Prohibition of certain Products containing plastic Microbeads

The following submission is to the Joint Committee on Housing and Local Government on the general scheme of the Prohibition of Certain Products Containing Plastic Microbeads Bill 2018.

Dr Anne Marie Mahon and **Dr Róisín Nash**
Marine and Freshwater Research Centre (MFRC)
Galway-Mayo Institute of Technology (GMIT)

Both academics are Irish researchers working in the area of microplastics from both freshwater and marine ecosystems in Ireland. The submission represents an introduction to microplastics and an overview of the research that is being carried out in GMIT in the area of microplastics to build a knowledge base in an Irish context and to develop and standardise methodologies in both Ireland and Europe to allow comparisons between studies and to identify the sources and potential pathways of microplastics.

Statement

Microplastics can be defined as "any synthetic solid particle or polymeric matrix, with regular or irregular shape and with size ranging from 1 µm to 5 mm, of either primary or secondary manufacturing origin, which are insoluble in water" (Frias and Nash 2019).

Microplastics are intentionally added to numerous products, some of which include (i) personal care products, (ii) paints/coatings, (iii) detergents, (iv) industrial abrasives, etc (Amec Foster Wheeler Environment and Infrastructure UK 2017).

However, it has been highlighted that for many products, there are numerous feasible alternatives that may be utilised instead of microplastics (Amec Foster Wheeler Environment and Infrastructure UK 2017). Replacing intentionally added microplastics with feasible alternatives can be undertaken by industry to reduce microplastic release into the environment.

Of the microplastics that are intentionally added to products, some of them are specifically referred to as microbeads. These plastic particles are one category of primary microplastics that have received much attention from both the scientific community and civil society within the past few years. This has in part been driven by their (i) discovery in the natural environment, (ii) ability to adsorb toxic chemicals and potentially transfer these to organisms upon ingestion, (iii) ability to negatively impact the health of organisms under laboratory conditions.

Furthermore, once these particles are released upon use, it is almost impossible to recover them as well as the fact that their use is avoidable in that they can be replaced by natural products. All of the above-mentioned factors have led to the 'Beat the Microbead' campaign as well as voluntary corporate and legislative bans of products containing such particles in several countries.

Based on the evidence and research both presented here, through out Ireland, Europe and Internationally we are in support of the general scheme of the Prohibition of Certain Products Containing Plastic Microbeads Bill 2018.

Presentation

Slide 1: Introduction

An EPA funded desk study carried out in 2015 showed the potential sources of microplastic pollution in Irish freshwater environments, whereby catchments with a high risk of exposure were identified. A number of potential sources were also identified including plastics industry, agricultural plastics, plastic manufacturing industry and house-hold discharges such as personal care products and clothing fibres.

Slide 2 ,3 & 4: Discharges

Further investigations into two plastics companies; a medical device company and a plastics recycling company, revealed that there was considerable accidental discharges into the sewer. Allowable discharges also occur due to the lack of regulation regarding the detection of microplastics and the existence of limits for suspended solids in discharge waters.

Slide 5: Sources and pathways

Further work is currently on-going to measure potential microplastics emanating from plastics industries overland by sampling near- by storm water drains. Many sources culminate in the urban waste water treatment plants where the microplastics loading is separated into those lighter particles which enter with the discharge waters (10%) and those that become incorporated into the sewage sludge. Researched carried out by GMIT and NUIG show that the processes of treatment of sludge can affect the hazard of the microplastics most of which are land spread in Ireland.

Slide 6: Sources and pathways

The current EPA funded project "Sources, Pathways and environmental Fate of Microplastics" is currently investigating microplastics emanating from the construction industry and from astro-turf pitches. Preliminary results show aspects of construction design dramatically reduce the leakage of microplastics from Astro-turf pitches. Other preliminary finding reveals microplastics present in small freshwater invertebrate species and in water samples taken from the Slaney catchment. Investigation regarding the mechanisms by which microplastics are transported overland and vertically through soil is ongoing between GMIT and UCD partners.

Slide 7 -9 : Intervention

GMIT identifies several potential points of intervention with regards to microplastic pollution. The introduction of legislation and regulation to reduce the production and use of microplastics is seen as a powerful intervention which will preventing unnecessary leakage of microplastics into the environment, thereby avoiding impact to environment and human health. Other interventions could include effective waste management and changes in industrial processes to avoid contact of microplastics and water which inevitably ends up in the sewer. Intervention at receptors such as treatment plants and effects disposal of sewage sludge are also perceived as effective mitigation measures.

Slide 10: Marine – An Irish context

Studies have reported a ubiquitous recording of microplastics in the Irish marine Environment. GMIT have experienced marine microplastic scientists answering research questions which involve the identification and quantification of MPs in seawater, sediments and biota. Our aims are to build on the knowledge base, particularly in Ireland, to produce comparative/standardised methodologies, to improve ocean literacy through proving information on microplastics in Irish commercial species and through taking an ecosystem based approach to our research using Irish case studies.

Slide 11: Building a knowledge base

Dr Amy Lusher did her PHD in Microplastics in GMIT where she began to show the ubiquitous distribution of microplastics in seawater off our coast through intensive surveys from the Irish research vessels the RV Celtic Voyager and RV Celtic Explorer, the presence of microplastics both in mesopelagic fish and in True's beaked whale.

Slide 12: Building a knowledge base – policy relevant

Dr Heidi Acamppora did her PHD in Micro and macroplastics in GMIT where she began to show the high levels of plastics in beached seabirds through carrying out beach bird and colony surveys with the help of citizen science. She helped to develop and apply European methodologies for necroscopies. The results of her research led to the use of an OSPAR Ecology Quality Objective (EcoQOs) to reduce the levels of litter (plastic particles) in fulmar stomachs in Ireland. Current research by Andrew Power (PhD candidate on a Marine Institute Cullen fellowship) is looking at seabird eggs to reduce the levels of hazardous substances in seabird eggs. EcoQOs are being developed to provide operational objectives and indicators for applying the ecosystem approach.

Slide 13 & 14 Building a knowledge base

Niall Keogh a PhD candidate is building on the knowledge on the interactions of seabirds and marine litter both inshore and offshore. Dr La Daana Kanhai recorded microplastics along latitudinal gradients in the Atlantic Ocean and in the Arctic Central Basin.

Slide 15 – Methodologies

Research led by Dr Anne Marie Mahon is exploring the use of different plankton nets to sample surface microplastics using Galway Bay as case study. This has resulted in providing recommendations on sampling and processing of microplastics in surface waters in Europe. This research will also provide valuable Irish data on the levels of microplastics in our backyard.

Slide 16 – Standardise Methodologies

GMIT is particularly invested in Quality Control and rigorous scientific standards in the research of microplastics and this subsequently led to our involvement in BASEMAN, a JPI Oceans project, with funding supported by the Irish Marine Institute. Research involving Dr João Frias, Dr Anne Marie Mahon,

Dr Ian O'Connor and Dr Róisín Nash has resulted in the production of European Standardised methodologies for seawater, sediment and biota and recommendations for monitoring.

Slide 17 & 18 – Commercial species

Research into commercial species is important for both increasing our knowledge base but also as ocean literacy is increasing and consumers are more aware of microplastics they are very interested in risks associated with seafood. We have researchers who have examined the intestinal tracts of pelagic fish and the Dublin bay prawn from fish grounds around the south and west coasts.

The blue mussel is regularly consumed in Ireland while the common periwinkle is largely exported. They have both recorded microplastics in their intestinal tracts. We have several research projects exploring research questions in spatial differences and potential impacts on behaviour etc. The lug worm best known for its use as bait has the potential to result in bioaccumulation of microplastics up the food chain to its predators.

Slide 19 & 20 – Ecosystem Approach

With so much research focusing on individual species we felt it was important to take an ecosystem approach and get a better overview of what is happening in a Bay and so we have Elena Pagter a PhD Candidate and Dr João Frias using Galway Bay to build up a more complete picture to inform both policy makers and the local community.

Slide 21 - Thank you

Further information can be found from the publications listed below:

Lusher, A.L., Burke, A., O'Connor, I., Officer, R., 2014. **Microplastic pollution in the Northeast Atlantic Ocean**: Validated and opportunistic sampling. Mar. Pollut. Bull. 88, 325–333.

Lusher, A.L., O'Donnell, C., Officer, R., O'Connor, I.,2015a. **Microplastic interactions with North Atlantic mesopelagic fish**. ICES J. Mar. Sci. J. du Cons .

Lusher, A.L., Tirelli, V., O'Connor, I.,Officer, R., 2015b. **Microplastics in Arctic polar waters**: the first reported values of particles in surface and sub-surface samples. Sci. Rep. 5, 14947.

Lusher, A.L., Hernandez-Milian, G., O'Brien, J., Berrow, S., O'Connor, I. and Officer, R., 2015. **Microplastic and macroplastic ingestion by a deep diving, oceanic cetacean**: The True's beaked whale Mesoplodon mirus. Environmental Pollution, 199, pp.185-191.

Acampora, H., Lyashevska, O., Van Franeker, J.A. and O'Connor, I. (2016). The use of **beached bird surveys** for marine plastic litter monitoring in Ireland. *Marine Environmental Research*, *120*, pp.122-129.

Acampora, H., Berrow, S.D., Newton, S. and O'Connor, I. (in review). Presence of **plastic litter in pellets** from Great Cormorant (Phalacrocorax carbo) in Ireland

La Daana, K.K., Officer, R., Lyashevska, O., Thompson, R.C. and O'Connor, I., 2016. **Microplastic abundance, distribution and composition along a latitudinal gradient** in the Atlantic Ocean. *Marine Pollution Bulletin*.

Frias, J.P.G.L, Nash, R., (2019). **Microplastics: Finding a consensus on the definition**. Marine Pollution Bulletin 138, pp. 145-147

Frias, J. P.G.L, Nash, R., O'Connor, I., et al., (2018). **Standardised protocol for monitoring microplastics in sediments**. JPI-Oceans BASEMAN project.

Frias, J. P.G.L, Nash, R., O'Connor, I., et al., (2018). **Standardised protocol for monitoring microplastics in seawater**. JPI-Oceans BASEMAN project.

Pagter, E., Frias, J., Nash, R., (2018). **Microplastics in Galway Bay: A comparison of sampling and separation methods**. Marine Pollution Bulletin 135, pp. 932-940.

Mahon, A.M., Officer, R., Nash, R., O'Connor, I., (2017). **Scope, fate, risks and impacts of microplastic pollution in Irish Freshwater Systems** (2014-HW-DS-2) EPA Final Report. Environmental Protection Agency (EPA).

Mahon, A.M., O'Connell, B., Healy, M.G., O'Connor, I., Officer, R., Nash, R., Morrison, L., (2016). **Microplastics in Sewage Sludge: Effects of Treatment**. Environmental Science & Technology 51, 810-818.

Lechner, A. and Ramler, D., 2015. **The discharge of certain amounts of industrial microplastic from a production plant into the River Danube is permitted by the Austrian legislation**. Environmental Pollution 200C: 159–160.