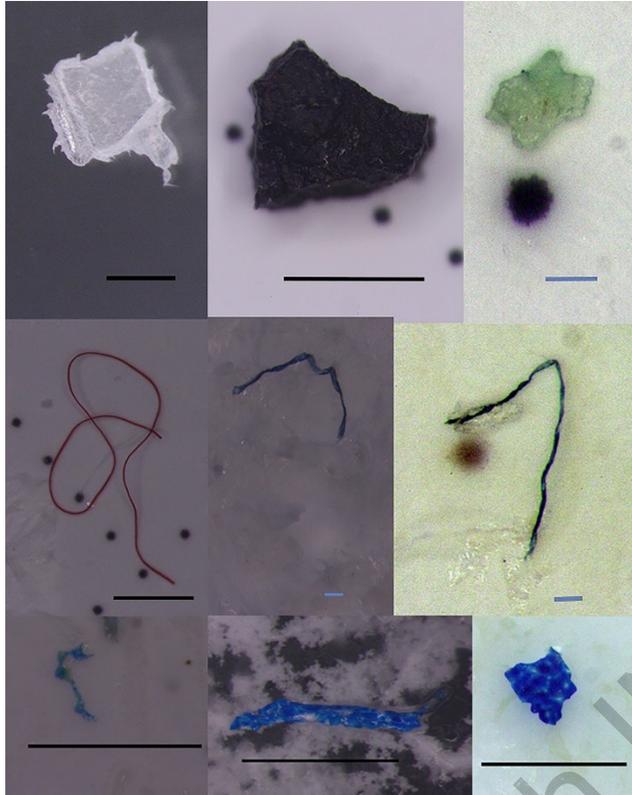
Micro and Nano plastics as an emerging concern for food safety and security
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Ç.Ü. Su Ürünleri Fakültesi

MNPs in Foods

Canned fish(In press at PeerJ)

PeerJ

Manuscript to be reviewed



Microplastic contamination in canned fish sold in Turkey

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Corresponding Author: Sedat Gundogdu
Email address: sgundogdu@cu.edu.tr

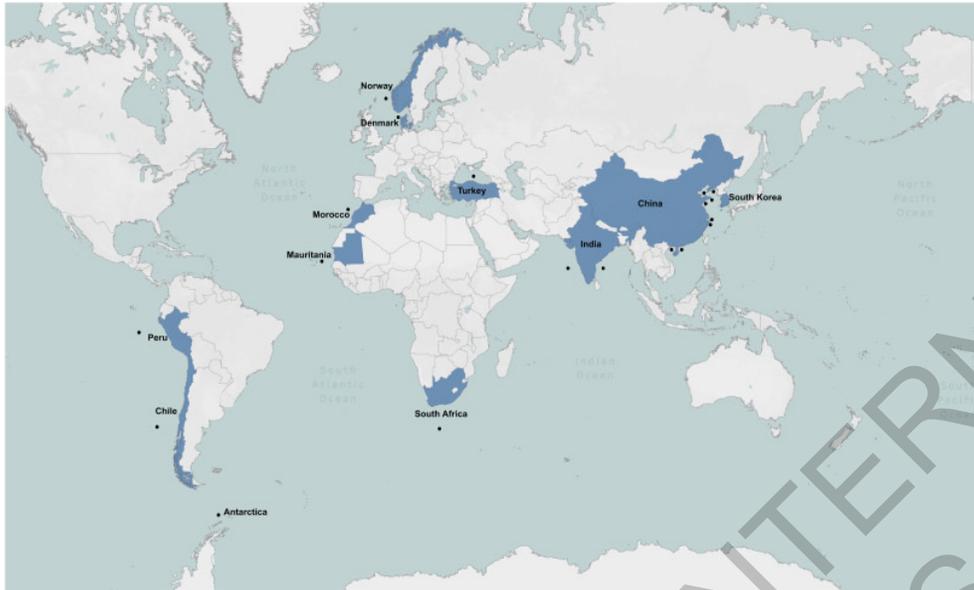
The presence of microplastics (MPs) in processed seafood is a growing concern. In this study, 33 different canned fish brands belonging to 7 producers were purchased from the Turkish market and investigated. MPs composition, possible sources, and potential intake were assessed. Light microscopy was used to quantify potential MPs, and micro-Raman microscopy was used to identify the polymer types. The results showed that all the samples had at least one MPs particle, and fragments were the most abundant (57.3%) shapes of MPs. Polyolefin (21.88%) was the most common polymer type. The results showed that packaging and the production processes are the main possible sources of MPs. Human intake estimation risk is relatively lower since canned fish consumption is relatively low. The findings suggest that the risk related to MPs in canned fish should be considered one of the components of food safety management systems.



MNPs in Foods

Fish feeds

The concentration of the plastic particles in fish feeds collected from 11 countries in four continents plus Antarctica can be ranged **zero to 526.7 items/kg (n=26)**



Contents lists available at ScienceDirect

Aquaculture

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

Fish out, plastic in: Global pattern of plastics in commercial fishmeal

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^c School of Life and Environmental Sciences, Deakin University, Geelong, Victoria 3220, Australia
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ARTICLE INFO

Keywords:
Fish meal
Plastic pollution
Microplastic
Aquaculture
Marine pollution

ABSTRACT

Plastic (as both micro- and macro- plastic) is an important environmental contaminant, affecting the food chain and directly entering into marine products, including seafood. However, plastic contamination in wild derived fishmeal, a globally traded commodity, remains unknown. Using a global sampling approach, this study is the first one to assess the plastic content and composition in commercial fishmeal products. The sampling consisted of 26 different fishmeal products, originating from 11 countries on four continents and Antarctica, and representing the vast majority of globally available and traded commercial products. A wide range of plastics content was found, ranging from 0 to 526.7 n kg⁻¹, and a relatively higher plastics content was identified in fishmeal obtained from China (337.5±34.5 n kg⁻¹) and Morocco (253.3±43.4 n kg⁻¹), whereas no plastics was detected in krill meal obtained from Antarctica. The risk assessment based on feed conversion ratio (FCR) showed that the carnivorous fish species (e.g. eel) with a high percentage of dietary fishmeal, have a substantially higher risk for plastic intake, than other species. In conclusion, these results indicate that fishmeal can be an important pathway for plastics to enter the seafood chain.

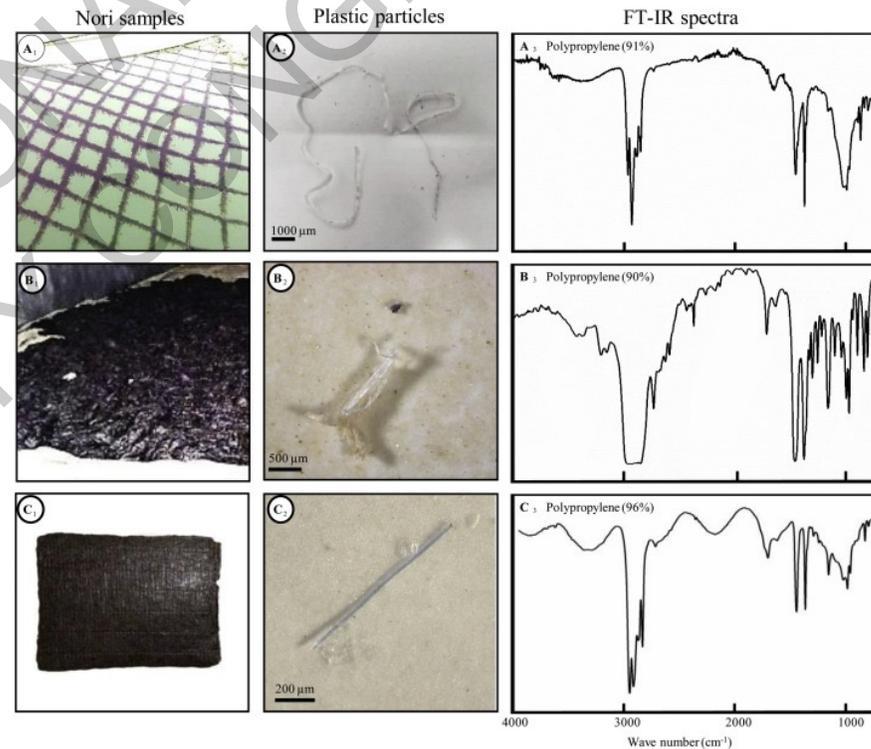


Micro and Nano plastics as an emerging concern for food safety and security
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MNPs in Foods

Nori

Between 0.9 and 3.0 pieces/g (dry weight) microplastic was found among 24 commercially packaged nori samples.

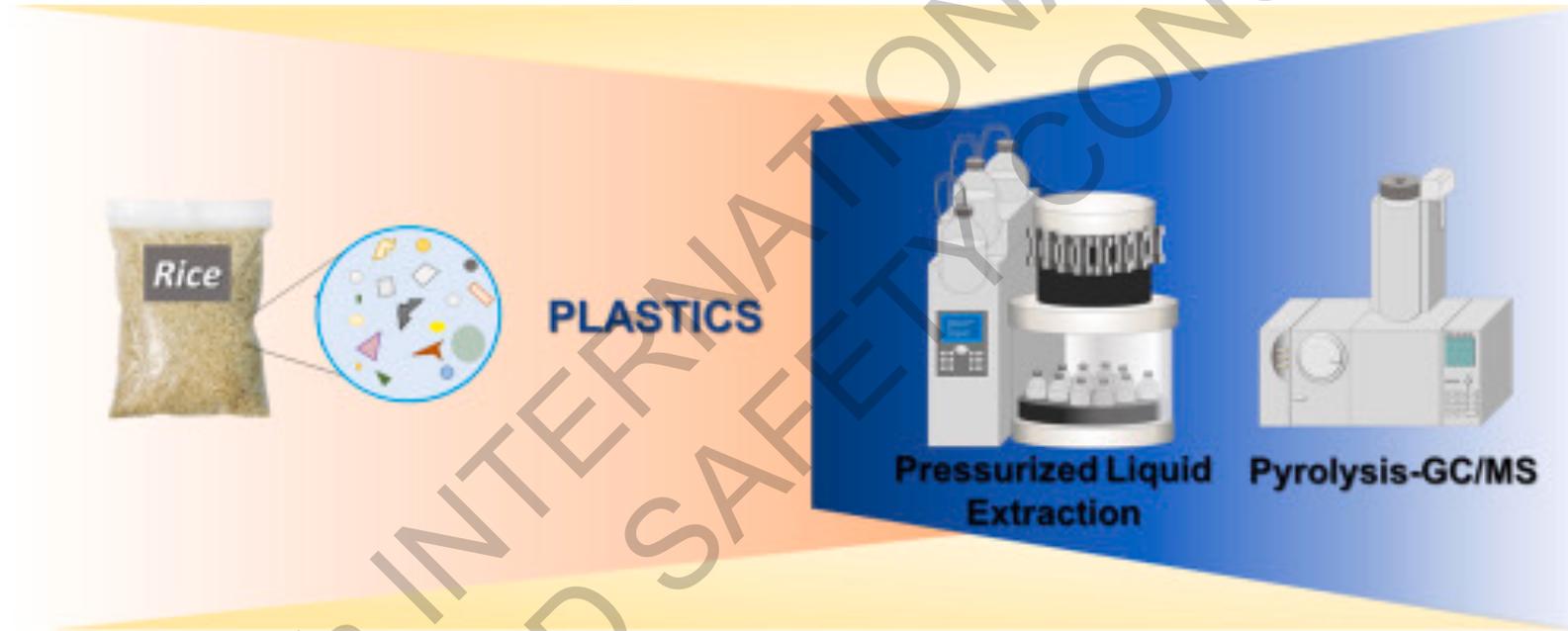


<https://www.sciencedirect.com/science/article/pii/S0304389420300467>

MNPs in Foods

Packaged rice

An estimate of plastic intake through rice consumption for Australians is 3.7 mg (100 g) per serving if rice is unwashed and 2.8 mg if washed. Annual consumption is estimated as 1 g/person.



<https://www.sciencedirect.com/science/article/pii/S0304389421007421>

MNPs in Foods

Ice Tea, Energy Drink and Beer

In the analysis on common beverages (n = 57; 27 brands) such as non-alcoholic beverages (n = 19), energy drinks (n = 8), cold tea (n = 4) and beer (n = 57) conducted in Mexico, it has been determined that 48 of 57 includes Microplastics.



Positive : 20 out of 26

Content : ND – 7 particles/L

Shape : Fibers

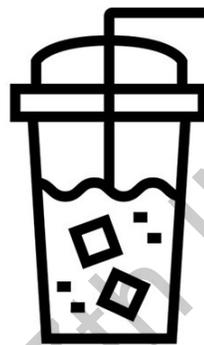
Size : 0.1 – 3 mm

Color : 

Type: Polyamide, poly(ester-amide), acrylonitrile-butadiene-styrene

ND : Not detected

Microplastics



Positive : 4 out of 4

Content : 1 – 6 particles/L

Shape : Fibers

Size : 0.1 – 2 mm

Color : 

Type: Polyamide, poly(ester-amide)

Microplastics

COLD TEA



Positive : 24 out of 27

Content : ND – 28 particles/L

Shape : Fibers and fragments

Size : 0.1 – 3 mm

Color : 

Type: Polyamide, poly(ester-amide), poly(ethylene-terphthalate)

ND : Not detected

Microplastics

BEER

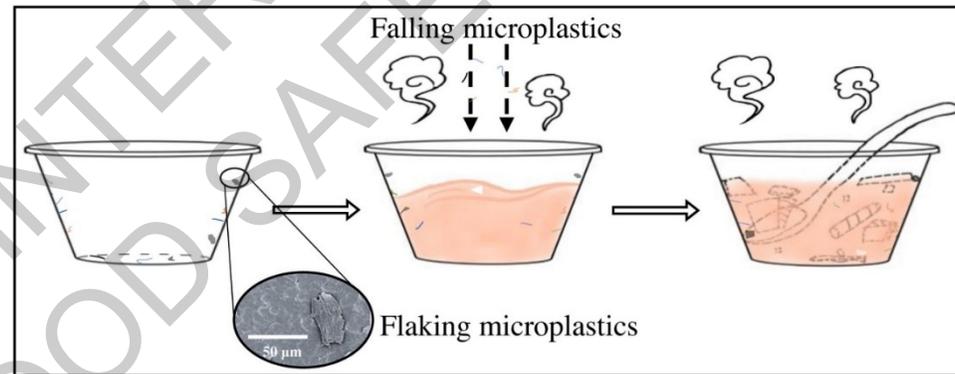
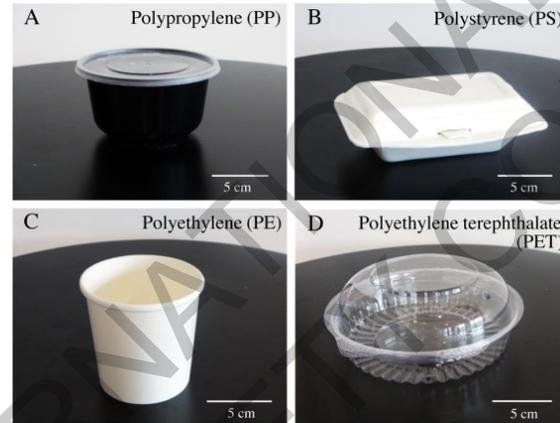
<https://www.sciencedirect.com/science/article/pii/S0048969720320969>



MNPs in Foods

Paket servis yemek kapları

Microplastics were found in all take-away containers of different types. Microplastic intake from these disposable containers can be 203 items/person/week.

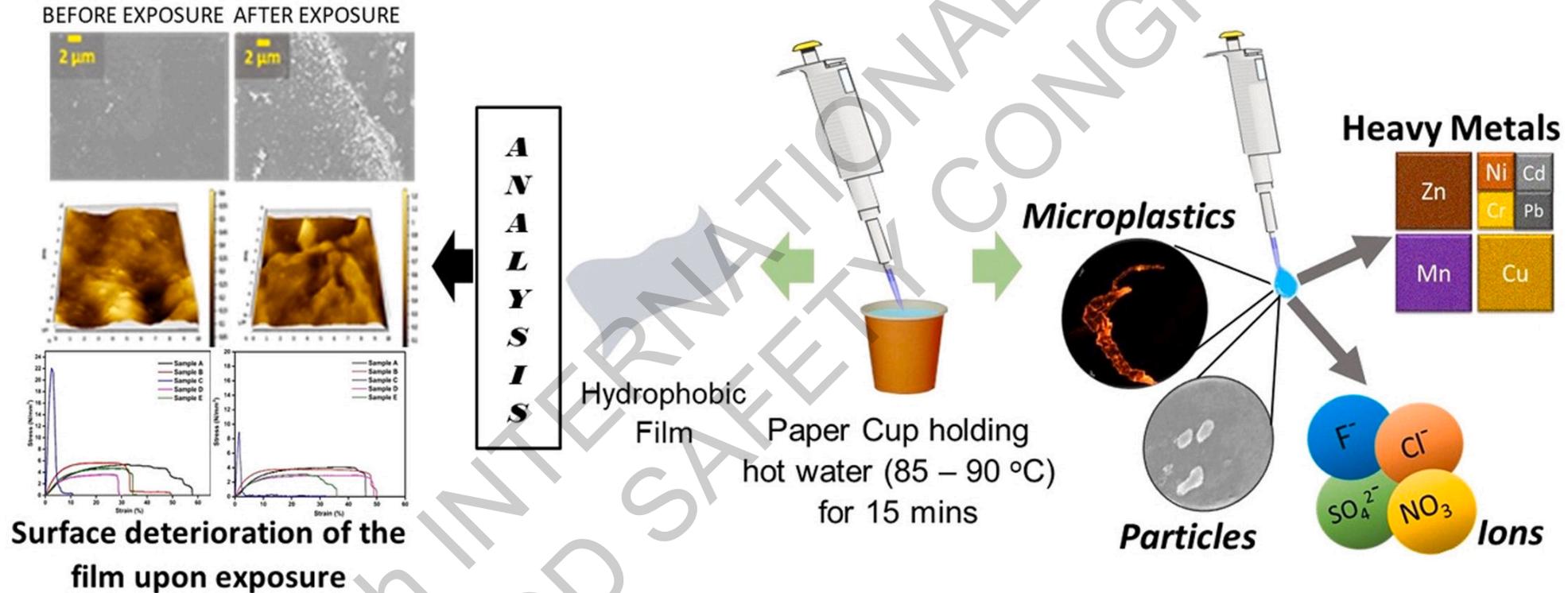


<https://doi.org/10.1016/j.jhazmat.2020.122969>

MNPs in foods

Single use Paper-like Cups

It has been determined that microplastics migrate to the liquid content from the plastic film on the inner surface of the paper cups exposed to hot water (85-90 °C).



<https://doi.org/10.1016/j.jhazmat.2020.124118>

MNPs in Foods

Tap and Bottled Waters

Brand	Lot	Purchase Location	Average Microplastic Densities (MPP/L)				
			NR+FTIR confirmed particles (>100 um)	NR tagged particles (6.5-100 um)	Total Average	Minimum	Maximum
Aqua	IB 101119	Jakarta, Indonesia	6.68	30.4	37.1	3	133
Aqua	BB 311019 08:11 PSRL6	Bali, Indonesia	10.5	695	705	1	4713
Aqua	BB 311019 09:50 STB1	Medan, Indonesia	6.93	397	404	0	3722
Aquafina	Oct0719	Amazon.com	14.8	237	252	42	1295
Aquafina	BN7141A04117	Chennai, India	11.6	162	174	2	404
Bisleri	HE.B.No.229 (BM/AS)	Chennai, India	18.0	808	826	39	5230
Bisleri	MU.B.No.298 (MS/AD)	Mumbai, India	8.85	204	213	2	1810
Bisleri	SO.B.No.087 (AS/LB)	New Delhi, India	0.57	3.15	3.72	0	32
Dasani	Oct 0118NHBRB	Amazon.com	14.6	150	165	85	303
Dasani	P18NOV17CG3	Nairobi, Kenya	6.28	68.3	74.6	2	335
E-Pura	17.11.18	Mexico City, Mexico	22.3	664	686	11	2267
E-Pura	14.10.18	Tijuana, Mexico	7.76	12.2	20.0	3	92
E-Pura	09.08.18	Reynosa, Mexico	0.21	37.1	37.3	0	149
Evian	PRD 03 21 2017 14:02	Amazon.com	26.0	171	197	126	256
Evian	PRD 05 24 17 11:29	Fredonia, NY, USA	1.51	56.7	58.2	0	256
Gerolsteiner	07.142018 2	Fredonia, NY, USA	14.8	1396	1410	11	5106
Gerolsteiner	NV No. AC-51-07269	Amazon.com	8.96	195	204	9	516
Minalba	FAB: 211017 09:06SP	Sao Paulo, Brazil	2.56	37.5	40.1	4	199
Minalba	FAB: 160817 15:05SP	Aparecida de Goiania, Braz	5.30	7.19	12.5	0	47
Minalba	FAB: 091217 16:53SP	Rio de Janeiro, Brazil	5.01	145	150	0	863
Nestle Pure Lif	100517 278WF246	Amazon.com	29.8	2247	2277	51	10390
Nestle Pure Lif P:	4/11/17 01:34 AZ	Beirut, Lebanon	11.0	38.2	49.3	6	153
Nestle Pure Lif:	730805210A 23:28	Bangkok, Thailand	18.0	450	468	11	3526
San Pellegrino	BBE 11.2018 10	Amazon.com	1.68	28.6	30.3	0	74
Wahaha	20171102 1214JN	Jinan, China	9.10	147	156	30	731
Wahaha	20171021 3214GH	Beijing, China	5.53	61.2	66.7	13	178
Wahaha	20171103 2106WF	Qingdao, China	4.40	62.7	67.1	1	165

DÜNYA GENELİNDE İÇME SULARINDAKİ MİKROLİF MİKTARLARI

Bölgelere göre mikroskobik partiküllerin oranları



WORLDWIDE
83 PERCENT



USA
94 PERCENT



EUROPE
72 PERCENT



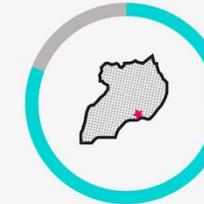
INDONESIA, JAKARTA
76 PERCENT



INDIA, NEW DELHI
82 PERCENT



LEBANON, BEIRUT
94 PERCENT



UGANDA, KAMPALA
81 PERCENT

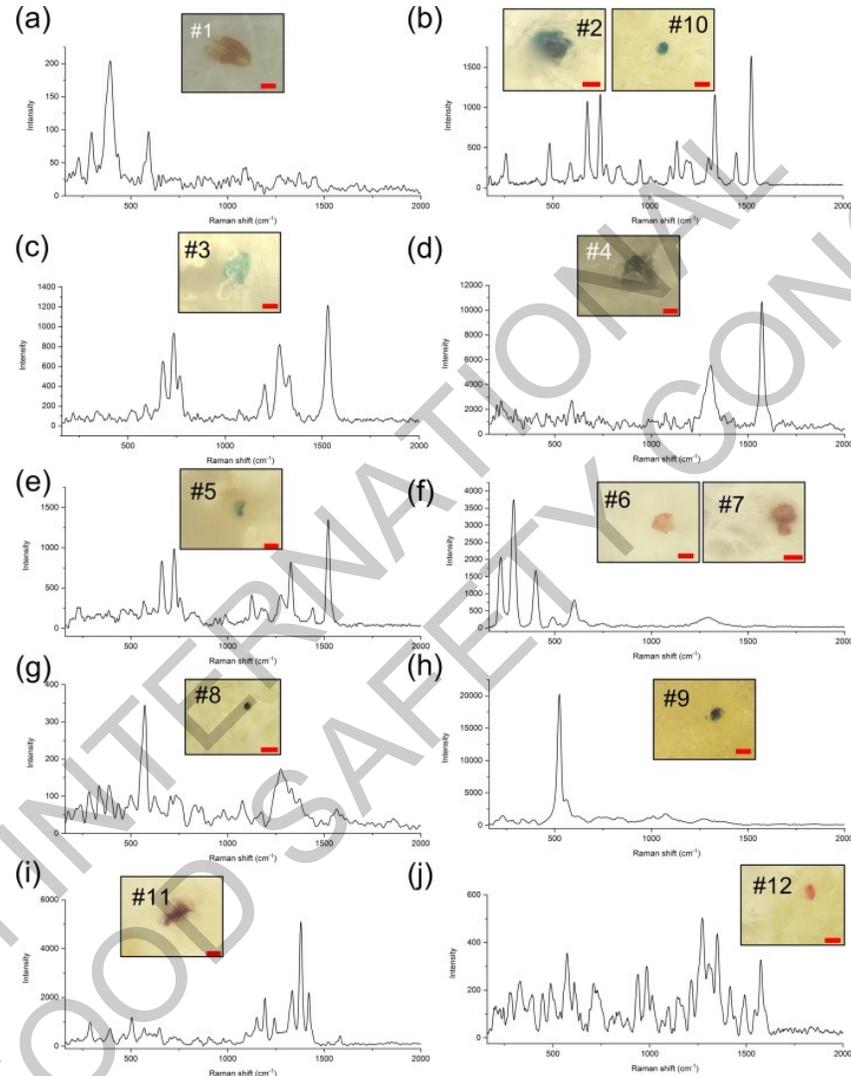


ECUADOR, QUITO
75 PERCENT

The Result!

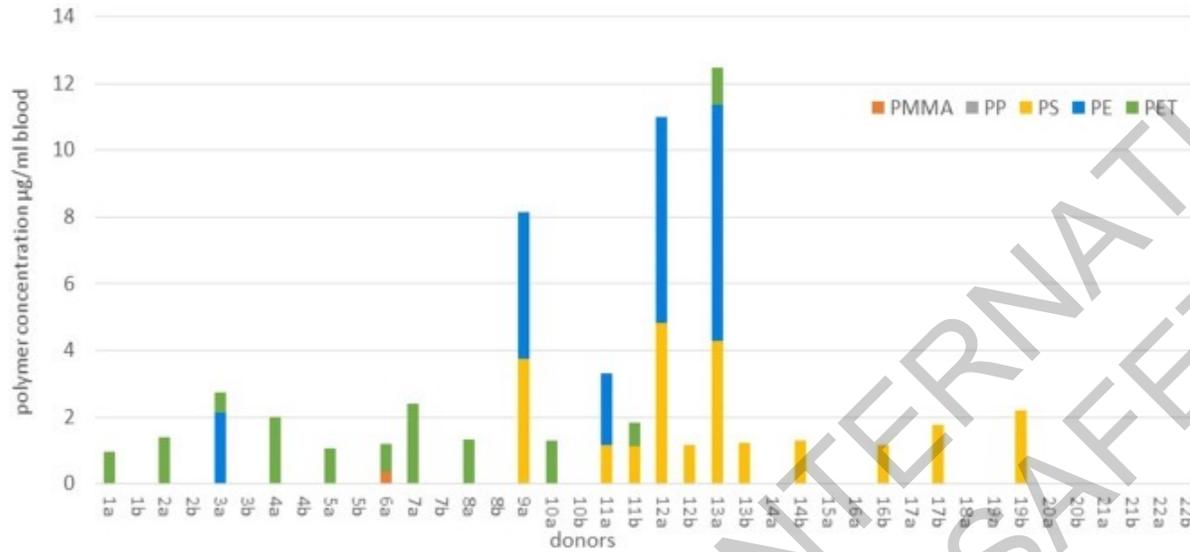
7th INTERNATIONAL
FOOD SAFETY CONGRESS

MNPs in Placenta: PLASTICENTA



Micro and Nano plastics as an emerging concern for food safety and security
Doç. Dr. Sedat GÜNDOĞDU
Ç.Ü. Su Ürünleri Fakültesi

MNPs in Human Blood: *Homo plasticus*



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Environment International

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Full length article

Discovery and quantification of plastic particle pollution in human blood

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ARTICLE INFO

Handling Editor: Adrian Covaci

Keywords:

Nanoplastic
Microplastic
Human whole blood
Polymers
Pyrolysis-GC/MS

ABSTRACT

Plastic particles are ubiquitous pollutants in the living environment and food chain but no study to date has reported on the internal exposure of plastic particles in human blood. This study's goal was to develop a robust and sensitive sampling and analytical method with double shot pyrolysis - gas chromatography/mass spectrometry and apply it to measure plastic particles ≥ 700 nm in human whole blood from 22 healthy volunteers. Four high production volume polymers applied in plastic were identified and quantified for the first time in blood. Polyethylene terephthalate, polyethylene and polymers of styrene (a sum parameter of polystyrene, expanded polystyrene, acetonitrile butadiene styrene etc.) were the most widely encountered, followed by poly (methyl methacrylate). Polypropylene was analysed but values were under the limits of quantification. In this study of a small set of donors, the mean of the sum quantifiable concentration of plastic particles in blood was 1.6 $\mu\text{g/ml}$, showing a first measurement of the mass concentration of the polymeric component of plastic in human blood. This pioneering human biomonitoring study demonstrated that plastic particles are bioavailable for uptake into the human bloodstream. An understanding of the exposure of these substances in humans and the associated hazard of such exposure is needed to determine whether or not plastic particle exposure is a public health risk.



Micro and Nano plastics as an emerging concern for food safety and security

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MNPs in Adult and Baby Stool!

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Occurrence of Polyethylene Terephthalate and Polycarbonate Microplastics in Infant and Adult Feces

Junjie Zhang, Lei Wang, Leonardo Trasande, and Kurunthachalam Kannan*

Cite this: *Environ. Sci. Technol. Lett.* 2021, 8, 11, 989–994

Publication Date: September 22, 2021

<https://doi.org/10.1021/acs.estlett.1c00559>

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MICROPLASTICS EXPOSURE

ng/kg-bw/day

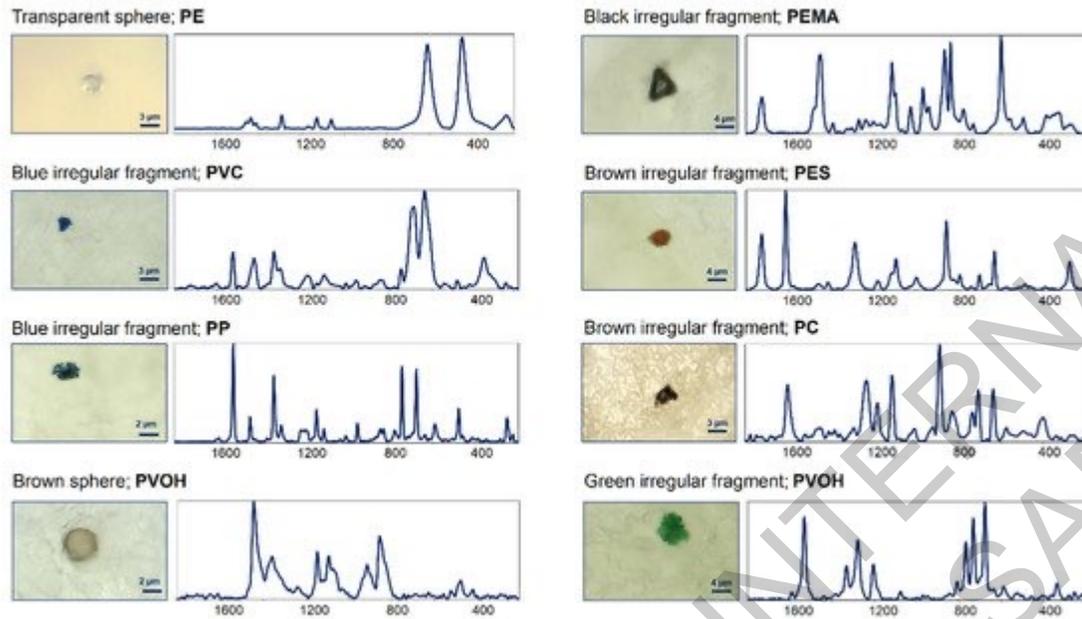


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MNPs in Human Breastmilk!



Article

Raman Microspectroscopy Detection and Characterisation of Microplastics in Human Breastmilk

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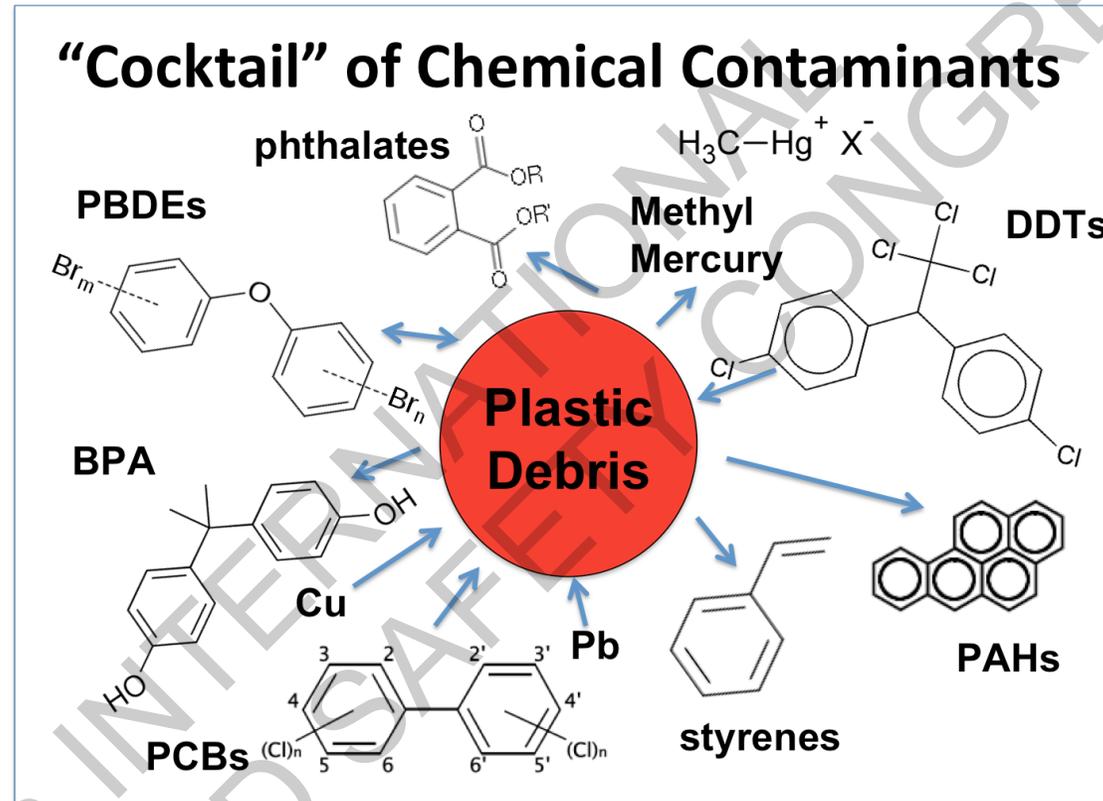
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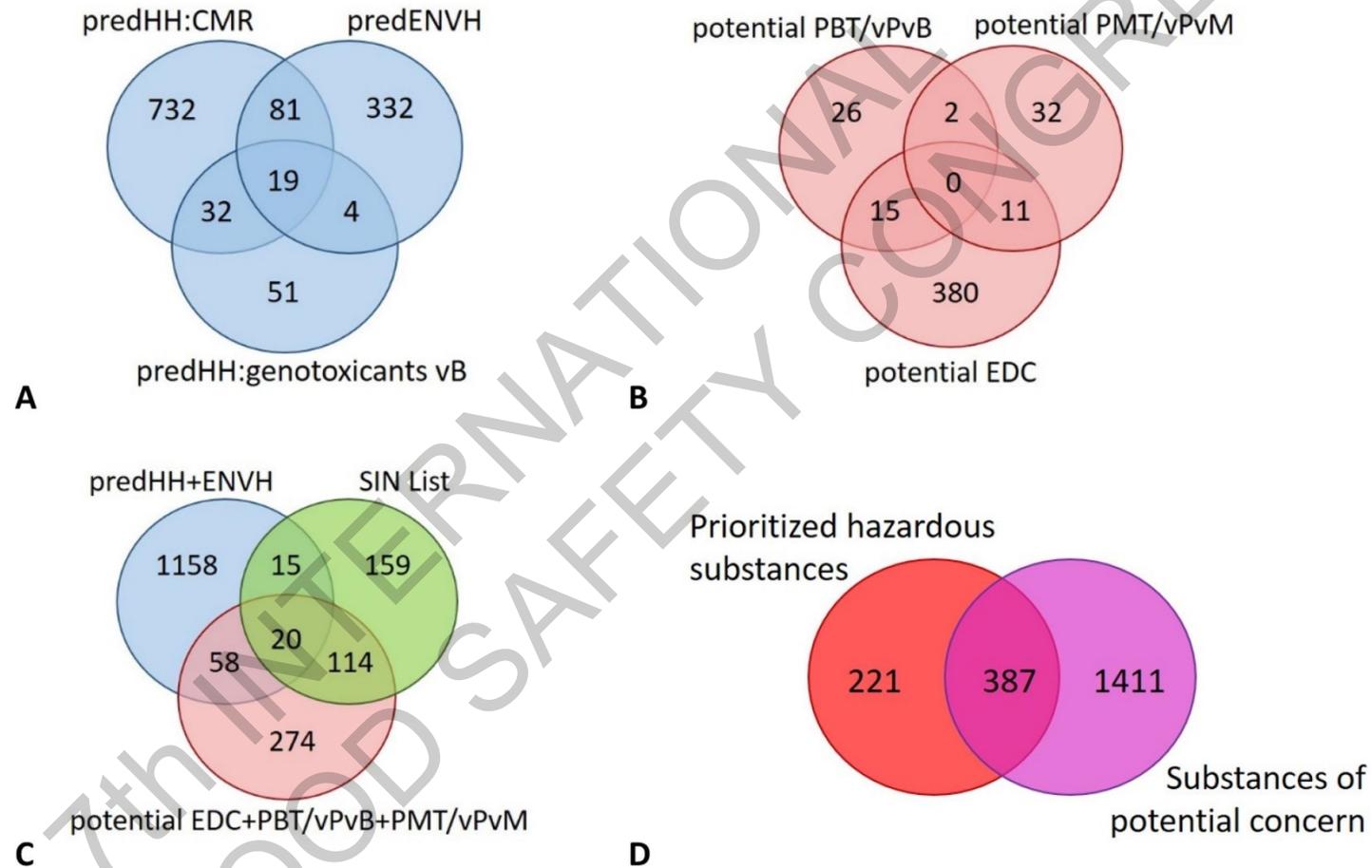
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Do you think that the problem is only limited with physically?



Do you think that the problem is only limited with physically?



Legal Regulations

Food contact materials are regulated according to the general safety principles in EU regulations (EC) No. 1935/2004 and (EC) No. 2023/2006 (European Commission 2004, 2006). In addition to the general legislation, there are specific European Union measures for some food contact materials such as plastic materials (including recycled), ceramics, regenerated cellulose films, active and smart materials, and some substances such as BPA, epoxy derivatives and nitrosamines (EFSA 2020).).

With so much evidence, what is the policy makers' approach to MNPs?

Reports published by EFSA, the United Nations Food and Agriculture Organization (FAO), the Science Recommendation for Policy by the European Academies (SAPEA) and the Norwegian Food and Environmental Science Committee (VKM) consider that there is insufficient data to assess the risk of microplastics to human health.



Legal Regulations

The European Green Deal (EGD), the new Circular Economy Action Plan (CEAP) and the EU Plastics Strategy announces measures to tackle pollution from microplastics intentionally added to products (e.g. cosmetics, detergents, paints) and those that are unintentionally released (e.g. tires and synthetic textiles). The EU Action Plan 'Towards Zero Pollution to Air, Water and Soil' states that by 2030 the EU must reduce plastic litter in the seas by 50% and microplastics by 30%.



Ref. Ares(2021)7346796 - 29/11/2021

CALL FOR EVIDENCE FOR AN IMPACT ASSESSMENT	
This document aims to inform the public and stakeholders on the Commission's future legislative work so they can provide feedback on the Commission's understanding of the problem and possible solutions, and give us any relevant information that they may have, including on possible impacts of the different options.	
TITLE OF THE INITIATIVE	Measures aiming to reduce the presence in the environment of unintentionally released microplastics from tyres, textiles and plastic pellets
LEAD DG (RESPONSIBLE UNIT)	DG ENV, UNIT B 1 SUSTAINABLE PRODUCTION, PRODUCTS & CONSUMPTION DG GROW, UNIT G 1 TOURISM, TEXTILES DG GROW, UNIT I 2 MOBILITY DG GROW, UNIT I 3 GREEN AND CIRCULAR ECONOMY
LIKELY TYPE OF INITIATIVE	Legislative initiative
INDICATIVE TIMETABLE	adoption Q4 2022
ADDITIONAL INFORMATION	Microplastics (europa.eu)
<i>This document is for information purposes only. It does not prejudice the final decision of the Commission on whether this initiative will be pursued or on its final content. All elements of the initiative described, including its timing, are subject to change.</i>	



Legal Regulations

- Limiting intentionally added microplastics and pellets, taking into account the ECHA opinion;
- Develop labeling, standardization, certification and regulatory measures for the unintentional release of microplastics, including increasing the capture of microplastics at all relevant stages of the product lifecycle;
- To further develop and harmonize methods for measuring microplastics unintentionally released, particularly from tires and textiles, and to provide harmonized data on microplastic concentrations in seawater.



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A global plastic treaty must cap production

MELANIE BERGMANN, BETHANIE CARNEY ALMROTH, SUSANNE M. BRANDER, TRIDIBESH DEY, DANNIELLE S. GREEN, SEDAT GUNDOĞDU, ANJA KRIEGER, MARTIN WAGNER,

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Gıda Güvenliđi ve Güvencesi Açısından Ortaya Çıkan Bir Endişe
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