Last updated:
September 2022

Roger Hendry
Global Director, Manufacturing & Technology

2022 Microplastics Position Statement

Microplastics and nanoplastics in compound fish feed

BioMar Group
Vaerkmestergade 25, 6
8000 Aarhus C
Denmark

www.biomar.com

Introduction

An increasing amount of plastic in the ocean has led to growing concern for trophic concern and food safety of plastics particles. It has been proposed that plastic particles of size between 1µm to 999 µm (1 mm), should be called microplastics. These are either manufactured as this size initially (ingredients in cosmetics, plastic pellets), or they originate from fragmentation of larger plastics. Nano-plastics are even smaller than microplastics, with a diameter less than 1 µm. These small plastic particles may occur in air, water, and soil.

Need for regulations and analysis methods.

There are currently no regulations regarding microplastics as contaminants in food and feed. There are still major knowledge gaps to create limits for what are unacceptable levels of micro- and nano-plastics in food and feed. Since there is a general lack of exposure and hazard data, the risk of nano-and microplastics to human health cannot be evaluated. There are mainly qualitative and not quantitative occurrence data in marine products. The current literature search revealed some data inconsistencies in marine products, and there are very limited data of acceptable quality. Many relevant food categories (meat, vegetable, dairy products) have not been investigated at all, and tolerable intake of micro-and nano-plastics need to be set for total dietary intake for consumers.

Analysis methods are not harmonised, and it is very difficult to compare results between different studies. A few research institutions/laboratories have instruments and analysis methods for microplastics, but there is currently not commercially available analysis method for the industry. Analysis of nano-plastics are getting even more complexed and sensitive; methods are getting very expensive and not available for a large part of the research institutions. Work for international harmonising of analysis methods is highly needed.

Studies on marine organisms

Since plastics are in use all over the world, microplastics are found practically everywhere, and often end up in the ocean. Marine organisms are documented to contain microplastics. The largest plastics particles are typically found only in the gut/intestines, but the smallest one may pass the fishes' intestinal barriers and may found in the internal organs of the fish.

Despite the explosion of interest in the topic and in comparison, to the research on the presence of microplastics in marine or fresh waters, there have been notably fewer studies on the extent to which these debris items are ingested by aquatic organisms and far fewer on the potential consequences, or response to their presence in organismal guts, tissues, and food webs. Even less research has focused on the smallest plastic debris items, nano-plastics (< 1 µm).

In general, plastics in their original form are considered to have low toxicity because of their water insolubility and the fact that they are biochemically inert. One possible concern is that high concentrations of organic and metal pollutants, like dioxins and PCBs etc. can accumulate in microplastics.

BioMar has a broad screening program on contaminants based on HACCP analysis, including those mentioned above, for feed raw materials and compound feed. Max limits for dioxins, PCBs and several other organic pollutants are set for both feed raw materials and compound feed.

Micro- and nanoplastics in fish feed and farmed fish

Micro and nano-plastics in fish feed and fish could come from marine ingredients, depending on the level of plastic pollution in fishing grounds and packaging methods.

Plastics in fishmeal could be transferred to the seafood and local environments via aquaculture. Fish species and aquaculture practices utilizing higher percentages of dietary fishmeal have a higher risk for plastic pollution transfer.

The observed differences and heterogeneity in plastic concentrations can likely be due to differences in the contamination level of the actual species used for fishmeal production. Small pelagic fish is short-lived species they often mature within the first two years, in contrast to other recognised alternative life history patterns in fish species that can show spans of up to 20 years and beyond. These small pelagic species do not generally, therefore, have the length of exposure to environmental contaminants (including plastics) that are seen in other species.

Different feeding modes can significantly influence the plastic content of organisms and thus, the contamination level of the fishmeal derived from those species. Plastic content of fishmeal also appears to be regionally dependent, which is likely due to the plastic contamination level in the marine environments where the caught fish come from, but possibly also the plastic contamination that might occur during the fishmeal rendering process.

30 years ago, marine ingredients represented 80% of salmon diet. At BioMar we have cut this by 75%; achieved by better feed optimisation and the use of alternative ingredients that allows to bypass the wild fish and go to the original source of essential nutrients. In addition, a thorough fish meal suppliers selection program is in place to lower the risk according to its origin.

Respect to packaging. BioMar is introducing some initiatives the reduce the use of bags using bulk delivery systems and implementing local recycling initiatives where bags are still in use; therefore, reducing its impact on plastic environmental pollution.

Although fish fillets and big fish are two of the main consumed fishery products, these are not a likely or significant source of microplastics, because in most cases the gut, where most microplastics are found, is not consumed. Therefore, small fish species, crustaceans and molluscs that are eaten whole and without de-gutting are the main concern when talking about dietary exposure to microplastics through consumption of fisheries and aquaculture products.

A few pilot tests have been done on occurrence level in farmed fish. One study analysed for microplastics in farmed Atlantic salmon, wild Atlantic salmon, and wild mountain trout. There was no difference between the 3 species; particles were found in both fillets and livers in both wild and farmed salmonids, and it was typically found smaller particles (less than 50 µm). One study compared results from the 2 main principal analysis methods: microscopy method (counting of number of plastic particles) and a combustion method (concentration of plastics). The two methods bring different type of information, but it seems be important to focus on sizes of the particles, and not only the numbers.

Considering that microplastics are everywhere and that aquaculture products are an important source of essential nutrients, BioMar will continue monitoring the knowledge development of micro-and nano-plastics, especially those aspects associated with production of fish feed and carry-over from feed to farmed fish; and working for taking actions in relation to its contribution to food safety and sustainability in the food chain.

References

Microplastics and nano plastics in food, an emerging issue; EFSA (2016)

Microplastics; occurrence, levels and implications for environment and human health related to food; Norwegian Scientific Committee for Food and Environment (2019)

A scientific perspective on microplastics in nature and society, Science Advice for Policy by European Academies (2019).

Limnology and Oceanography Letters (2020)

Fish out, plastic in: Global pattern of plastics in commercial fishmeal; Aquaculture 534 (2021) 736316

FAO Microplastics in fisheries and aquaculture (2019)

https://www.iffo.com/microplastics-and-marine-ingredients-global-challenge

Powered by Partnership
Driven by Innovation

Version History		Owner and Approver	
Version 1:	16-09-2022	Owner:	Marco Espinoza
		Approver:	Roger Hendry
	Approval date:	16-09-2022	

www.biomar.com