Breast Cancer UK comments submitted to ECHA following their "call for evidence on the use of intentionally added microplastic particles in products of any kind".

The European Chemicals Agency (ECHA) has recently announced that, at the request of the European Commission, it will investigate the need for a restriction on the placing on the market and/or use of 'intentionally added' microplastic particles in products or uses that 'intentionally release' microplastic particles to the environment. This call is intended to gather information on all possible intentional uses of microplastic particles in products. The information gathered will be used to determine whether these uses pose a risk on an EU-wide basis and assess the socio-economic impacts of any potential restriction.

Submitted to ECHA on May 10th 2018

Breast Cancer UK is a charity which aims to prevent breast cancer by reducing public exposure to carcinogenic and other hazardous chemicals in the environment. We are concerned about the potential role of exposures to environmental chemicals in increasing breast cancer risk. We consider microplastics to be potentially harmful to human health and the environment. We believe their presence in the environment may increase breast cancer risk, due to the potential for these particles to release harmful additives and to accumulate and release other substances of concern.

We welcome ECHA's consideration of whether the addition of microplastics should be restricted in products and are grateful for the opportunity to respond to the call for evidence. Breast Cancer UK supports fully a restriction on the use of intentionally added microplastic particles in products of any kind.

We are especially concerned about chemical "additives" present in microplastics (e.g. plasticisers and compounds used in manufacture such as bisphenols), and the potential for microplastics to act as "vectors" for environmental pollutants; these substances may be transferred to marine and other organisms, following ingestion of microplastics (1, 2). Studies have found common persistent organic pollutants can be up to 10 million times higher in plastic pellets than in sea water (3). As well as being potentially detrimental to the health of marine organisms and birds, microplastics and associated environmental pollutants have the potential to be passed up the food chain.

Many chemical additives that leach from microplastics, such as bisphenols, heavy metals and phthalates, are endocrine disrupting chemicals (EDCs), which can affect the function of the hormone system. In particular EDCs which act as oestrogen mimics are associated with increased breast cancer risk (reviewed in reference 4). Endocrine disrupting chemicals may exert their effects at very low doses, and it is becoming increasingly apparent that environmental exposures to mixtures of such chemicals may be especially harmful (5).

Studies have shown microplastics may enhance toxicity (as well as bioaccumulation) of heavy metals in fish. For example, the presence of microplastics enhanced the toxicity and bioaccumulation of cadmium in zebrafish (6), causing oxidative damage and inflammation. Environmental exposure to cadmium (which is an EDC), is a risk factor for breast cancer (7).

As stated in ECHA's background document, intentionally added microplastics can be released into the environment during the use of these products (typically via wastewater), potentially contributing to environmental litter and leading to concerns that their use may pose a risk to the environment and/or

human health. Recent studies show that microplastics are not removed fully from wastewater treatment plants (WWTPs). The activated sludge process (the most common type of sewage treatment used globally) has a retention capacity of up to around 98-99% (e.g. 8, 9), with most of the microplastics remaining within the activated sludge solids. Despite this, WWTPs remain point sources for microplastics (and nanoplastics) discharge, due to the high volume of effluent that is released constantly.

Microplastics may have a negative impact on the activated sludge treatment process itself; a recent study found respiration of activated sludge flocs was acutely inhibited by the presence of polystyrene nanoplastics (10), due to a change in composition of the extracellular polymeric substance (EPS) that surrounds activated sludge microorganisms and is integral to floc formation. Such changes will affect sludge settling and reduced respiration will affect the ability of activated sludge microorganisms to biodegrade pollutants. Another concern is the presence of microplastics (containing environmental pollutants) in the activated sludge solids that are removed, and used commonly as land fertiliser (following appropriate treatment). One study which examined the fate of polyethylene microbeads from cosmetics using a laboratory scale bioreactor run to simulate an activated sludge WWTP found approximately half the microbeads were captured in the activated sludge (11). Other studies (cited above) suggest that most of the microplastics that enter an activated sludge WWTP will end up in the excess sludge solids.

Reducing significantly microlitter pollution in marine, freshwater and terrestrial environments should be a priority, given the potential harm this type of pollution causes. Although we appreciate microplastics may also arise from degradation of macroplastics, a ban on the use of added microplastics in products of any type would be one step towards reducing environmental pollution.

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