'Critical' questions over disease risks from ocean plastics

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Key knowledge gaps exist in our understanding of how ocean microplastics transport bacteria and viruses—and whether this affects the health of humans and animals, researchers say.

With millions of tons of plastic reaching the world's oceans every year—and trillions of particles floating on the surface—the potential impacts of plastic pollution are vast.

Plastic particles are known to carry specific combinations of metals, pollutants and pathogens (bacteria, viruses and other microorganisms that can cause disease).

But the new study, by the University of Exeter and the Centre for Environment, Fisheries and Aquaculture Science (Cefas), says critical questions remain about the role of microplastics in carrying pathogens, and possible threats to food production and safety.

The paper focusses on aquaculture (seafood farming), which is expected to play a vital role in feeding the world's growing population, and already faces challenges due to diseases.

"Microplastic fragments differ markedly from natural floating particles, and there is growing evidence that they represent a potential reservoir of pathogens," said Dr. Ceri Lewis, of Exeter's Global Systems Institute.

"Of particular concern are the increasing reports of the presence of numerous pathogens on plastic surfaces in oceans around the world.

"One study found antimicrobial-resistant bacteria at concentrations 100-5,000 times higher on microplastic surfaces than in surrounding seawater.

"However, the effects of all this on marine animals, aquaculture and ultimately human health are really unknown at this point."

Many studies have suggested that disease transfer from plastic to ingesting organisms may occur, but this has not been demonstrated

experimentally.

Seafood fears

Aquaculture is now the fastest-growing food sector, and bivalves (such as mussels and oysters) arguably offer the best route to increase production globally.

However, bivalves are filter-feeders and are known to take in microplastic particles from seawater.

"Understanding any risk of pathogen transport associated with microplastic is important for the aquaculture industry," said lead author Jake Bowley, of the University of Exeter.

"Disease is one of the biggest issues faced by the industry.

"We mapped the abundance of sea-surface plastics against areas of intensive aquaculture, and the results show a number of areas of high aquaculture production in microplastic hotspots where pathogen transfer could theoretically occur.

"One such hotspot is in China, where 57 microplastic particles per individual have been reported in the commercially important Yesso clam."

Dr. Craig Baker-Austin, of Cefas, added: "Bacteria from a genus called vibrio—a globally important group of human and animal pathogens that are increasing in incidence—have been found in high levels on microplastics.

"Some vibrio bacteria are known to contribute to disease in bivalves, often causing mass mortality among larvae and in some cases mortality

within adult bivalve populations."

This research is funded by insurer AXA XL through their Ocean Risk Scholarships Programme.

The programme funds Ph.D. research that examines how the ocean is changing and how that will impact the current and future risk landscape.

Geir Myre, AXA XL's Global Head of Aquaculture, serves as a risk supervisor to Jake Bowley, providing advice on how this research is relevant to AXA XL and the wider aquaculture insurance industry.

Myre said: "Understanding the link between microplastics and the risk of transferring pathogens through shellfish is critical to our work to manage and transfer risk for the aquaculture industry.

"It's one of many emerging risks we must consider as a result of human impact on the ocean and highlights the connection between ocean risks and public health and safety."

Dr. Lewis added: "There is a lot we still need to know about the impact of plastic pollution.

"Shining a light on this pressing environmental, food safety and microbiological issue is really important.

"However, it's likely that any negative impacts will get worse if we continue to dump plastic into the oceans at the current rate.

"We urgently need to move to more sustainable and circular economy approaches to our use of plastic materials to drastically reduce the input of plastics into the environment."

The article, published in *Trends in Microbiology*, is entitled: "Oceanic hitchhikers—assessing pathogen risks from marine microplastics."

More information: "Oceanic hitchhikers - assessing pathogen risks from marine microplastics," *Trends in Microbiology*, DOI: 10.1016/j.tim.2020.06.011

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