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Occurrence of microplastics in water, feed, and tissues of European seabass produced in recirculating aquaculture system

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Abstract

Background: Microplastics (MPs) in seafood are a global major concern to human health [1]. Due to MPs' ubiquitous presence in aquatic ecosystems, aquacultures are also susceptible to contamination from external or endogenous sources. Previous studies have reported MP occurrence in farmed organisms [2], but little is known about recirculating aquaculture systems (RAS), which provide an opportunity for sustainable seafood production under environmentally controlled conditions. **Objective:** The present study aimed to investigate MP occurrence in several body sites of European seabass (*Dicentrarchus labrax*) produced in a RAS, due to the high presence of plastic components. MP occurrence in two direct exposure routes, water and feed, was also evaluated. **Methods:** Water, feed, and 55 fish were collected from a RAS facility. MP retention in seabass was investigated in the gastrointestinal tract (GIT), gills, liver, and dorsal muscle [3]. Bioconcentration (BCF) and bioaccumulation (BAF) factors of MPs were estimated [4]. **Results:** MP concentrations in water and feed were 37.2±1.9 MP/L and 3.9±1.3 MP/g, respectively. In total, 422 MPs were recovered from seabass body sites: GIT presented the highest concentration (1.0±0.8 MP/g) and muscle the lowest (0.4±0.3 MP/g). All fish had MPs recovered from at least two of the analysed body sites. Black, blue, and transparent fibres made of regenerated cellulose and polyethylene terephthalate were the most common particles. Polymers linked to RAS components (e.g., polyethylene, polypropylene) occurred in low quantity, suggesting a limited system's contribution to overall MP levels. BCF and BAF values equal to 19.9 and 0.2, respectively, indicating MP bioconcentration in fish (i.e., >1), but no bioaccumulation. **Conclusions:** RAS-farmed seabass are susceptible to MPs through water and feed, potentially retaining MPs in tissues. MP occurrence in muscle highlights RAS-farmed fish as a potential dietary exposure pathway to humans, but further dedicated risk evaluation studies are required to fully ascertain the relevance of such finding for consumers.

Keywords: bioconcentration; microplastics; 'One Health' concept; recirculating aquaculture systems (RAS); seafood contamination

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