Overview on microplastic contamination in marketed fresh and alive bivalve molluscs: a plausible risk for public health.

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Statement of the Problem: Microplastics (MPs) are a relevant threat to food safety since there is evidence that they are ingested by humans through various foods. The presence in markets of food from marine and aquaculture industry intended for human consumption and contaminated with MPs or fibres, poses a threat to food safety. In particular, bivalve molluscs are at high risk of microplastic contamination due to their filter-feeding mechanism posing a risk to consumers as they are ingested whole. Our work aims to assess the extent of bivalves' contamination and raise awareness about the linked potential health risks for consumers, also on a regional scale.

Methodology and Theoretical Orientation: Microplastics were isolated with experimental protocols in samples of Italian marketed mussels (*Mytilus galloprovincialis*) and oysters (*Crassostrea gigas*) and both Italian and Spanish marketed clams (*Ruditapes philippinarum*). MPs were detected, quantified and classified basing on their morphology, colour and size. Finally, they were chemically identified with the Fourier transform infrared spectroscopy.

Findings: The total number of plastic debris was 789 particles in mussel samples and 270 particles in the oyster samples. Italian clams counted 584 items while the Spanish ones 647. The average value was higher in mussels than in other species with 1,59 ± 0,95 MP/g, compared to 0,55 ± 0,19 MP/g, 0,7 ± 0,41 MP/g and 1,22 ± 0,71 MP/g for oysters, Italian clams and Spanish clams respectively. Transparent fibres were the dominant findings, while the most abundant polymer was polyamide in all samples, regardless of the bivalves' species.

Conclusion & Significance: Our data show that mussels, oysters and clams purchased at fish markets are contaminated with microplastics.
Bivalve molluscs, being filter feeders, are highly efficient at trapping particles suspended in the water, including MPs present in their natural environment. Furthermore, MPs contamination may occur during the marketing processes through several ways, since MPs are suspended also in the air and fish packaging are usually made of plastic.
Between European countries, Italy and Spain are the largest producers and consumers of seafood. In particular, fresh and alive bivalve molluscs sold in supermarkets represent a widely consumed protein source in their diets. Thus, contamination by microplastics has significant implications for food safety. Ensuring the safety and quality of bivalve molluscs is therefore critical for public health.

Biography

Flavia Capuozzo has a master in Veterinary Medicine and is a PhD candidate in Animal Health and Zoonosis in the Unit of Safety of Food of Animal Origin, at Department of Veterinary Medicine of the University of Bari. Her field of research includes the study of the most common pathogens and the identification of microplastics in food from animal origins.

About Research Topic

Microplastics (MPs) have been defined traditionally as particles of size inferior to 5 mm, originating from the degradation of larger plastic waste (secondary microplastics) or intentionally produced at such sizes (primary microplastics). While plastics have played a revolutionary role in various industries, they are often used only as single-use items, resulting in their ever-increasing accumulation in the environment as waste, and a concerning increase of microplastic and nanoplastic pollution. Nowadays, MPs have been found in the faecal matter of human beings with PP (63%) and PET (17%) being predominantly and coinciding with the dominant polymers detected in bivalves. This proves that humans are being exposed to these particles and similarly that one of their intake routes is ingestion. Although there are no studies evidencing the link between MPs ingestion and human health yet, many animal models and cell culture experiments hint that MPs may influence the immune and endocrine systems leading to reproductive and developmental disorders.

About Institution:

The Unit of Safety of Food of Animal Origin in Valenzano, Italy, is a research unit of the Department of Veterinary Medicine of University of Bari. The research topics of the aforementioned unit are focused on the consumers' health studying food safety at different scales with a multidisciplinary vision and integrative approach. In 2022 the Department of Veterinary Medicine received the recognition of Department of Excellence, making it the only department at the University of Bari and one of the five Italian Veterinary Education Establishments in the 2018-2022 selection promoted by the Italian Ministry of Universities (MUR). In 2023, the Department of Veterinary Medicine was awarded Full Approval by the EAEVE.

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