Position Statement

Micro-plastics

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Micro-plastics and Nano-plastics in compound fish feed

General about micro- and nano-plastics

In recent years, the widespread of microplastics in the food chain and environment became a topic of much research and consumer awareness.

The International Standardization Organization defines microplastics as solid plastic particles that are insoluble in water and have at least one dimension between 1 µm and 1,000 µm (ISO 24187). In addition, it defines "large microplastics" as solid, insoluble plastic particles with any dimension between 1 mm and 5 mm. This distinction between microplastics and "large microplastics" is not standard practice in the field. EU and US chemical and environmental agencies, for example, define microplastics in general as plastic particles with dimensions smaller than 5 mm. Nano-plastics are even smaller than microplastics, with a diameter less than 1 µm. Microplastics and nanoplastics are found in a wide variety of sizes, shapes, and colors, as well as varying polymer types, states of degradation, and presence of chemical additives included in plastics during the manufacturing process. Since plastics are in use all over the world, microplastics are found practically everywhere, and occur in air, water, soil and most samples tested included seafood.

There is still significant knowledge gap when it comes to occurrence data and health impact of micro and nano plastics. US Food and Drug Administration concluded in 2024 that current scientific evidence does not demonstrate that levels of microplastics or nanoplastics detected in foods pose a risk to human health. The European Parliament has requested EFSA (European Food Safety Agency) to deliver a scientific opinion on the potential health risk posed by microplastics in food, water and air. This report is expected at the end of 2027.

Need for regulations, analysis methods and laboratories

There are currently no regulations regarding microplastics as contaminants in food and feed. Without adequate knowledge and scientific risk assessment, regulators have not been able to create limits for what are unacceptable levels of micro- and nano-plastics in food and feed. Occurrence data in most common food categories (seafood, meat, vegetable, dairy products) are required to estimate total dietary intake of micro and nano plastic for different consumer groups.

It is a problem that analysis methods for microplastics have not been harmonised, and many of the scientific studies have used methods of variable, questionable, and/or limited accuracy and specificity. Hence, it is very difficult to compare results between different studies. Literature review revealed some data inconsistencies in marine products, and there are very limited data of acceptable quality. The International

Standardization Organization published one of the first internationally recognized microplastic testing standards, ISO 24187, in September 2023.

A few research institutions/laboratories have instruments and analysis methods for microplastics, and it starts now to be commercially available analysis method for the industry for some type of food matrix (i.e water, seafood, fish oil). 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.

Occurrence in the marine organism

More than 70% of scientific and media coverage on microplastics in food has focused on seafood, contributing to the public perception that eating fish is the biggest risk. Later studies suggest that level of microplastics in seafood is consistent with those of other food and beverages. There have been fewer studies on nanoplastics because available scientific measurement methods are not very reliable at detecting polymer particles with such small sizes.

In fish, 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.

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, PCBs, heavy metals etc. can accumulate in microplastics.

Micro-plastics in fish feed and farmed fish

Micro plastics in fish feed come mainly from the feed ingredients, packaging materials and processing. Focus so far has been to document levels of micro plastics in marine feed ingredients. Both types of plastic polymer and number of particles vary with different types and origin of fish meal. The observed differences and heterogeneity in plastic concentrations in fish meal may 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, have the length of exposure to environmental contaminants (including plastics) that are seen in other species. It seems to be a large geographical variation for levels in vegetable ingredients as well, but we need more documentation for these types of ingredients.

30 years ago, marine ingredients represented 80% of salmon diet, today this level has been reduced drastically by the inclusion of a blend of several different feed ingredients with different origins, like novel ingredients.

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 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 to be important to focus on sizes of the particles, and not only the numbers.

Mitigation actions

- 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.
- BioMar purchases fish meals based on fish caught in the open seas, or from trimmings from farmed species, both origins are expected to reduce the level of microplastic compared to fish caught near urban areas. A thorough fish meal and fish oil suppliers' selection program is in place to lower the risk according to its origin, especially for parameters like dioxins, PCBs and heavy metals.
- At BioMar we have cut fish meal inclusion levels by 75%; achieved by better feed optimisation and the use of alternative ingredients like microalgae as a source of the important marine omega-3 fatty acid DHA, produced by fermentation in closed tanks at land, that allows to bypass the wild fish as dominating ingredients and go to the original source of essential nutrients.
- 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.

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.

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