European Commission

MICROPLASTICS
Focus on Food and Health

Factsheet – December 2017

MICROPLASTICS

Microplastics are considered to be all plastic particles in the range of 0.1–5,000 µm.

Every year worldwide, more than 300 million tons of plastics are produced, half of which is designed for single use, and each year, at least 8 million tons end up in our oceans. Between 69 and 81 % of microplastics in the marine environment comes from 'secondary microplastics' that originate from degradation of larger plastics[1]. The main 'primary microplastics released in the ocean mainly originate from land activities[2] (Figure 1).

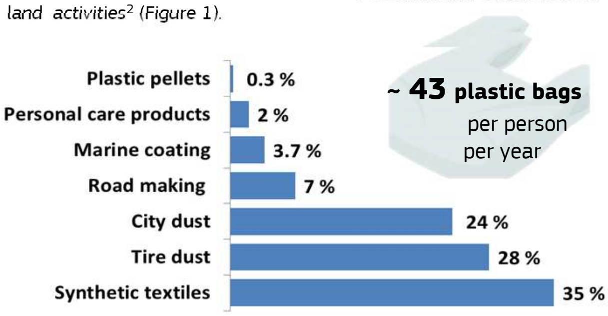

Fig 1. IUCN Primary Microplastics in the Oceans: a Global Evaluation of Sources, 2017

Biodegradation is the process by which plastics (e.g. AcC, PBS, PCL, PES, PVA)* breaks down to carbon dioxide, methane and water and requires microbial action. This process is temperature dependent and, in some cases, complete degradation can only be achieved above 50° C. Such conditions are rarely met in the marine environment. In addition, the polymers most commonly used (e.g. PE, PP, PVC)* are not readily biodegradable; they are subjected to weathering and fragmenting into micro- and nano-plastics and remain in the environment for hundreds of years[3]. These small particles of plastic can be ingested by zooplankton, invertebrates and small fish, entering this way in the food-chain[4-7] (Figure 2).

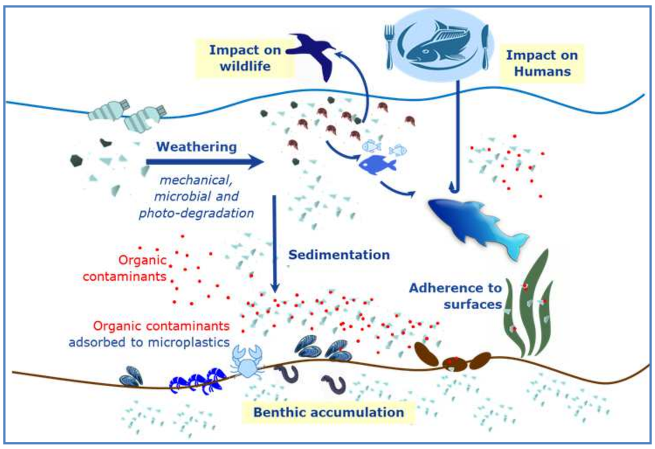

Fig.2. Schematic representation of how microplastics enter in the food-cycle(4).

*__ABREVIATIONS__: ***AcC*** *(acetyl cellulose),* ***PBS*** *(polybutylene succinate),* ***PCL*** *(polycaprolactone),* ***PES*** *(polyethylene succinate),* ***PVA*** *(polyvynil alcohol),* ***PE*** *(polyethylene) ,* ***PP*** *(polypropylene),* ***PVC*** *(polyvinyl chloride)*

In addition to fish and shell-fish, microplastics enter the food-chain via other abiotic sea products such as sea-salt[5,8]. Furthermore, synthetic fibres have also been detected in beer[9], honey, sugar[10] and, as shown in Figure 3, tap water.

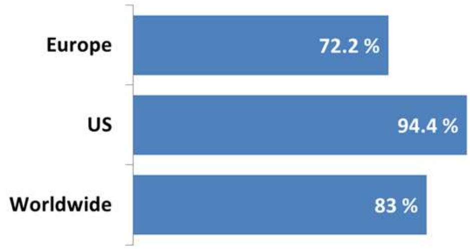

Fig.3. Percentage of drinking water contaminated with microplastic fibres, 2017 (ORB Media) [11]

In the food-chain, the impact of microplastics on both wildlife and human population are not well understood (limited systematic studies available as shown in Figure 4). According to current knowledge, ingestion of **microplastics *'per se'* is unlikely to represent** an objective **risk to human health**[1].

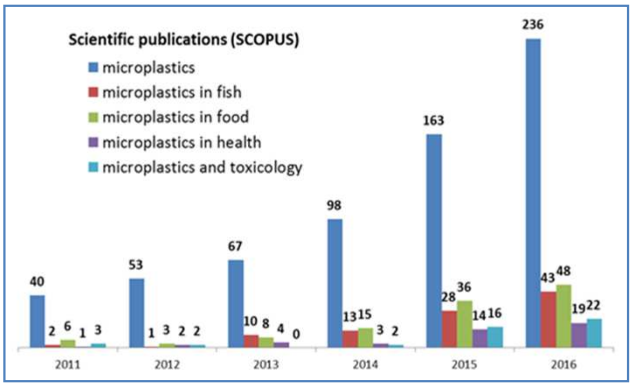

Fig.4. Number of publications on microplastics in SCOPUS database.

Nevertheless, the nature of the risk depends on the physical characteristics and chemical composition, as well as the time to biodegrade[7]. **Plastics often contain additives**[9] such as stabilisers, plasticisers, flame retardants and pigments that can be released to the waters. Currently, the 150 million tonnes of plastics in the oceans are estimated to include about 23 million tonnes of additives[1].

Moreover, **plastics can contain unintended substances** such as impurities or adsorbed contaminants that may be released when consumed by fish and mammals (Figure 5).

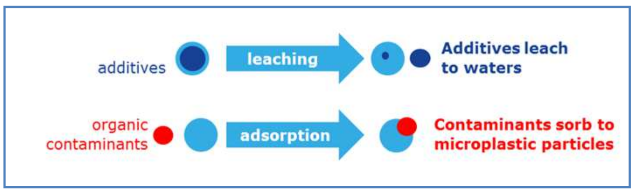

Fig.5. Additives and organic contaminants release processes.

Some of the additives or organic contaminants adsorbed can be toxic, can develop endocrine effects, can give an unpleasant taste to the food or even enhance degradation. Furthermore, microplastics can act as a transport medium for pollutants, invasive species and pathogens[12,13].

The presence of microplastics may have a small effect on overall exposure to substances such as bisphenol (BPA), certain phthalates, pesticides and endocrine disrupting chemicals (EDCs). BPA, for example, has already been banned from baby bottles in the EU and Canada.

At the request of the German Federal Institute for Risk Assessment (BfR), the EFSA Panel for Contaminants in the Food Chain has delivered a statement on the presence of microplastics and nanoplastics in food, with particular focus on seafood[12]. The report concludes that there are insufficient data on the occurrence, toxicity and fate of these materials when ingested to carry out a full risk assessment.

KNOWLEDGE GAPS[13-17]

Lack of reliable information on

- levels of primary microplastics entering Europe's sewage systems or surface waters[12].
- the natural degradability and potential environmental impact of all types of microplastics and its associated additives in marine and fresh water[14,15].
- microplastic uptake in humans and the effect of accumulation after inhalation and ingestion[16] (i.e. embolization of small vessels due to microplastic accumulation, inflammation and immunoreactions, are some potential effects on human health[16]).
- the impact of size, shape, point of entry and chemical composition on human toxicity[16].
- the impact of microplastic ingestion on the microbiome (microplastics can act as vehicles for microbes)[16].

As well as **lack** of systematic studies on

- the impact on human health of additives leaching from microplastics and/or chemicals adsorbed, and microbes accumulated in the microplastics[14,16].
- the amount and fate of microplastics during the processing of food[13].

Limited data available on

- the amount of microplastics in food and when transferred between trophic levels. (i.e. fish products are used to feed poultry and pigs)[13].
- toxicokinetics; only includes absorption and distribution but not metabolism or excretion (do they target secondary organs?)[13,16].
- In addition, the limited information available lacks comparability due to the absence of standardised methods for performing risk assessment of health impact.

Lack of integrated databases to be used by scientists and regulatory authorities. The EU-funded ECsafeSEAFOOD Contaminants database contains information on contaminants of emerging concern in seafood. The database focuses on unregulated contaminants (i.e. endocrine disruptors, flame retardants, toxic elements, pharmaceuticals, microplastics, etc).[17]

REGULATORY AND LEGAL FRAMEWORK

Methods for identifying and quantifying microplastics in food, including sea food, are available[13]. However, the lack harmonisation results in lack of comparability of data and implementation of Quality Assurance Systems[13].

Although there is no specific legislation for microplastics as being contaminants in food, other directives/regulations (Cosmetics Regulation and REACH) are referred to on a case-by-case basis.

The Cosmetics Regulation, regulating the safety of a cosmetic product during normal use, could be applied to products containing microbeads (i.e. toothpaste and lip gloss containing primary microplastics).

REACH regulates the registration, evaluation, authorisation and restriction of chemicals.

Directive 2015/720 on plastic bags requires the Commission to examine the impact of the use of oxo-degradable plastic carrier bags on the environment.

The life-cycle of plastics are regulated under EU chemical regulation, the Packaging and Packaging of Waste Directive, the Waste Framework Directive and the Directive on the Landfill of Waste[18]. It is recommended also that the Marine and Water Framework Directives specifically address plastic waste affecting water quality[18].

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