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MICROPLASTICS IN THE MARINE ENVIORNMENT-A REVIEW

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Abstract

Microplastics are very small particles of plastics that find their way into the marine environment through two main sources; cosmetic products and generally when larger plastic debris is weathered into smaller pieces. Due to the relative small size, microplastics are easily ingested by marine organisms and have been found to accumulate in tissues, circulatory system, and brain. The extent to which microplastics represent a hazard to the entire ecosystem is pronounced with the degree of ingestion by a wide range of marine biota and the existence in sea salt. This is of considerable concern because microplastics can cause significant harm to marine organisms and humans.

Keywords: Microplastics, abrasion, marine organisms, industrial drainage systems, Sewage sludge

Introduction

Microplastics are tiny abundant plastic particles smaller than five millimeters (5 mm) in size and originate from two sources; those that are manufactured purposely for particular industrial or domestic application such as exfoliating facial scrubs, toothpastes and resin pellets used in the plastic industry (primary microplastics), and those formed from the breakdown of larger plastic items under ultraviolet radiation or mechanical abrasion (secondary microplastics) (IMO, 2015).

These small plastic particles enter the marine environment through several activities on land and in the marine environment. Microplastic beads present in facial cleansers, synthetic clothing, toothpaste, and scrubs get into the marine ecosystem through domestic and industrial drainage systems and wastewater treatment plants (Cole et al., 2011;

Murphy et al., 2016). Also, larger plastic particles from waste dumps that have been broken down into smaller fragments can be transported into seas which cause microplastic pollution.

ROUTING OF MOCROPLASTICS IN TO THE OCEAN WATER

The size small of microplastics and associated low density contributes to the widespread transport and distribution across larger distances by currents(Eriksson et al., 2013; Eerkes-Medrano et al., 2015). These small marine plastics are abundant and are widespread in all aquatic habitats across the world (Reisser et al., 2014; Cole et al., 2014; Eerkes-Medrano

et al., 2015).

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Microplastics enter the marine environment via different pathways

(terrestrial and marine-based activities)

- The microplastics beads present in cosmetics such as scrubs, toothpastes and in clothing can enter the aquatic environment through industrial or domestic drainage systems.
- synthetic fibers from clothing produce microplastic sheds that are washed into water or wastewater treatment plants as effluents(Murphy et al., 2016).
- Microplastics also get into the marine environment via storm

  wind, and currents (Zalasiewicz et al., 2016; Murphy et al.,

  2016). Some are transported out to sea via runoff

  (Cole et al., 2011),
- The degradation of macroplastic debris is another source and the route is often sea recycling ports and landfills where adverse weather situations aid in macroplastic dumping at sea shores.
- Sewage sludge is another possible source of microplastic pollution as it contains more microplastics than effluent which are transported into the aquatic ecosystem (Leslie et al., 2012; Alomar et al., 2016).

  Microplastics exist on beaches, seabed sediments surface waters, and in a wide diversity of marine organisms such as sea birds, fishes, bivalves, mammals and crustaceans (DeWitte et al., 2014; Gauquie et al.,2015).

EFFECTS OF MICROPLASTICS

Studies have been carried out on microplastic ingestion by marine organisms and most of the studies come from the analysis of stomach contents (Rochman et al., 2013;Fossi et al., 2016; Cole et al., 2013; Caron et al., 2016; Rehse et al.,

2016).Microplastics, when ingested by marine organisms, cause chemical and physical harm. The consumption of microplastics by marine organisms may cause mechanical effects such as attachment of the polymer to the external surfaces thereby, hindering mobility and clogging of the digestive tract, or the effect could be chemical such as inflammation, hepatic stress, decreased growth (Setala et al., 2016). are fed upon by organisms in the higher trophic level (Hollman et al.,2013).

MICROPLASTICS IN THE SEA SALT

Abiotic sea products are a source of food for humans and there is a possibility that the presence of microplastics in the sea could lead to the contamination of sea products and potential transfer to humans. One of such products is sea salt. The presence of microplastics in sea salt has recently been proven through the study by Yang et al. (2015) that detected 7–204 particles kg−1, 550–681 particles kg−1 and 43–364 particles kg−1 of microplastics in 15 brands of rock/well salts, sea salt and lake salt, respectively. The microplastics found were polyethylene, cellophane and polyethylene terephthalate. This demonstrates that alongwith fish and shellfish (seafood), table salt also appears to be contaminated by microplastics.

CONCLUSION

Microplastics reduce the recreational, esthetic and heritage value of an environment and it seems inevitable that these particles will continue to increase in the coming years as ways to do away with the presence have not been feasible. Reducing the problem of microplastics cannot occur without involving the general public, the socio-economic sectors, tourism and companies specializing in waste management. In addition, research avenues are being tested on bacteria of marine origin which have properties that could degrade marine microplastics. Such bacteria could then be applied in the remediation of contaminated environments. Harnessing microbes for the degradation of microplastics is a promising and environmentally safe action plan that will enable the management of microplastics without negative effects, and eventually favor the natural cleaning of contaminated environments.

REFERENCES

- Auta, H.S., Emenike, C.U, Fauziah S.H.,2017. Distribution and importance ofmicroplastics in themarine environment:A review of the sources, fate, effects, and potential solutions 165-176.
- Asmita, K., Shubhamsingh, T., Tejashree, S., 2015. Isolation of plastic degrading microorganisms from soil samples collected at various locations in Mumbai, India. Curr. World Environ. 4 (3), 77–85.
- Cole, M., Lindeque, P., Halsband, C., Galloway, T.S., 2011. Microplastics as contaminants in the marine environment: a review. Mar. Pollut. Bull. 62, 2588–2597.
- Cole, M., Lindeque, P., Fileman, E., Halsband, C., Goodhead, R., Moge, R.J., Galloway, T.S.,2013. Microplastic ingestion by zooplankton. Environ. Sci. Technol. 47:6646–6655. http://dx.doi.org/10.1021/es400663f.
- Cole, M., Webb, H., Lindeque, P.K., Fileman, E.S., Halsband, C., Galloway, T.S., 2014. Isolation of microplastics in biota-rich seawater samples and marine organisms. Sci. Rep. 4:4528. http://dx.doi.org/10.1038/srep04528.
- Cole, M., Lindeque, P.K., Fileman, E., Clark, J., Lewis, C., Halsband, C., Galloway, T.S., 2016. Microplastics alter the properties and sinking rates of zooplankton faecal pellets. Environ. Sci. Technol. 50:3239–3246. http://dx.doi.org/10.1021/acs.est. 5b05905.
- De Witte, B., Devriese, L., Bekaert, K., Hoffman, S., Vandermeersch, G., Cooreman, K.,Robbens, J., 2014. Quality assessment of the bluemussel (Mytilus edulis): comparison between

commercial and wild types. Mar. Pollut. Bull. 85:146–155. http://dx.doi.org/10.1016/j.marpolbul.2014.06.006.

- Eriksen, M., Lebreton, L.C.M., Carson, H.S., Thiel, M., Moore, C.J., Borerro, J.C., Galgani, F.,Ryan, P.G., Reisser, J., 2014. Plastic pollution in the World's oceans: more than 5 trillionplastic pieces weighing over 250,000 tonnes afloat at sea. PLoS One 9 (12),E111913. http://dx.doi.org/10.1371/journal.pone.0111913.
- Eriksson, C., Burton, H., Fitch, S., Schulz, M., Van Den Hoff, J., 2013. Daily accumulation rates of marine debris on sub- Antarctic island beaches.Mar. Pollut. Bull. 66, 199–208.
- Gauquie, J., Devriese, L., Robbens, J., DeWitte, B., 2015. A qualitative screening and quantitative measurement of organic contaminants on different types of marine plastic debris. Chemosphere 138, 348–356.
- Hollman, P.C.H., Bouwmeester, H., Peters, R.J.B., 2013. Microplastics in the aquatic food chain: sources, measurements occurrence and potential health risks. RIKILT Report2013.003. RIKILT Wageningen UR (University & Research Centre),
- Wageningen.
- Setala, O., Norkko, J., Lehtiniemi,M., 2016. Feeding type affects microplastic ingestion in acoastal invertebrate community. Mar. Pollut. Bull. 102, 95–101.
- Yang, D., Shi, H., Li, L., Li, J., Jabeen, K., Kolandhasamy, P., 2015. Microplastic pollution in table salts from China. Environ. Sci. Technol. 49 (22):13622–13627. http://dx.doi.org/10.1021/acs.est.5b03163.