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Letter to the Editor

# From feed to food: Unveiling the widespread impact of microplastics on animal and human health

Microplastics (MPs) are a pervasive environmental threat infiltrating our ecosystem, including food and animal feeds. Their presence in feeds highlights significant risks to animal health, food safety, and human well-being. As MPs enter the food chain, their impact on human health is profound, requiring urgent and coordinated action from all stakeholders. This editorial explores the journey of MPs from animal feeds to animal products and calls for immediate collective response. Microplastics, defined as plastic particles smaller than 5 mm in diameter, have been found in various environmental settings, from the deepest oceans to the highest mountains. These minute particles stem from a multitude of sources, from the degradation of larger plastic debris to the microbeads found in consumer products. Research has increasingly focused on understanding how these particles move from being ingested by animals to becoming embedded in the food products derived from these animals. However, their presence in animal feed, water and environmental sources are introduces a direct pathway to human exposure, as these plastics can accumulate in the tissues of animals consumed by humans (Fig. 1). Earlier study have identified plastic particles in livestock feed, as well as in milk, meat, and blood, presenting troubling implications for health [1]. The scale of potential exposure is alarming, considering the global reliance on livestock and fishery products for nutrition. The journey of MPs from animal feed to the human body is a complex process, facilitated by the widespread use of plastics in agriculture and feed production. Plastics are omnipresent in packaging materials, storage containers, and even as direct components in some feed types, inadvertently introducing MPs into the animal diet. Once ingested by animals, these particles can accumulate in tissues or be excreted, influencing not only animal health but also the quality and safety of animal-derived food products. Furthermore, there has been a recent discovery of MPs impacting the development of microbial communities and enhancing gene transfer, notably those related to antibiotic and metal resistance [2]. Particular concern should be directed towards livestock, as they yield food products like milk, eggs, and meat, potentially amplifying biological risks up the food chain. The ingestion of products contaminated with MPs poses worrisome health risks to humans. The presence of different types of microplastics in human and animal feces indicates that these particles have entered the human body. Research has connected microplastics to the transport of harmful microbes, heavy metals, and persistent organic pollutants, sparking concerns about gastrointestinal infections, toxicity, and potential cancer risks [3]. Karen Shapiro from University of California Davis recently found that *Toxoplasma gondii*, *Cryptosporidium parvum*, and *Giardia enterica* attached to microplastics in seawater, with their proportion increasing over the week compared to those floating in the water [4]. Microplastics can harbor microorganisms like *Vibrio* spp., potentially causing tissue damage, enhancing disease transmission, and increasing infection risk by promoting resistant pathogens and altering immune responses. In vitro studies suggest that *Vibrio parahemolyticus*, a common seafood contaminant, can attach to microplastics and infect human gastrointestinal cells more readily than without microplastics [5]. Ingesting large amounts of microplastics may disrupt the gut microbiota, leading to harmful bacterial growth, increased gut permeability, and endotoxemia. Moreover, the physical presence of MPs in the human body has been associated with inflammation and other adverse health outcomes, although the long-term effects remain largely unknown. The leap from animal health to human health is a short one, as the pathogens and contaminants carried by MPs can enter the human body through the consumption of contaminated animal products. There is a growing concern that MPs could act as vectors for pathogens and pollutants, further exacerbating their impact on animal health and food safety. The rough surfaces and crevices of MPs provide an ideal habitat for pathogenic bacteria and viruses, potentially leading to outbreaks of disease in animal populations.

Given the seriousness of MPs pollution, it is vital to investigate its impact on animal health and productivity. Research is still in early stages, requiring detailed studies on animals' physiological and biochemical responses to MPs. Assessing MPs transfer from feeds to animal products is crucial for understanding human health risks. A multidisciplinary approach involving environmental scientists, toxicologists, nutritionists, and public health experts is needed to address microplastic pollution and its effects on food safety. Improving detection methods, risk assessments, recycling initiatives, and reducing plastic waste are essential. Policymakers must enforce stricter controls on plastic use in feed, agriculture and promote sustainable alternatives. Consumer awareness and responsible practices are also critical in reducing MPs pollution and its risks. In conclusion, the rise of microplastics as a public health concern underscores their potential impact on infectious diseases. MPs can harbor pathogens and facilitate their spread, posing risks to both animal and human health. Addressing this issue requires vigilance and innovation to prevent the transmission of infectious disease associated with MPs. A unified effort from the scientific community, industry, policymakers, and the public is essential to mitigate these risks and protect public health. This editorial calls for enhanced awareness, research, and action to tackle the infectious disease threats posed by microplastics.

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**Tajul Islam Mamun:** Writing – review & editing, Writing – original draft, Supervision, Conceptualization.

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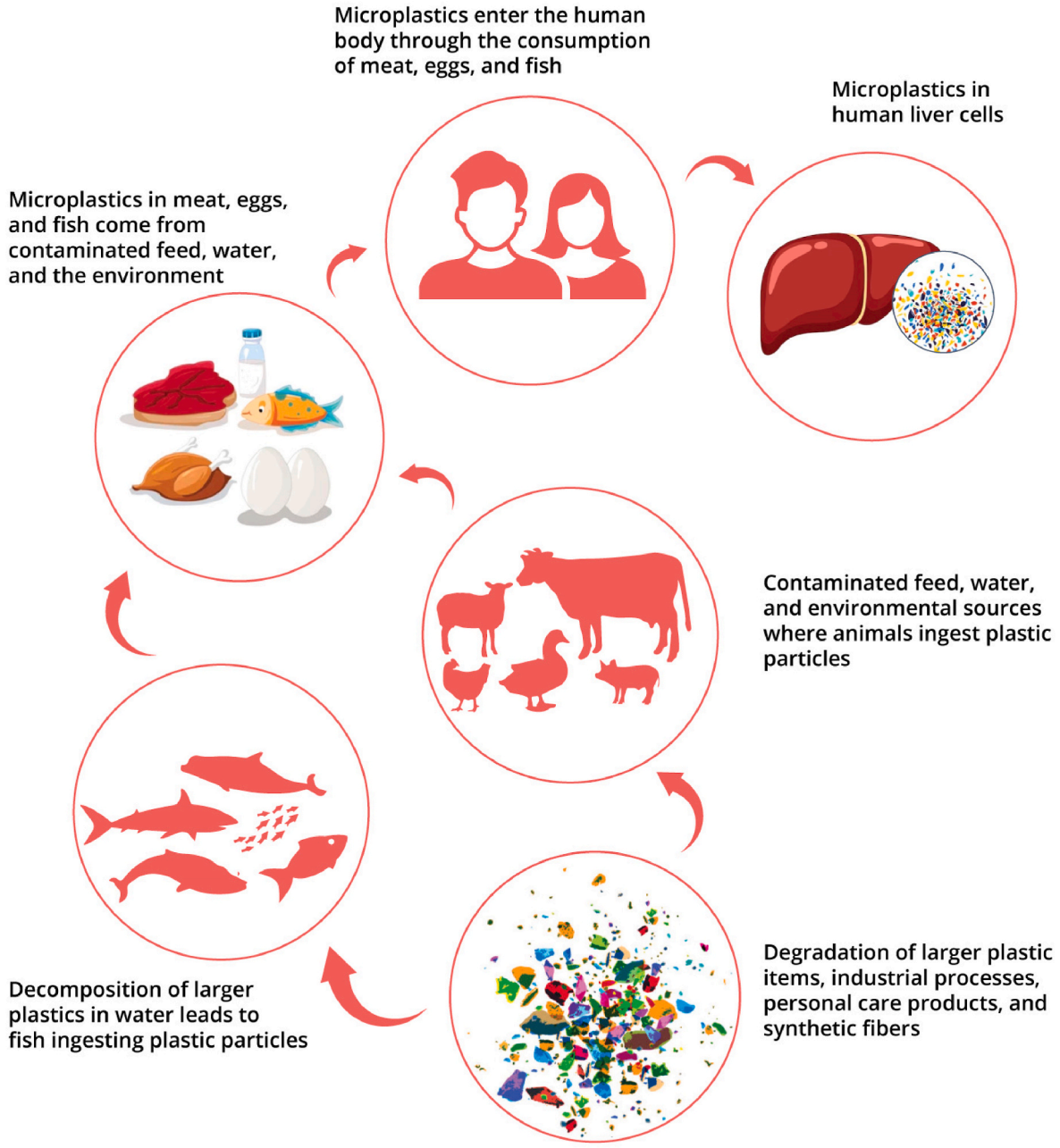


**Fig. 1.** Pathway of microplastics from environmental sources to human consumption through meat, eggs, and fish.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Tajul Islam Mamun
*Department of Epidemiology and Public Health, Sylhet Agricultural University, Sylhet, Bangladesh*
*E-mail address:* tajul.sau23@gmail.com.
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