



Technology Topic

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COMMITTEE GUIDE

Technology

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1. Topic 1: *Microplastics in human blood*

I. History/Context

Plastics were first invented in 1856 and have gone through many changes since that time. During the Second World War, in 1939, thermoplastics were developed on an industrial scale to replace rubber. During the 1970s, plastic production expanded greatly, reducing its cost and providing new materials for goods such as cars and personal products. Microplastics derive from this type of plastic.

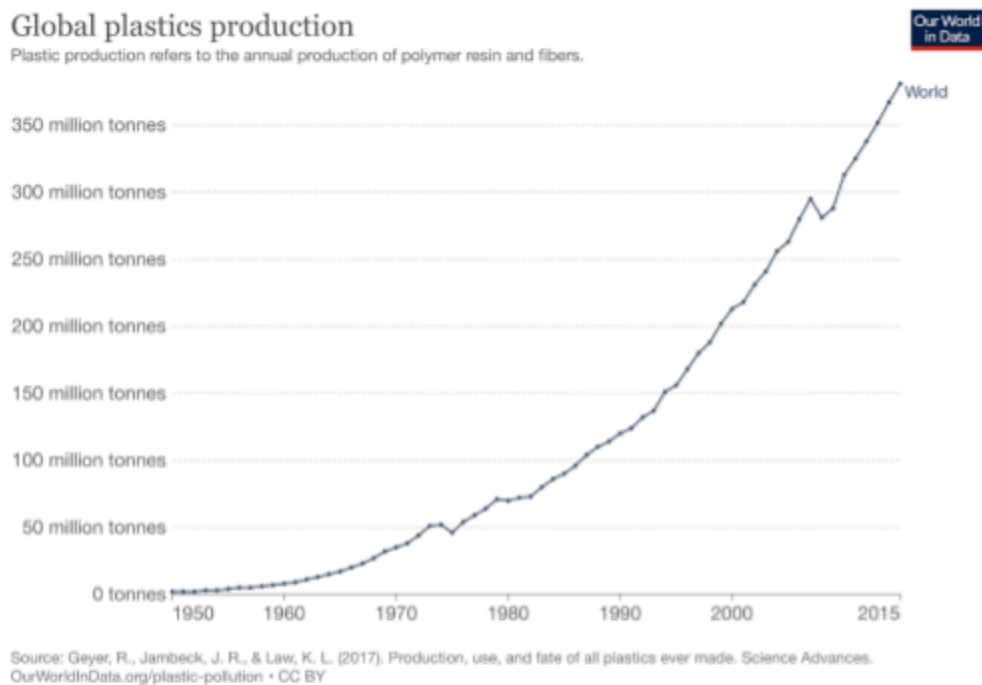


Figure 1: Hannah Ritchie and Max Roser (2018) - "Plastic Pollution"

Microplastics are derived from a variety of sources. “Microplastics are tiny plastic particles less than five millimetres (0.2 inches) in diameter, they result from both commercial product development and the breakdown of larger plastics.” (National Geographic, 2022). Microplastics come from things like the breakdown of plastic bottles, the washing of synthetic clothes and the breakdown of pharmaceutical materials.

The microplastics are too small to be removed by many water-treatment plants, and they may end up in lakes where they stay for hundreds of years. This pollutant material is extremely unsustainable to the environment and may be dangerous to both animal and human health in the long term.

In 2017, a group of Belgian scientists announced that seafood lovers were consuming approximately 11,000 microplastics a year by eating mussels. This curious fact caused interest to the University of Plymouth in the UK; they made a study comparing eating contaminated wild mussels in Scotland or breathing air in a typical home. They found out that “people will take in more plastic during a mussels dinner by inhaling or ingesting tiny, invisible plastic fibers floating in the air around them, fibers shed by their own clothes, carpets, and upholstery, than they will by eating the mussels.” (Parker, L, 2022). This showed that eating mussels was not particularly harmful to human health.

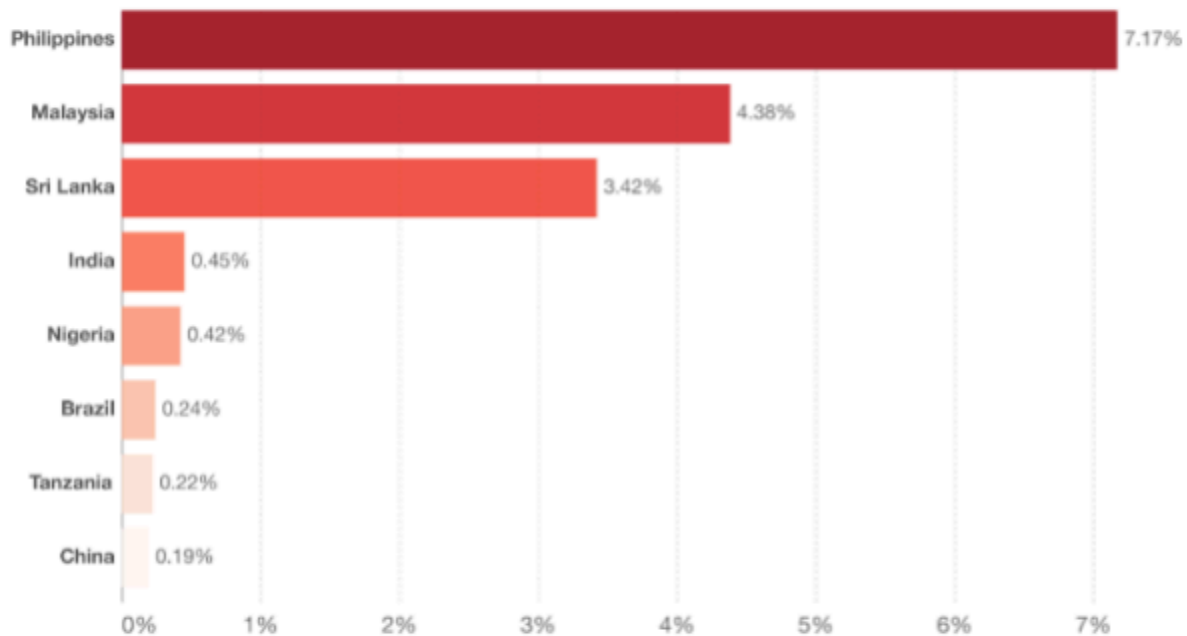
In 2018, The World Health Organisation (WHO) performed its own investigations, and some studies revealed the presence of microplastics in numerous brands of bottled water, such as Nestlé and Danone, in France. According to Bruce Gordon, WHO's coordinator for Water, Sanitation, Hygiene and Health, "in bottled water, plastic particle counts are slightly higher than tap water" (Falk, P, 2019). In the

same year it was found that “based on a study, microplastics were found in the faeces of eight people. Another study documented the presence of microplastics in the placentas of unborn babies.” (Parker, L, 2022)

Probability of mismanaged plastic waste being emitted to ocean, 2019



Mismanaged plastic waste is defined as "plastic that is either littered or inadequately disposed. Inadequately disposed waste is not formally managed and includes disposal in dumps or open, uncontrolled landfills, where it is not fully contained.



Source: Meijer et al. (2021). More than 1000 rivers account for 80% of global riverine plastic emissions into the ocean. Science Advances

Figure 2: Hannah Ritchie and Max Roser (2018) - "Plastic Pollution".

The WHO stated that it was important to continue researching the presence of microplastics in the environment and possible effects on human health when these plastics were ingested.

The first case study where microplastics were found in human blood was on March 25, 2022, where “a Dutch study published in the Environment International journal on Thursday examined blood samples from 22 anonymous, healthy



volunteers and found microplastics in nearly 80% of them” (Heather A, 2022). From this study, scientists concluded that tiny microplastics could be deposited in our organs little by little.



Figure 3: Heather A. Leslie et al, Discovery and quantification of plastic particle pollution in human blood, *Environment International* (2022).

According to some scientists from Vrije Universiteit Amsterdam in the Netherlands, "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," (Askew, K. 2022)

Although the issue is very recent, this does not mean that the WHO Committee is not concerned; it wants to do everything possible to reduce the quantities of plastics being used so that the world's citizens do not suffer the consequences.

II. Current Situation

This situation is very recent, therefore advances and solutions have not been implemented yet. However, the WHO Committee is concerned about their findings and the amount of plastic we consume; the worry is that today it is in our blood, but later it could affect our organs.

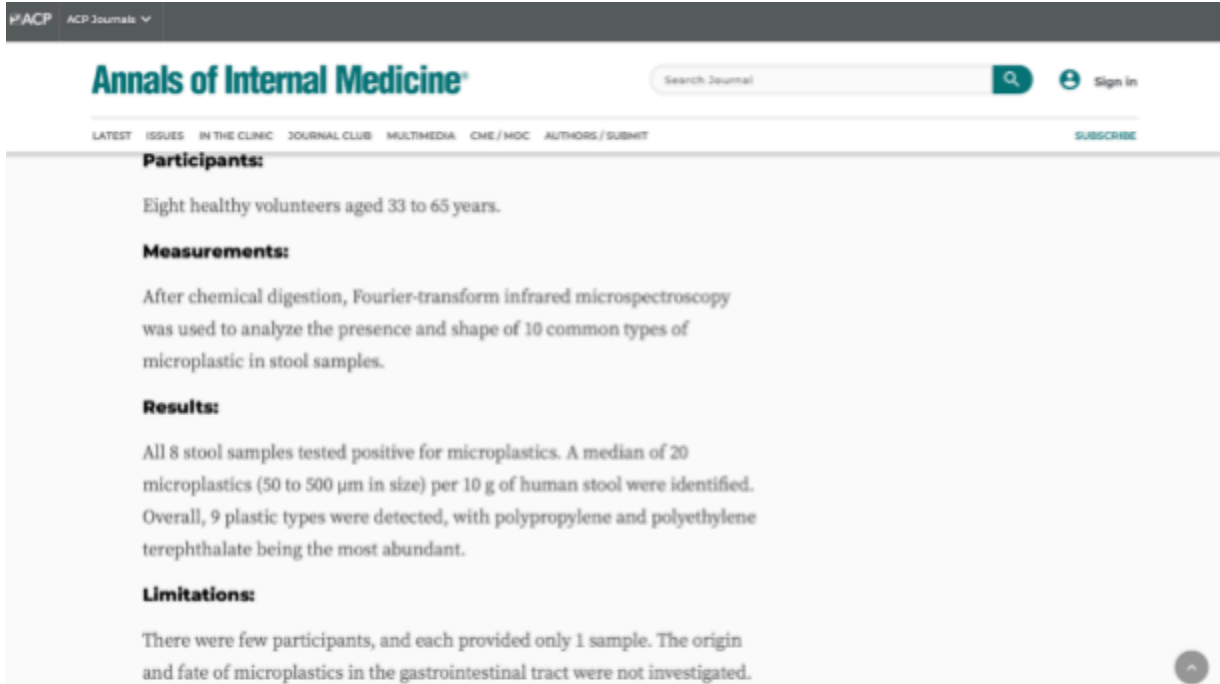
“The World Health Organization (WHO) today calls for a further assessment of microplastics in the environment and their potential impacts on human health, following the release of an analysis of current research related to microplastics in drinking-water. The Organization also calls for a reduction in plastic pollution to benefit the environment and reduce human exposure.”

The screenshot shows the Annals of Internal Medicine website. The article title is "The Ins and Outs of Microplastics" by Stephanie Wright and Ian Mudway. The abstract includes the following sections:

- Objective:** To examine human feces for the presence of microplastics to determine whether humans involuntarily ingest them.
- Design:** Prospective case series in which participants completed a food diary and sampled stool according to step-by-step instructions.
- Setting:** Europe and Asia.
- Participants:** Eight healthy volunteers aged 33 to 65 years.

The article also features a "SEE ALSO" section with a link to "The Ins and Outs of Microplastics" and a "METRICS" section showing the following data:

- Picked up by 74 news outlets
- Blogged by 13
- Referenced in 2 policy sources
- Tweeted by 180
- On 4 Facebook pages
- 594 readers on Mendeley



Figures 4 and 5: Schwabl P;Köppel S;Königshofer P;Bucsics T;Trauner M;Reiberger T;Liebmann B; (n.d.)

Currently, this problem is gradually getting worse and preoccupying. During the month of September of this year 2022, more cases of microplastics in the digestive system were confirmed in a group of people from Asia and Africa aged 33 and 65 years. If microplastics reach the human digestive tract, in the future they could cross the lung barrier.

Doctors and scientists have to carry out further studies on the effects that microplastics could cause on the human system, however some have come to conclude logical consequences that could lead to a high risk for the organism.

Concerns associated with microplastic are:

- **“Toxic substances:** Microplastics can absorb toxic materials like pesticides, heavy metals, and cancer-causing chemicals. They can then transport these toxic materials into your body and cause health issues, Johnson-Arbor says.

- **Digestive issues:** *Some research suggests that people with inflammatory bowel disease consume more microplastics than others. The microplastics may contribute to inflammation in the digestive tract.*
- **Infections:** *Harmful microbes like bacteria can grow on microplastics, so when we breathe in or ingest the specks, they can carry disease directly into our bodies, Vethaak says.*
- **Build-up in your body:** *Over long-term exposure, it's possible that microplastics could accumulate in your tissues and organs, causing damage, Vethaak says.” (Kennedy, M. 2022. para. 16-19)*

Ragas, a professor at Radboud University and a specialist in the consequences of chemical substances on the environment and humans, has compared this problem with nature which is being affected by contamination. He explains that we are experimenting the same issues that animals are currently dealing with. For example, it's like a small bird eating a piece of plastic thinking it is food; this leads to its gastrointestinal tract being affected since it becomes obstructed by the trash it is consuming. Raga states that “On a smaller scale, you can imagine that particles block veins and cause vascular issues, which, for example, is the case when it comes to particulate” (Nowee, M. 2022. para. 6)

Since 2019, the WHO has been concerned about this problem and is urgently calling for help before this situation escalates into critical situations which we will not be able to solve. All countries need to address the issue of the overuse and unnecessary use of plastics. India, for example, is one of the few nations that has implemented measures to counteract the problems of plastics in the environment. “Elimination of Single Use Plastic: In 2019, the Prime Minister of India pledged to

eliminate all single-use plastic in the country by 2022, with an immediate ban in urban Delhi and Global Partnership on Marine Litter (GPML): The GPML was launched at the Earth Summit in 2012 in response to a request set out in the Manila Declaration” (Microplastics in human blood. 2022). It promotes reducing plastic consumption and makes people conscious, not only of the environmental issues, but also of the dangers of microplastics ending up in our bodies.

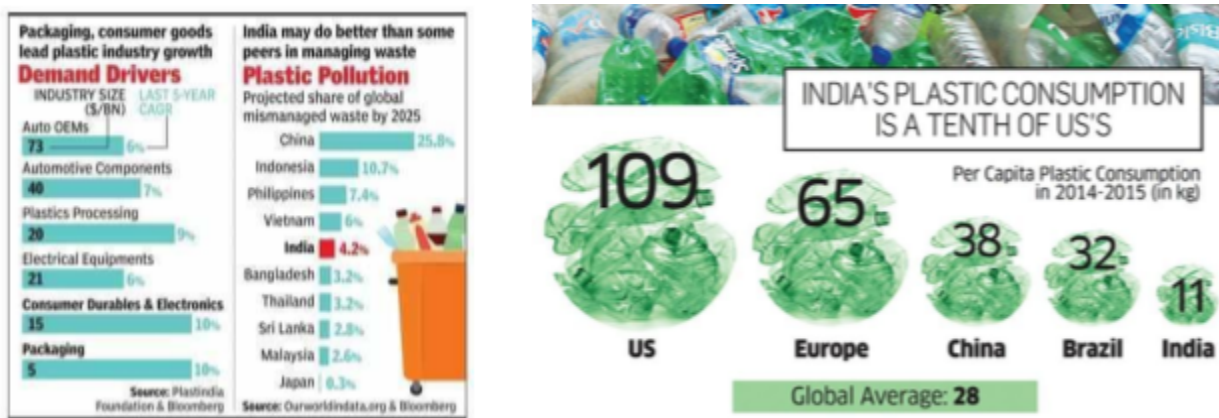


Figure 6: Sakar, J and Singh, N. 2019. How cos are gearing up for less plastic in the biz. Timesofindia.

Figure 7: Image: The Economic Times . 2018. India will abolish all single-use plastic by 2022, vows Narendra Modi. weforum.

According to research in 2021, the nations that have a better management of the environment, such as Canada, had taken a big step in declaring this material toxic and had planned to eliminate most single-use disposables by the end of the year. Rwanda has been one of the most radical and demanding countries; in 2008 it placed a ban on plastic bags, and since 2019 it has planned to eliminate all single-use plastics, in order to become the first plastic-free country. India, which is known for having high levels of pollution, had three key steps for the reduction of plastic; in 2021 it banned the use of plastic bags, in January 2022 it banned six

categories of single-use plastic and in July of this year it banned disposable plastic food packaging.



Figure 8: Treasury Board of Canada Secretariat. 2020. Guidance for the Reduction of Plastic Waste in Meetings and Events. canada.ca.





Figures 9 & 10: Hakuzimana, J. 2021. Break Free From Plastics: Environmental Perspectives and Lessons from Rwanda. longdom.

The current situation is of great concern, and it is necessary for international cooperation to ensure the health of citizens; without this, the highest mortality rate could begin to be microplastics.

For the moment, until more research can be done, the WHO Committee recommends “WHO recommends drinking-water suppliers and regulators prioritise removing microbial pathogens and chemicals that are known risks to human health, such as those causing deadly diarrhoeal diseases. This has a double advantage: wastewater and drinking-water treatment systems that treat faecal content and chemicals are also effective in removing microplastics” (WHO. 2019)

III. Key points of the debate

- Causes of microplastics in the blood
- Effects on health of having a high percentage of microplastics in the bodies
- Reducing the use of plastic, especially single-use plastic
- Ensuring products and food are eco-friendly
- Possible treatments for eliminating microplastics from the body

IV. Guiding questions

1. What is your country's position regarding the use of plastic and its disposal?
Are there adequate systems in place to ensure that microplastics do not get into the water system?
2. How could your country work towards reducing the amount of plastic used in general?
3. Is there any evidence from your country that microplastics are entering the human body system or food chain?
4. What processes should be put in place in order to ensure food product distribution is safe for consumers?
5. How could the study of microplastics and human health be funded at an international level?

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