Government of Western Australia
Department of Health

Micro-plastics and Public Health

Micro-plastic particles are found in air, water and soils, as well as in the gut and tissues of numerous marine and terrestrial animal species.

Currently, there is limited research into the nature, extent and effects of micro-plastics on public health. Theoretically, micro-plastics can affect health through the action of particles, release of chemical by-products, and as carriers of organic and inorganic contaminants. However, based on the information currently available, there is little evidence to demonstrate adverse health effects in humans arising from real-life exposures.

Despite the lack of information on the human health effects of micro-plastics, plastic use should be minimised as much as practicable for broader ecological health and human-wellbeing benefits.

What are micro-plastics?

The term 'micro-plastic' typically refers to very small (<5 millimetre (mm) diameter), solid particles made of predominantly polyethylene, polystyrene, polypropylene, polyvinyl chloride, polyurethane, polyethylene and terephthalate plastics. Plastic particles that are smaller than 0.1 micrometre (µm)[1] diameter are called nano-plastics.

How do micro-plastics end up in the environment?

Micro-plastics in the environment come from -

- products that contain micro-plastics purposefully manufactured into a particular product. Primary micro-plastics (also known as micro-beads) are found in products such as cosmetics, personal care products, cleaning products, medical devices, fertilisers, paints and coatings, and agricultural chemicals. Micro-plastics are released into the environment simply through the act of using or working with the product.
- manufactured plastic items such as single use plastic bags, packaging, straws and bottles that break down over time. Breakdown can be accelerated by UV light and through wind and wave action. These "macro-plastics" are already present within the environment due to littering or waste mismanagement.
- the release of micro-plastics from textiles and clothing (also called microfibres) as a result of normal wear and tear.

Micro-plastic pollution is widespread across water, land and air. Globally, between 5 and 13 million tonnes of macro-plastic waste enters the oceans each year, while primary micro-plastics can enter waterways from waste-water systems. Micro-plastics in the soil are due to the degradation of plastic waste and application of agricultural chemicals that contain primary micro-plastics. Airborne micro-plastics result from the release of synthetic fibres from clothes, and resuspension of soils and road dust.

[1] Micro-metre (µm) = 1/1,000,000th of a metre

How am I exposed?

The main route of exposure for humans is via food and drink. Micro-plastics in the oceans and on land can be consumed by organisms that are then consumed by humans. Micro-plastics are consistently found in seafood and have also been measured in a diverse range of other food sources including chicken, honey, and salt.

Most of our consumption of micro-plastics is probably from what we drink. Micro-plastics are found in both tap and bottled water, but the range of particles per litre is large (0 – 1000 particles/L)[2].

It has been estimated that we may consume up to 5g of micro-plastics a week, although this estimate is based on average diets and water consumption[3]

We can also breathe in micro-plastics from the air, which will depend on the concentration of micro-plastics in the air. This will also vary widely.

It is important to note that there will be a big difference between the amount of micro-plastic that may enter our body and how much is absorbed. Many micro-plastic particles are too large to cross from the gut into the bloodstream. Indeed, absorption of intact plastic particles from the gut is likely to be very small (≤0.3 %)[4]. As far as micro-plastics in the air, only the smallest particles will reach deep into our lungs.

Can micro-plastics affect my health?

At present we don't really know. This is because we haven't been able to establish how much we are exposed to; how much is absorbed and how much is needed to affect health.

There are three pathways by which micro-plastics could potentially affect health. These are:

- as particles that we ingest or inhale. Although this will depend on the size of the particle and most microplastics will be too large to be breathed deep into the lungs or cross the gut barrier when ingested.
- from chemicals that can leach out of the micro-plastics (or plastics in general). There has been concern about chemicals, such as phthalates and bisphenols, that are used in the production of plastics. These are considered endocrine disrupting chemicals (EDCs) that can interfere with human immune and hormonal systems. However, human health effects from exposure to low levels of these chemicals are unclear.
- from chemicals, metals and micro-organisms that can attach to micro-plastics. Micro-plastics can become carriers for these contaminants but, again, how much exposure we have to these contaminants via micro-plastics is not known.

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[2]World Health Organization. Microplastics in drinking-water; Geneva: 2019.
[3]Senathirajah K. and Palanisami T. How much microplastics are we ingesting? Estimation of the mass of microplastics ingested. Report for WWF; Singapore: 2019
[4]Food Standards Australia New Zealand (FSANZ). Microplastics in food.
https://www.foodstandards.gov.au/consumer/generalissues/Pages/Microplastics-in-food-.aspx

Toxicological studies (studies on human cells or animals) show that there are adverse impacts on biological systems from each of these pathways. Studies in human populations are however difficult, because; we are exposed to a wide-range of other environmental contaminants, we don't know how much micro-plastic we are exposed to, and there are no specific plastic-related diseases. At present, research is ongoing.

Current advice

Although there is still much more research to be done, the current advice from organisations such the World Health Organisation (WHO), European Food Safety Authority (EFSA), and Food Standards Australia New Zealand (FSANZ) is that it is unlikely that current levels of consumption of micro-plastics in our food and drink is harmful to human health.

The Department of Health supports this advice. However, plastic pollution is a growing problem and, irrespective of any human health risks, appropriate measures should be taken to reduce the use of plastics where possible and to minimise the release of plastics into the environment because of their broader ecological impacts.

More information

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