Amsterdam, April 21, 2021.

## **Response to the Mandate of the Special Rapporteur on Toxics and Human Rights call for submissions, “The lifecycle of plastics and human rights”**

**Dear Dr. Marcos Orellana,**

The Plastic Soup Foundation strongly supports the report on “the lifecycle of plastics and human rights”. The effect plastics have not only on the environment, but also on human health and wellbeing is of grave concern to our organization, and the exposure of people all over the world to these harmful substances without their prior informed consent is a human rights issue. Therefore, the Plastic Soup Foundation strongly supports the initiative and wants to provide you with information about the possible impacts of the plastic lifecycle on human health. Plastics may affect our health [via three pathways](https://www.plastichealthcoalition.org/):

1. We eat, drink and breathe microplastics every day. These small plastic particles may harm our health once they have entered our bodies.
2. Plastic products contain chemical additives. A number of these chemicals have been associated with serious health problems such as hormone-related cancers, infertility and neurodevelopment disorders like ADHD and autism.
3. When plastics and microplastics end up in the environment, they attract micro-organisms, such as harmful bacteria (pathogens). If microplastics containing these pathogens enter our body, they may increase the risk of infection.

**Microfibers and other plastic microparticles**

Research has found microplastics in the [faeces of people](https://pubmed.ncbi.nlm.nih.gov/31476765/) from Europe, Russia, and Japan, which confirms that humans do, in fact, ingest microplastics. This research also demonstrated that some microplastic particles are egested from our bodies. However, is this true for all ingested microplastics, or does a percentage remain in our bodies? In order to understand this, a wide range of animal studies have been conducted and scientists found that the smallest microplastics can pass the gut barrier and reach the bloodstream. From there, these plastic particles can travel to other parts of the body. For example, [in rats](https://link.springer.com/article/10.1007/s11051-015-3029-y), plastics were detected in the stomach, intestines, kidney and heart. One [especially interesting study](https://particleandfibretoxicology.biomedcentral.com/articles/10.1186/s12989-020-00385-9) (conducted on rats) has recently found that nanoplastics have the potential for maternal-fetal translocation once these particles reach the placenta. Furthermore, very small plastic particles have even been detected in the [foetuses of mice](https://pubmed.ncbi.nlm.nih.gov/26526105/) and in the [brain of fish](https://www.nature.com/articles/s41598-017-10813-0). These are only animal studies; we have yet to know more about what plastic does exactly to humans.

The rising number of synthetic fibers used in industry and consumer life are causing enormous amounts of microplastic release into our living environments. Synthetic textiles such as clothing, for example, are a significant source of microfiber pollution, [accounting for up to a third of all microplastics entering the ocean every year](https://www.eunomia.co.uk/reports-tools/plastics-in-the-marine-environment/). Plastic fibers are also constantly released into the air, both indoors and outdoors; polyester clothing pollutes the air as well as [our bodies of water](https://pubs.acs.org/doi/10.1021/acs.est.9b06892). We are not only eating and drinking plastic, but also inhaling plastic fibers which are found in [outdoor air](https://www.sciencedirect.com/science/article/abs/pii/S2468584417300119), as well as inside buildings. About 33% of fibers in indoor environments [are plastic fibers](https://www.sciencedirect.com/science/article/abs/pii/S0269749116312325). We breathe in at [least 13,000 to 68,000 plastic microfibers](https://www.sciencedirect.com/science/article/abs/pii/S0269749117344445?via%3Dihub) from our clothing, carpets, curtains, and other textiles every year. Strong concerns have been raised by researchers about the damage nylon and polyester microfibers [could cause to human lungs](https://www.biorxiv.org/content/10.1101/2021.01.25.428144v2). The right to clean air and water are two of the most basic human rights there are, and the ubiquity of plastic microfibers at ever-increasing levels is a threat to both.

Researchers have hypothesized that human exposure to microplastics could lead to [oxidative stress](https://pubmed.ncbi.nlm.nih.gov/24127541/), [DNA damage and inflammation](https://pubs.acs.org/doi/10.1021/acs.est.7b00423), [among other health problems](https://www.sciencedirect.com/science/article/abs/pii/S2468584417300119). Particularly, when inflammation becomes chronic, this can pave the way to very serious health problems. [Preliminary results](https://www.plasticsoupfoundation.org/en/2019/10/does-plastic-make-us-sick-contact-with-microplastics-may-lead-to-immune-cell-death/) also indicate that immune cells in blood die significantly faster when exposed to coated microplastics of a particular size. However, it’s not only the plastic particles themselves that are potentially harmful: the surface of microplastics in the environment are colonized by micro-organisms, some of which have been identified as human pathogens.

**Microplastics and Pathogens**

Human pathogens have a particularly strong bind to plastic waste, more so than to [natural surfaces](https://www.cell.com/trends/microbiology/fulltext/S0966-842X%2820%2930190-6#back-bb0070). Research published in 2016 identified the human pathogen [*Vibrio cholera*](https://www.sciencedirect.com/science/article/abs/pii/S014111361630112X)*,* which causes cholera in humans*,* attached to microplastics sampled from the North and Baltic Seas.

Plastic does not biodegrade and can consequently travel long distances in the aquatic environment. Particularly in areas with poor sanitation facilities and high plastic pollution, it is hypothesized that plastic could be contributing to the spread of diseases; this especially important to consider in the midst of a pandemic.

**Chemical Additives**

Plastics contain chemical additives which give them various characteristics such as durability, plasticity, and stability in heat. Common among these chemicals are endocrine disrupting chemicals (EDCs), such as the notorious BPA. [According to the World Health Organization](https://apps.who.int/iris/handle/10665/78102), EDCs are associated with imbalances in sex ratios, disruption in fertility cycles and delayed or accelerated puberty in females, as well as delayed neurodevelopment in children, immune disorders, and hormone-related cancers.

Even low levels of exposure to endocrine disrupting chemicals are of concern to living organisms; [experimental research on animals shows](https://enveurope.springeropen.com/articles/10.1186/s12302-018-0139-z) impaired thyroid and immune function, among other concerning side-effects. The periods during which test subjects were most susceptible to the effects of endocrine disrupting chemicals were the embryonic and early development stages; the plastic and health problem concerns future generations, as exposure starts early.

Studies have found that virtually all plastic items tested, even those cleverly marketed and advertised as “BPA Free”, contain chemical alternatives which similarly affect estrogenic activity. BPF, for example, is commonly used as a coating for food and drink cans and in dental devices as a replacement for BPA. In mice, it has been shown to lead to [increases in anxiety and depression](https://pubmed.ncbi.nlm.nih.gov/27312807/) in offspring exposed in the womb.

Phthalates**,** another form of endocrine disrupting chemical,are used in plastics to increase flexibility in plastic and are often referred to as plasticizers. They are also used as solvents and can be found in various products, ranging from vinyl on floors, to cosmetics and toys. Human exposure occurs mainly through diet, as phthalates can be released from packaging material into products. Phthalates usually pass out of the body through urine; phthalates are not known to bioaccumulate. [Despite this, some studies have observed](https://www.cdc.gov/biomonitoring/Phthalates_FactSheet.html) associations with health effects such as altered [semen quality and](https://oem.bmj.com/content/62/11/806.short) [shortened gestation periods](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2873014/).

Brominated Flame Retardants (BFRs), used in plastics to fireproof electronics, synthetic foams and textiles, and plastic furniture, have also [raised concern among scientists over the past 20 years.](https://pubmed.ncbi.nlm.nih.gov/11999784/) Sensitive populations such as children are thought to be at higher risk of exposure, and some BFRs such as PBDE (polybrominated diphenyl ethers) have been [found in human breast milk](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1241790/). BFRs are believed to impair neurological behavior, developing immune systems, and thyroid hormones23. Once again, however, more research is needed.

Apart from intentionally added chemicals, plastics also contain many non-intentionally added substances, named [NIAS](https://www.foodpackagingforum.org/fpf-2016/wp-content/uploads/2018/06/FPF_Dossier03_NIAS_2nd-edition.pdf). These substances can be breakdown products of chemicals that are added during manufacturing, side products or contaminants. Most of the detected chemicals in a plastic product are NIAS, and as these substances are unknown, their toxicity is unknown too. What does this mean? Biologist dr. Pete Myers [explains](https://www.plastichealthcoalition.org/plastic-health-summit-2019/) that as a result, “*no plastic has been tested thoroughly for all the plausible and important health effects that may be related to it[…]*”. Further leaving a hole in our understanding of the harmful effects of not only plastic, but the chemicals found in plastic products as well.

**Final word**

Like many socio-enviro problems, the issue of plastic pollution, specifically when it comes to health, [adversely affects communities in already precarious positons](https://news.un.org/en/story/2021/03/1088712). We highly recommend that you take into consideration the Center for International Environmental Law (CIEL)’s report on [Plastic and Health; the Hidden Costs of a Plastic Planet](https://www.ciel.org/plasticandhealth/).

There is no question that plastic, in its production, consumer use, and disposal stages threaten the human rights to health and to a healthy environment, as well as the rights to body integrity, safe drinking water, and the rights of future generations. It is incredibly important that we approach plastics and their additives with the precautionary approach, trusting science and in the meantime doing everything we can to mitigate human and environmental exposure.

Thank you for your consideration.

**Yours sincerely,**

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**On behalf of The Plastic Soup Foundation**

