URL : https://news.amdi.usm.my/fullnews.php?id=OWhDWXhKRE1YZmRHcURoblhUR3lpdz09
AMDI Magazine
e-issn 2735-041X, Volume 4, Issue 1 (2023)
Expert Column

Are We Eating Microplastics?

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PUBLISHED : 03 MAY 2023

What's for dinner? Lego sushi, credit card burgers, or a well-done piece of PVC pipe? These might be extreme examples, but they can readily illustrate the total amount of small plastic particles that humans consume each day over time.

A study by the University of Newcastle reported that an average adult could consume about 5 g of plastic (approximate equivalent to a credit card) weekly from a variety of commonly eaten foods and beverages. In addition, there is increasing evidence supporting that microplastics could be ingested by animals and humans via food chains. In Malaysia, microplastics are detected in some commercial fish species, which may pose potential health concerns to consumers (Karbalaei et al., 2019). Whereby, aquatic and seafood products are important protein sources and dietary component of many Malaysians with reports of per capita consumption of fish of 58 kg per person.

One of the major global environmental issues often discussed and brought up by many governments in the world today is microplastic pollution. Microplastic pollution causes severe harm to biodiversity, especially aquatic organisms as million tons of these plastic wastes able to migrate, accumulate and proliferate within the natural habitat, especially within the aquatic environment from the flowing rivers to the ocean surface and within the ocean's seabed. These activities severely threatens the well-being and preservation of the aquatic environment (Cole et al., 2011). The big plastic debris undertakes various degradation processes and fragmentation by UV solar radiation to breakdown. Consequently, it forms smaller tiny pieces of plastic fragments within the aquatic environment (Ivar do Sul & Costa, 2014). These including polyester, polycarbonate, polypropylene (PP), polyamide, polyvinyl alcohol, polyvinyl chloride (PVC) and polyethylene (PE) are the common polymers in microplastics found in the environment. These particles can be shifted within the food

chains and, eventually, the food webs as well.

There are three kinds of potential health hazards associated with microplastic ingestion that has been identified by Ma et al., (2020). These are chemical, physical particles and microbial pathogens. Firstly, plastics can leach estrogenic-like chemicals (e.g., bisphenol-A or BPA) when exposed to a certain temperature and/or sunlight (UV radiation). These estrogenic chemicals mimic the actions of naturally occurring oestrogens, which subsequently disrupt the endocrine activity with resulting metabolic disorders including obesity and diabetes. In addition, microplastics can absorb and bind harmful additives and monomers including organic pollutants that are present together with microplastics in the environment. In mammals, these chemicals found in plastics are associated with increased risk of obesity, some forms of cancers e.g., breast cancer, low sperm count in males and early puberty in females. We can postulate that similar adverse consequences are mostly likely found in humans because endocrine system is highly conserved across all vertebrate classes. However, confirmatory studies are greatly needed.

Secondly, as a physical particle, after ingestion, some microplastics may pass through the gastrointestinal (GI) tract and are excreted through defecation. However, microplastics may potentially accumulate and cause mechanical or physiological disruption to the GI tract and elsewhere. Microplastics may be translocated through blood or lymph to the cardiovascular and respiratory systems causing adverse health consequences. For instance, accumulation of microplastics in the circulatory system has been shown to block blood flow and subsequently cause severe damage to the cardiac tissue and its activity. In addition, a study has found that inhalable microplastics may also reach the lung alveoli, causing inflammation of the respiratory tract and cardiovascular diseases.

Thirdly, microplastics has been shown to induce gut microbiota dysbiosis in fishes and dysbiosis can interfere with the immune system and trigger life-threatening diseases including infection and death. Although, the adverse health consequences of short- and long-term microplastic ingestions in humans are not well studied, t is important to be aware that the adverse consequences from microplastic ingestion may depend on the type of microplastics and exposure (i.e. dose-dependent).

Therefore, supporting policies that seek to limit single-use plastics is always important.