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Commentary: Plastic waste associated with disease on coral reefs

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A commentary on

Plastic waste associated with disease on coral reefs
by Lamb, J. B., Willis, B. L., Fiorenza, E. A., Couch, C. S., Howard, R., Rader, D. N., et al. (2018). Science 359, 460–462. doi: 10.1126/science.aar3320

This commentary addresses the important issue of the influence of plastic waste on marine disease risk recently raised by Lamb et al. (2018) in their article "Plastic waste associated with disease on coral reefs" and poses new questions beyond this comprehensive study.

The first-ever Europe-wide strategy on plastics adopted on 16 January (EC, 2018) followed a landmark December 2017 United Nations resolution signed by nearly 200 countries to fight ocean plastic waste (UNEP, 2017). These policy actions aim to revolutionize the design, production, use, and recycling of plastics, which have come to dominate the litter and debris ending up in our coastal seas and open oceans. We have become increasingly cognizant of the direct effects of marine plastic pollution on human and wildlife health (Galloway, 2015; Galloway et al., 2017). Many different impacts of plastic marine debris (PMD), including microplastics (diameter <5 mm) and nanoplastics (diameter <100 nm), have been observed (e.g., tissues inflammation, metabolic disruption, decreased feeding and growth rates, impairment of reproduction, and increased mortality) (Rist and Hartmann, 2018).

In their recent article, Lamb et al. (2018) suggest that mesoplastics (diameter >50 mm) entangled on coral reefs substantially increase the risk of disease for these organisms. Plastic debris stresses corals giving pathogens a niche for invasion. However, the indirect effects of PMD on microbial processes, pathogen transmission, and disease emergence are less well-known. There is evidence of diverse microorganisms, including notable human, fish and bivalve pathogens, such as some *Vibrio* species, living in the microbial community that is specifically enriched on PMD (Kirstein et al., 2016; Harrison et al., 2018). Yet, the virulence and disease dynamics of these pathogens hitching a ride on PMD are unknown (Keswani et al., 2016; Quero and Luna, 2017), and in this regard, a key research question moving forward would be: what is the role of PMD, particularly microplastics ingested by marine biota (clams, corals, fish, mussels, oysters, etc.), in the transmission of marine and seafood-borne human pathogens? This complex question would require a multidisciplinary approach focusing on the actual pathogenicity of plastic-associated bacteria through RNA sequencing of virulence factors and detailed analysis of the transmission dynamics through experimental exposure and modeling tools. The EU Strategic Research Innovation Agenda for plastics should address this avenue of research, which is crucial to understanding the disease process and to improving management responses to marine disease challenges.

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