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Microplastics

In March 2022, the Blue Growth Research Lab discovered microplastics in the human blood for the first time. How has this come so far? And more, what can we do to prevent further damage?

In 2019, microplastics were identified as tiny pieces of plastics with a maximum size of 5 mm. There are two kinds of microplastics. The first sort of microplastics are the ones who are intentionally added to daily-life products, such as shampoo, toothpaste, face masks, … The second kind of microplastics are parts of bigger shaped plastics, for-example shopping bags, which erode to tiny little fragments. The microplastics don't perish, but stay in the environment for many years (Bollaín Pastor & Vicente Agulló, 2019).

Microplastics are everywhere in our daily lives. They are released from the plastic bottles we drink of. The amount depends on the brand of the bottle (Song et al., 2021). Fitting clothes can liberate tiny plastics which can be inhaled (Zhang et al., 2020). Unintentionally, humans eat and breathe in to 0,1 to 0,5 g of microplastics via these ways (Senathirajah et al., 2021).

Whereas microplastics themselves are a threat, they tend to carry other contaminants with them such as insecticides, toxins, microbes, viruses, and chemicals that adhere to them. This can possibly contribute to drug resistance (Hirt & Body-Malapel, 2020). It can even have an adverse effect on gut microbiota, which is very important in the health of both humans and animals. Further research must be done to examine the danger of chemicals releasing from the microplastics in the body (Adamovsky et al., 2021). High concentrations of microplastics can trigger hypersensitivity, detected by the increase of cytokines and histamines in human blood (Hwang et al., 2019).

Not only humans are suffering the damage of the microplastics, also the ocean gets overloaded with floating and sinking microplastics. The waste in the ocean is estimated 150 million tonnes (Chandran et al., 2020). They are hardly recognisable because they get overloaded with algae which makes them look like natural fragments. This leads to marine organisms mistaking these microplastics for food. Their size and the annex of algae makes them look very tasty (Desforges et al., 2015). The microplastics enter the organism while eating of just by sucking it in while they are breathing (Li et al., 2021). This way, fish meal made of fish gets infected too (Wang et al., 2022).

Oysters are filter feeders, filtering massive amounts of water through their gills. This is how they get infested with plastics that can interfere with their reproduction and offspring (Li et al., 2021; Sussarellu et al., 2016). The average contamination is 0,72 particles per individual (Keisling et al., 2020). The amount variates in the bays, due to temperature, circulation, and the amount of people (Lozano-Hernández et al., 2021). The risk of eating oysters to the human health depends to whether the ingested microplastics are infected with chemicals and to the size and form of the ingested microplastics. If the ingested microplastics are infected with chemicals, they can have an adverse effect to the oyster's health. They can lower micro-closure time or lower the growth. This is only due to the chemicals, which shouldn't be in the oysters if they weren't sucked in sticking to the microplastics (Bringer et al., 2021). There is no proven harmful effect of eating oysters that ingested microplastics without chemicals (Smith et al., 2018). Oysters can egest microplastics, but some of them not, depending on size and form. The bigger the microplastic, the sooner it gets egested (Ward et al., 2019).

Shrimps ingest microplastics out of their food. The microplastics enter via the mouth, passing through to the stomach and only the smaller parts end up in the midgut gland. The hepatopancreas is not affected thanks to protection through the pyloric filter. The microplastics can stay for a long time in the stomach, but the duration of this stay doesn't affect the shrimp (Korez et al., 2020). The microplastics loaded with chemicals can induce the immune reaction and reaction of the microbials, ending in death of the shrimp (Hsieh et al., 2021). Normally, the microplastics enter the intestines and they are excreted. The shape of the microplastic doesn't affect egestion in

shrimp. In uptake of microplastics, only the size matters (Klein et al., 2021). Large microplastics are kept apart and are egested. Small microplastics enter the gastro-intestinal system with oxidative stress as an reaction to it (Saborowski et al., 2022). The effect on humans when eating shrimp is very low because the head and intestines are thrown away (Lusher et al., 2017).

Fish reject the microplastics with mucus. The rejective behaviour is selective and less prone to selection when there is food around the source (Ding et al., 2021). Not all plastics are ejected, as they have been found in intestines and gills (Azevedo-Santos et al., 2019). The amount is about 0,72 mg per individual (Thiele et al., 2021). Microplastics bruises the intestines. They affect respiration, development, metabolic process, and the immune system. Altogether, they cause trauma and dysbacteriosis (Qiao et al., 2019). Dysbacteriosis modulates the immune system, which can reduce good physical condition and thus limit daily living (Fackelmann & Sommer, 2019). In real life, the burden is aggravated due to hazardous additions, sticking to the microplastics (Adamovsky et al., 2021).

The answer to getting microplastics out of the seas and oceans remains unsolved, as the particles are so microscopic, they escape filtering and end up in the ecosystem. In Europa, there is an intention of prohibiting microplastics that are added to products. An effort will be made to use biodegradable plastics (Fältström & Anderberg, 2020). Biodegradable plastics can be enzymatically recycled to no waste (Roohi et al., 2017). In contrast with the non-degradable plastics, the alternative is expensive, what keeps people from using it (Yaguchi et al., 2020). Once aware of the health risks, people can get motivated to use less plastics in their daily lives, creating a better environment for themselves and for the marine world (Garcia-Vazquez & Garcia-Ael, 2021).

Not everything is known about microplastics. Yet, the evolution to cope with alternatives is promising, but far from ideal.

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