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| Table S1. Toxicological effects of MPs on fish. | | | |
| Fish species | Effects of MPs/Combine effects of MPs | Combine/Single | References |
| *Symphysodon aequifasciatus* | In the brain and gut of fish, there is a reduction in growth and changes in neurotransmitters. The contact of neuroactive ligands with receptors in the brain, as well as serotonergic synapse pathways, was boosted. | MPs | Huang et al. 2022 |
| *Oryzias melastigma* | Embryos are more toxic as a result of this. Toxic effects are primarily caused by physical impairment. The particle sorption process to the chorion causes hypoxia. | Polyvinyl chloride MPs | Xia et al. 2022 |
| *Danio rerio* | Bioaccumulation and oxidative stress are both increased intestinal damage and growth retardation is both increased. Lipid metabolism is disrupted, and genes involved in lipid digestion, transmission, and absorption are disrupted. | Polyamide MPs | Zhang et al. 2022 |
| *Oryzias melastigma* | Growth, HSI, and GSI indices were inhibited by MPs rather than EE2. In a dose-dependent approach, MPs boosted EE2-induced E2 levels. EE2 with MPs increased estrogen biomarker gene expression more than EE2 alone. In the EE2 plus MPs group, histopathological harm to the liver and testes were found. | Polystyrene MPs | Wang et al. 2022 |
| *Ctenopharyngodon idella* | MPs who ate grass carp lost weight and had histological alterations. MP-1000 therapy causes increased oxidative damage in the liver. Metabolic diseases and oxidative stress are linked, according to pathway enrichment. | MPs | Liu et al. 2022 |
| *Solea senegalensis* | MPs boosted antioxidant defenses, neurotransmission, and energy expenditure when consumed. Histological changes were generated by PE MPs alone and in combination with nanoclays. Under joint exposure, energy usage rose. | Polyethylene MPs | Santana et al. 2022 |
| *Dicentrarchus labrax* | Stimulate an inflammatory reaction in the gut of European sea bass. The gut microbiota of fish changed significantly after ingesting contaminated MPs. | Polypropylene MPs and chemical pollutants | Montero et al. 2022 |
| *Clarias gariepinus* | African catfish have a high rate of opercular beats. The swimming pace has slowed. | MPs | Tongo and Erhunmwunse, 2022 |
| *Oryzias melastigma* | MPs changed the makeup of the microbiota, leading to dysbiosis. | MPs | Kang et al.2021 |
| *Danio rerio* | Stronger behavioral consequences, such as decreased mobility and activities. | MPs and bisphenol | Mu et al. 2021 |
| *Sparus aurata* | Stimulate antioxidant enzymes in the liver and plasma, as well as oxidative damage. Boost the activities of lysozyme and myeloperoxidase in the blood. | MPs | Solomando et al. 2021 |
| *Symphysodon aequifasciatus* | MPs had a greater impact on the microbial communities of the skin and gills than on the gut. MPs produced oxidative damage on the epidermis and digestion obstruction in the intestine. | MPs | Huang et al. 2021b |
| *Lates calcarifer* | The presence of fibers causes oxidative stress. Intestinal microbiota dysbiosis was induced by fiber consumption. A little amount of histopathological damage to the intestine was seen. | MPs | Xie et al. 2021 |
| *Danio rerio* | PE-MPs produced microbiome dysbiosis. PE-MPs reduced the amount of mRNA expression of glycolipid metabolism genes. The metabolic profile was altered by PE-MPs. Changes in phospholipid metabolism were closely linked to changes in the microbiota. | Polyethylene MPs | Zhao et al. 2021 |
| *Oreochromes niloticus* | ALP, glucose, uric acid, albumin, and the A/G ratio were all considerably elevated biochemically. Reduce serum LH and T levels by a large amount. The MP-exposed fish had testicular, histological, and degenerative alterations, as well as testis-ova. | MPs | Ismail et al. 2021 |
| *Pelteobagrus fulvidraco* | Stimulate a fish's immunological response. | MPs | Li'ang et al. 2021 |
| *Oryzias melastigma* | Smaller PS-MPs produce hepatic inflammatory responses. Larger PS-MPs cause lipid metabolic diseases by causing dysbiosis in the gut microbiota. | Polystyrene MPs | Zhang et al. 2021b |
| *Hypophthalmichthys molitrix* | MPs concentrations cause oxidative stress and up-regulation of the target gene. Gills and intestines are severely harmed by high MPs concentrations. Once exposed to large concentrations of MPs, silver carp do not recover quickly after deposition. | MPs | Zhang et al. 2021c |
| *Danio rerio* | PE caused higher neurotoxicity and oxidative stress than 9-NAnt or the PE-9-NAnt combination. The biological toxicity was delayed by the PE-9-NAnt complex. The presence of 9-NAnt altered the makeup of the intestinal microbial population dramatically. | Polyethylene MPs | Zhang et al. 2021d |
| *Oreochromis niloticus* | Histopathological changes were seen in the MPs-exposed groups. The liver tissue had vacuoles, degeneration, and significant hepatocyte deformation. Hyperplasia and MP accumulation between the main lamellae were seen in the gill tissue. | MPs | Hamed et al. 2021 |
| *Centropristis striata* | Exposure to virgin microspheres reduced immunological response. | MPs | Stienbarger et al. 2021 |
| *Oncorhynchus mykiss* | DNA damage was seen after exposure to four MPs samples. MPs extracts toxic effects on a fish cell line is highlighted by changes in EROD activity and DNA damage rate. | MPs and sorbed pollutants | Pannetier et al. 2019 |
| *Oryzias melastigma* | MPs exposure reduced embryo hatching rates and larval body weight. Body size, gonosomatic index, and egg production are all reduced after whole-life exposure. MPs caused trade-offs between growth and reproduction. Parental exposure accelerated the hatching of offspring but slowed larval development. | MPs | Wang et al. 2021a |
| *Channa argus* | Gill tissue injury to some extent. Oxidative stress is caused, and the antioxidant level is affected. To varying degrees, they influence the expression of immune-related genes. | MPs and Cd | Wang et al. 2021b |
| *Dicentrarchus labrax* | Substantial cellular changes have occurred. | EMPs | Zitouni et al. 2021 |
| *Argyrosomus regius* | At the greatest concentration, the presence of PE-MPs hampered larval feeding activities. Exposed larvae triggered antioxidant defenses by boosting total glutathione levels and reducing catalase activity when starved, which appeared to be effective in preventing oxidative damage. Greater energy expenditure and reduced neurotransmission were also seen in these larvae, which might be linked to oxidative damage avoidance. | Polyethylene MPs | Campos et al. 2021 |
| *Carassius auratus* | Several physiological parameters in goldfish are affected by MPs. | MPs | Abarghouei et al. 2021 |
| *Danio rerio* | MPs can upregulate genes associated with xenobiotic metabolism. MPs can influence immunological gene expression in the head kidney. After being exposed to MPs, acetylcholinesterase activity was reduced. | MPs | Limonta et al. 2021 |
| *Danio rerio* | MPs exposure over time may harm reproductive organs. In fish, exposure to waterborne MPs enhanced gonadal ROS levels. When exposed to high amounts of MPs, apoptotic mRNA expression in male gonads changed significantly. At higher MPs exposure concentrations disrupted tissue development in zebrafish testis was detected. | Polystyrene MPs | Qiang and Cheng, 2021 |
| *Sparus aurata* | In the early stages of life, fish that consumed a lot of MPs had considerably more behavioral problems. | MPs | Nanninga et al. 2021 |
| *Sparus aurata* | Behavior changes after ingesting MPs. Contaminants in MPs cause more physiological reactions than MPs that aren't polluted. | MPs | Rios-Fuster et al. 2021 |
| *Pimephales promelas* | Larvae subjected to preconsumer polyethylene had lower survivability, length, and weight, but those treated to preconsumer polypropylene gained weight. Natural MPs resulted in a greater rise in length and weight, as well as nearly six times the number of malformations as pre-consumer MPs. | MPs | Bucci et al. 2021 |
| *Danio rerio* | AChE activity is elevated to natural MPs. MPs affect the lateral line systems, causing neuroblasts to change. There is a rise in apoptotic and necrotic erythrocytes. | MPs | Guimarães et al. 2021 |
| *Leuresthes tenuis* | Have a substantial impact on their development and survival. | MPs | Uy and Johnson, 2021 |
| *Danio rerio* and *Perca fluviatilis* | The most vulnerable indicator was DNA damage, which showed a larger reaction in both species' livers. The association of MPs with cellular components caused metabolic changes in the tissues investigated, primarily influencing amino acid, nitrogen, and energy metabolism. | Polystyrene MPs | Kaloyianni et al. 2021 |
| *Oncorhynchus mykiss* | Nutritional factors are reduced. | Polystyrene MPs and chlorpyrifos | Hanachi et al. 2021 |
| *Oryzias melastigma* | The gut microbial profiles were altered by PS-MPs. PS-MPs reduced the weight of the fish and disturbed the anti-oxidative condition of the liver. PS-MPs put people's health at risk by disrupting the gut-liver axis. | Polystyrene MPs | Feng et al. 2021 |
| *Danio rerio* | After four months of exposure, the development and breeding were impaired. | MPs | Cormier et al. 2021 |
| *Oncorhynchus mykiss* | In the plasma, total protein, albumin, globulin, total immunoglobulins, high-density lipoprotein, low-density lipoprotein, cholesterol levels, and -glutamyltransferase activity reduced, whilst glucose, triglyceride, and creatinine levels, as well as glutamic-oxaloacetic transaminase, glutamic-pyruvic transaminase, alkaline Catalase activity, glutathione peroxidase activity, and total antioxidant levels all reduced. The activities of superoxide dismutase and the amount of malondialdehyde in hepatocytes both improved. | MPs and *Yersinia ruckeri* | Banihashemi et al. 2021 |
| *Sparus aurata* | Consumption of MPs has an effect on the survival of juveniles as well as their major metabolite profiles in the brain. Fish hepatocyte vacuolation and Zn assimilation are affected by MPs consumption. | Polyethylene MPs | Jacob et al. 2021 |
| *Boleophthalmus dussumieri* | The presence of MPs in the gut has an impact on the life-history features. | MPs | Kumkar et al. 2021 |
| *Sparus aurata* | Intake of MPs damages the intestines. Mechanical rather than chemical actions induce intestinal injury. The intestinal microbiota alters somewhat after ingesting MPs. Consumption of MPs over an extended period may result in developmental issues and bacterial overgrowth. | Polyethylene MPs | Varó et al. 2021 |
| *Oncorhynchus mykiss* | PS-MPs or those enriched with CPF displayed significant histomorphometric alterations. PS-MPs enhanced CPF lethality. | Polystyrene MPs | Karbalaei et al. 2021 |
| *Oryzias javanicus* | The oxidative damage and porosity in the intestines were found to be much higher. Neurotoxicity was discovered in the brain, which was characterized by a large increase in oxidative stress, lipid peroxidation, and suppression of the acetylcholinesterase enzyme. | Polystyrene MPs | Usman et al. 2021 |
| *Danio rerio* | Effect on oxidative stress resilience and immunological function. Produce a synergistic toxic impact. | MPs and phenanthrene | Xu et al. 2021 |
| *Cyprinus carpio* | MPs ingestion had little effect on common carp growth. Following the excretion of MPs, there was a reduction in growth. MPs had no discernible influence on the isotopic and chemical composition of the body. Intestinal microbiota community composition and structure were changed after taking MPs. | MPs | Ouyang et al. 2021 |
| *Danio rerio* | Severe death and oxidative stress are induced. Impede acetylcholinesterase function to trigger neurotoxicity. | MPs and Cu | Santos et al. 2021a |
| *Danio rerio* | After extended exposure to MPs and Cu, the survival and hatching rates of larvae reduced. Cu and Cu+MPs impaired avoidance behavior and reduced swimming activity. AChE activity was suppressed by MPs, Cu, and Cu+MPs, with MPs having a stronger impact than Cu alone. | MPs and Cu | Santos et al. 2021b |
| *Pomacentrus amboinensis* | Reduced depuration rates and an increased body load. | MPs | Santana et al. 2021 |
| *Danio rerio* | MPs can alter the makeup of the gut microbiota. | Polystyrene MPs | Xue et al. 2021 |
| *Danio rerio* | Exposure to PE-MPs causes REDOX imbalance. The activation of the Na+/K+-ATPase seems to be a physiological response to the oxidative stress generated by PE-MPs. | Polystyrene MPs | Rangasamy et al. 2021 |
| *Danio rerio* | PS-MPs increased ROS-induced oxidative stress responses in the brain and liver. Through transcriptional alterations, PS-MPs changed the hepatic enzymological profile and histology of the liver. PS-MPs induced neurotoxic reactions in the brain that were gene-modulated. | Polystyrene MPs | Umamaheswari et al. 2021 |
| *Oncorhynchus mykiss* | B cells in development are influenced by primary immune cells. Decrease RAG1, immunoglobulin heavy chain mu, and tau gene expression. | Polystyrene MPs | Zwollo et al. 2021 |
| *Sparus aurata* | MPs exposure increased antioxidant defenses. MPs exposure over 90 days resulted in oxidative damage and proinflammatory responses. | MPs | Capó et al. 2021 |
| *Danio rerio* | Fish death and tissue destruction have increased significantly. | Polyurethane MPs | Dinani et al. 2021 |
| *Oreochromis niloticus* | PS-MPs have negative impacts on antioxidative, inflammatory, and detoxifying genes. | Polystyrene MPs | Ahmadifar et al. 2021 |
| *Carassius auratus* | Olfactory-mediated behaviour is harmed by MPs. The capacity to recognize odors is hampered by MPs. MPs interfere with the production of action potentials and the receipt of odorant signals. Olfactory neuronal signal transduction is disrupted by MPs. The ability to interpret olfactory information is limited by MPs. | MPs | Shi et al. 2021 |
| *Danio rerio* | TCS distribution in tissues was altered by MPs, and TCS accumulation in the liver and intestines was enhanced. TCS + PP increased oxidative damage and lipid peroxidation in the liver, as well as brain neurotoxicity. TCS and MPs together disrupted hepatic metabolism, with MPs contributing more to metabolic problems. | MPs | Sheng et al. 2021 |
| *Danio rerio* | PS-MPs reduce the frequency of ventricular contractions in the heart. PS-MPs greatly reduce swimming speed. PS-MPs induced an increase in oxidative stress markers as well as metabolic changes. | Polystyrene MPs | Dimitriadi et al. 2021 |
| *Danio rerio* | Boost the larvae's lethality. Behavioural impacts were greater, such as decreased movement distance and activities. | MPs and bisphenols | Mu et al. 2021 |
| *Oryzias melastigma* | MPs advocated for the mother phenanthrene to be transferred to offspring embryos. Phenanthrene and 200 g/L MPs both caused reproductive harm. The presence of MPs exacerbated phenanthrene's transgenerational hazard. | MPs and phenanthrene | Li et al. 2021 |
| *Danio rerio* | Minimal morbidity and changed phenotypes in embryos, but species-specific bio interactions were developed. MPs were able to slow hatching in a size and the concentration-dependent way by sticking to the chorion. | MPs | Bonfanti et al. 2021 |
| *Danio rerio* | The esophagus and gills were the most susceptible. Toxic impacts on unaffected offspring for a long time. | MPs and ZnO | Zheng et al. 2021 |
| *Poecilia reticulata* | MPs had no discernible effect on guppy development. After being exposed to MPs, the guppy developed oxidative damage. The content of C: N and δ13C were lowered by MPs, but there was no discernible impact on δ15N. In guppy, catalase had the strongest reactivity to MPs. | MPs | Huang et al. 2020a |
| *Poecilia reticulata* | MPs may be retained in the stomach of young guppies, impairing digestion, stimulating immunological response, and causing microbial dysbiosis. | MPs | Huang et al. 2020b |
| *Clarias gariepinus* | Stimulate oxidative damage and histological changes in the exposed fish's liver. | Polyvinyl chloride MPs | Iheanacho and Odo, 2020a |
| *Clarias gariepinus* | Oxidative damage in fish was indicated by changes in antioxidant enzyme activity and higher lipid peroxidation levels. Fish that had their brain acetylcholinesterase activity inhibited showed signs of neurotoxicity. The exposed fish's hematological indicators were dramatically altered. | Polyvinyl chloride MPs | Iheanacho and Odo, 2020b |
| *Clarias gariepinus* | The activity of acetylcholinesterase and antioxidant enzymes in the brain decreased considerably, whereas malondialdehyde levels rose. | Polyvinyl chloride MPs and melamine | Iheanacho et al. 2020 |
| *Sparus aurata* | Long-term exposure to MPs causes oxidative damage in the gut as well as a pro-inflammatory response. | MPs | Solomando et al. 2020 |
| *Danio rerio* | At the biochemical and transcriptional levels, MPs exposure disrupted hepatic glycolipid metabolism. At the transcriptomic level, hepatic lipid metabolism abnormalities have been reported. | Polystyrene MPs | Zhao et al. 2020 |
| *Oreochromis niloticus* | Put under a lot of stress. | MPs | Ding et al. 2020 |
| *Carassius auratus* | MPs may cause oxidative stress, damage the gut, liver, and gills, elevate heart rate, and stop growing and moving. | MPs | Yang et al. 2020 |
| *Danio rerio* | The toxicity of combining two stressors has an antagonistic impact on mortality. | MPs and Cd | Zhang et al. 2020 |
| *Dicentrachus labrax*,*Trachurus trachurus*,*Scomber colias* | Neurotoxicity and oxidative damage. | MPs | Barboza et al. 2020a |
| *Dicentrachus labrax*,*Trachurus trachurus*,*Scomber colias* | MPs may increase the risk of bisphenol exposure. | MPs and Bisphenol A | Barboza et al. 2020b |
| *Oryzias latipes* | Mortality, reduced head/body ratios, enhanced EROD activities, and DNA breakage, and changes in swimming behaviour were among the effects. | MPs | Pannetier et al. 2020 |
| *Oryzias latipes and Oryzias javanicus* | Intestinal gene expression was considerably changed. Cell adhesion, xenobiotic substances, and neurodevelopment are all linked to those genes. | Polystyrene MPs | Assas et al. 2020 |
| *Danio rerio* | Exposure to MPs decreased caudal fin regrowth. After being exposed to microplastics, signaling pathways involved in regeneration were changed. The inhibition effects were attributed to changes in ROS signaling and immunological response. Wounded fish's ability to mend and regenerate may be harmed by MPs. | Polystyrene MPs | Gu et al. 2020 |
| *Cyprinus carpio* | PVC MPs prevented carp larvae from gaining weight and lengthening their bodies. Antioxidant activities were changed after exposure to PVC MPs. The expression levels of CYP1A, GSTpi, and GSTa were altered by PVC MPs. Fish exposed to PVC MPs have histological abnormalities in their livers. | Polyvinyl chloride MPs | Xia et al. 2020 |
| *Gasterosteus aculeatus* | Substantial suppression and hyperactivity of AChE, which might enhance predation sensitivity. Change the chemical balance in organs. | MPs | Bour et al. 2020 |
| *Girella laevifrons* | The greater exposure group had more significant leukocyte infiltration and hyperemia than the lesser exposure group. Physical abrasion of Poly(styrene-co-divinylbenzene) MPs enhanced crypt cell loss and villi cell loss considerably. | MPs | Ahrendt et al. 2020 |
| Coral reef fish | Fish become more daring, energetic, and erratic. Plastic exposure had a larger influence on behavior, according to effect sizes. | MPs | McCormick et al. 2020 |
| *Oryzias melastigma* | Chronic and development damage was caused by aquatic pollutants spiked on MPs. | Organic contaminants sorbed to MPs | Le Bihanic et al. 2020 |
| *Oryzias latipes* | A dose-dependent decline in female fertility was observed. Particle transport caused injury to the mucosa of the gut. Despite the lack of particles, the kidney and spleen were changed. | Polystyrene MPs | Zhu et al. 2020 |
| *Prochilodus lineatus* | DNA damage was produced by MP, Cu, and MP + Cu exposures, and brain AChE activity was decreased. MP, Cu, and the mixture of both affected ion regulation. There were transitory changes in plasma glucose concentrations. | MPs and Cu | Roda et al. 2020 |
| *Danio rerio* | After being exposed to MPs, fish became hyperactive. Following MPs exposure, there was a scarcity of energy-supplying compounds. | MPs | Chen et al. 2020a |
| *Cherax quadricarinatus* | PS microspheres interfered with hepatopancreatic lipid production. In vivo, PS microspheres enhanced lipid transport capacity and aided in the breakdown of lipids. | Polystyrene MPs | Chen et al. 2020b |
| *Oryzias melastigma* | MPs had a considerable impact on the hatching time and rate. Embryos' heart development appears to be hampered by MPs. Embryos have their inflammatory and immunological genes activated by MPs. | MPs | Chen et al. 2020c |
| *Danio rerio* | Exposure at more than 100 g/L resulted in substantial alterations in steroidogenic mRNA expression. Due to parental MPs exposure, there were no significant differences in the total number of eggs produced or the rate of fertilization. Transgenerational impacts of MPs exposure on offspring longevity and early development were minimal or reversible. | MPs | Qiang et al. 2020 |
| *Salmo trutta* | Long-term, non-ingestion-related exposure to MPs does not affect the development of young sea trout, although it may cause genotoxic reactions. | MPs | Jakubowska et al. 2020 |
| *Danio rerio* | 100 nm PS nanoparticles efficiently blocked embryonic chorions. In the embryo, micro and nano PS may cause an antioxidant system malfunction. | MPs | Duan et al. 2020 |
| *Danio rerio* | Induce oxidative stress on the body and disturbance in avoidance behavior. Cu and Cu + MPs exposed larvae showed suppression of AChE. | MPs and Cu | Santos et al. 2020 |
| *Oryzias latipes* | Through vector effects, MPs altered the pharmacokinetic profile of ANT. Intake of PE-MPs may serve as a channel for concentrating and transferring ANT, yet the existence of these particles may have very minor negative consequences for the fish. | MPs | Qiu et al. 2020 |
| *Danio rerio* | Proinflammatory response induced by macrophages. Antioxidants damaged. | Polyamide MPs | Zou et al. 2020 |
| *Gadus morhua* | None of the MPs treatments had any impact. | MPs | Hauge, 2020 |
| *Oreochromis niloticus* | MPs induce oxidative trauma and DNA impairment by causing excessive production of reactive oxygen species and altering antioxidant properties. | MPs | Hamed et al. 2020 |
| *Danio rerio* | The regrowth of the caudal fin was retarded, and the ability to mend was harmed. | MPs | Gu et al. 2020 |
| *Oryzias melastigma* | High amounts of MPs stopped fish from hatching and growing. Phe's teratogenicity and mortality were reduced by a low level of MPs. The combined effects of MPs and Phe may result in a decline in the fish populations. | Polystyrene MPs and phenanthrene | Li et al. 2020 |
| *Diplodus sargus* | Except for high levels of MPs intake, there was no noticeable influence on development and condition in juveniles. | MPs | Müller et al. 2020 |
| *Oryzias melastigma* | Intestinal microbiota variety and density are reduced. Disrupt the signaling pathway of the HPG axis. Influence male fish gut functioning. | MPs and Cd, Pb, Zn | Yan et al. 2020 |
| *Salmo trutta* | MPs did not affect brown trout growth, oxidative stress, or acetylcholinesterase activity when used alone. There was just a little influence on the sleeping behaviour of fry exposed to 106 particles/L. Amitriptyline induced increased acetylcholinesterase activities and suppression of two carboxylesterases, which had a major impact on growth. The most noticeable change was in swimming and resting habits. | Polystyrene MPs | Schmieg et al. 2020 |
| *Sebastes schlegelii* | Decrease swimming speed and range of motion. After water removal, PS-exposed fish's unusual behaviour improved somewhat. PS caused fish to consume more oxygen and excrete more ammonia. With particle size-dependent PS, fish development and energy reserves were lowered. | Polystyrene MPs | Yin et al. 2019 |
| *Oreochromis niloticus* | PS-MPs have the potential to increase ROX bioaccumulation. PS-MPs have the potential to reduce ROX's neurotoxicity and oxidative damage. The availability of PS-MPs may have an influence on ROX metabolism. | Polystyrene MPs and roxithromycin | Zhang et al. 2019 |
| *Oreochromis niloticus* | Anemia and changes in hemato-biochemical parameters were produced by MPs, which may have resulted in juvenile death. | MPs | Hamed et al. 2019 |
| *Oryzias melastigma* | MPs induced oxidative stress and structural damage. MPs showed a sex-dependent pattern of reproductive endocrine disturbance. Prenatal exposure to MPs affected the offspring's early development. | Polystyrene MPs | Wang et al. 2019 |
| *Ambassis dussumieri* | The length and depth of the fish shrank. Significant decreases in the likelihood of survivability. | MPs | Naidoo and Glassom, 2019 |
| *Danio rerio* | In the gut, there was mucosal injury, increased permeability, inflammation, metabolic disturbance, and microbial dysbiosis. | MPs | Qiao et al. 2019a |
| *Danio rerio* | MPs and NOM may cause a size-dependent increase in Cu buildup in fish tissues. Cu poisoning in fish livers and intestines might be exacerbated by MPs and NOM. Cu-ion transport blockage and oxidative stress amplification were blamed for the increased toxicity. | MPs and natural organic matter | Qiao et al. 2019b |
| *Dicentrarchus labrax* | MPs caused histological damages in the liver and gut when they were consumed. The immune system was not affected by the consumption of PVC-MPs. PE-MPs consumption resulted in immune system malfunction, most likely due to oxidative stress. | Polyvinyl chloride MPs | Espinosa et al. 2019 |
| *Danio rerio* | Acute exposure might impair the oogenesis process as well as produce neurotoxicity. Unusual motions, convulsions, and tail bending are examples of erratic behaviour. The level of cyp1a in the gut increased. Vtg1 levels in the liver (middle and high concentrations) were likewise up-regulated. | Polyethylene MPs | Mak et al. 2019 |
| *Oryzias melastigma* | Following exposure, there was a rise in a fatality, as well as a reduction in growth and development. | Polystyrene microspheres | Cong et al. 2019 |
| *Danio rerio* | Stimulate dysbiosis in the gut microbiota. PS MPs disrupt the transcription of genes involved in glucose and lipid metabolism. | Polystyrene MPs | Wan et al. 2019 |
| *Pomatochistus microps* | PEPP of juveniles and AChE of L-est estuary juveniles were both strongly suppressed. Sub-lethal toxicity and neurotoxicity. | MPs and Cd | Miranda et al. 2019 |
| *Danio rerio* | MPs have a substantial negative impact on swimming ability. When exposed to MPs, genes associated with inflammation (il1b) and oxidative stress (cat) were highly elevated. | MPs | Qiang and Cheng, 2019 |
| *Cyprinus carpio* | Exposure to alone changes blood biochemical and immunological markers. The damaging effects of MPs and Cd when combined are potent. | MPs or Cd | Banaee et al. 2019 |
| *Danio rerio* | The changes in mucosal epithelial integrity and immunological response might impair defense against infections and lead to a shift in energy storage usage. | MPs | Limonta et al. 2019 |
| *Dicentrarchus labrax* | Hematological profile, immunological defense in plasma and skin mucus, and bactericidal activities in plasma and skin mucus are all affected. | MPs and Cd | Cruz, 2019 |
| *Oreochromis niloticus* | PS-MPs decreased AChE activity in the brain when they were exposed to them. The liver metabolism was disrupted after exposure to PS-MPs. | Polystyrene MPs | Ding et al. 2018 |
| *Symphysodon aequifasciatus* | When MPs and Cd are combined, they cause severe oxidative stress. The innate immune system was activated by co-exposure to MPs and Cd. | MPs and Cd | Wen et al. 2018 |
| *Danio rerio* | Change the homeostasis of the organs in a more significant way. | MPs and sorbed contaminants | Rainieri et al. 2018 |
| *Sebastes schlegelii* | MPs significantly reduced their ability to swim and explore. The gallbladder and liver were extensively harmed by the accumulated MPs. MPs inhibited growth, energy reserve, and nutritional quality. | Polystyrene MPs | Yin et al. 2018 |
| *Dicentrarchus labrax* | MPs and Hg have a deleterious impact on swimming ability. When swimming against the current, fish's swimming speed and resistance time are reduced. | MPs and Hg | Barboza et al. 2018b |
| *Dicentrarchus labrax* | Oxidative stress is induced. | MPs and Hg | Barboza et al. 2018c |
| *Dicentrarchus labrax* | Increase neurotoxicity, as well as lipid oxidative damage and changes in energy enzymes. | MPs and Hg | Barboza et al. 2018d |
| *Acanthochromis polyacanthus* | Negative impact on the fish's development and overall health. | MPs | Critchell and Hoogenboom, 2018 |
| *Carassius auratus* | The liver was discovered to have significant and serious damage. Chewing caused significant damage to the jaws. Fiber consumption resulted in the greatest number of progressive and inflammatory alterations in the livers and intestines. | Virgin MPs | Jabeen et al. 2018 |
| *Cyprinodon variegatus* | MPs altered swimming behavior, the transcriptional levels, activities of ROS-related genes, as well as their enzymatic levels and activities. | MPs | Choi et al. 2018 |
| *Sparus aurata*, *Dicentrarchus labrax* | Increase alterations in fish leucocytes and oxidative stress. | Polyvinylchloride and polyethylene MPs | Espinosa et al. 2018 |
| *Danio rerio* | MPs caused a substantial and temporary shift in gene expression. | MPs | LeMoine et al. 2018 |
| *Dicentrarchus labrax* | Filtration and lipid dispersion in the liver are both affected. | MPs | Granby et al. 2018 |
| *Danio rerio* | Stimulate gut microbiota dysbiosis and inflammation by increasing mucin secretions. | Polystyrene MPs | Jin et al. 2018 |
| *Danio rerio* | MPs damaged the intestine, causing villi to break and enterocytes to split. | MPs | Lei et al. 2018 |
| *Danio rerio* | The combination exposure induced oxidative damage and inflammation. | Polystyrene MPs | Lu et al. 2018 |
| *Barbodes gonionotus* | The mucosal epithelium of the intestine thickened as PVC exposure increased. With increased PVC exposure, trypsin and chymotrypsin activity increased. | Polyvinyl chloride fragments | Romano et al. 2018 |
| *Lates calcarifer* | Decrease the juvenile's eating pace. Juvenile swimming pathways are harmed. | Pyrene and pyrene MPs | Guven et al. 2018 |
| *Sparus aurata* | Stress was not induced, and the rate of development was not slowed. | MPs | Jovanović et al. 2018 |
| *Gasterosteus aculeatus* | Hepatic stress and lipid peroxidation are hardly affected. | MPs | Ašmonaitė et al. 2018 |
| *Danio rerio* | When the concentration reached 250 mg/L, it was deadly; 25 mg/L 0.6-1.0 m polystyrene particles may induce cyrtosis and pericardial edema as well as other non-lethal poisonous effects, and exposure levels of 250 and 1000 mg/L can reduce heart rate. | MPs | Ling et al. 2018 |
| *Sparus aurata* | The activity of aspartate aminotransferase and creatine kinase, as well as albumin and glucose levels, were all elevated. Intake of PVC-MPs has very little impact on the immune system's key functions. The consumption of PVC MPs caused stress in the fish. | Polyvinyl chloride MPs | Espinosa et al. 2017 |
| *Blennius pholis and Blennius galerita* | Minor histopathological changes. | MPs | Almeida, 2017 |
| *Cyprinus carpio* | The harmful effects of paraquat were significantly amplified. Exposure to paraquat and/or MP caused changes in blood biochemical markers. | MPs | Haghi and Banaee, 2017 |
| *Bathygobius krefftii* | Personality is unaffected. | MPs | Tosetto et al. 2017 |
| *Mullus surmuletus* | In the liver of the fish, there was no sign of oxidative stress or cellular damage. Increased GST in mullet fish might indicate a detoxification system induction. | MPs | Alomar et al. 2017 |
| *Danio rerio* | Very little biodistribution. Ingrained particles activated the complement system, which triggered an immunological response. Toxic mechanisms for lipid metabolism and oxidative stress have been improved. | Polystyrene MPs | Veneman et al. 2017 |
| *Pomatoschistus microps* | Predatory performance suppression may result in a decline in population efficiency. | MPs and cefalexin | Fonte et al. 2016 |
| *Danio rerio* | Stimulate inflammatory reactions in the liver of fish. Disrupt the lipid and energy metabolism. | MPs | Lu et al. 2016 |
| *Clarias gariepinus* | The gill and liver had significant histological alterations. Change the biochemical properties of the blood as well as the transcription of certain reproductive-axis genes. | MPs and phenanthrene | Karami et al. 2016 |
| *Dicentrarchus labrax* | Histological alterations in the tissues of the distal intestine. | MPs | Peda et al. 2016 |
| *Pomatoschistus microps* | Abridge Fish predatory performance and efficiency. Fish's capacity to pick prey/MP may be influenced by their development circumstances. | MPs | de Sá et al. 2015 |
| *Pomatoschistus microps* | Predatory performance has dropped significantly. AChE activity is significantly inhibited. | MPs and Cr(VI) | Luís et al. 2015 |
| *Dicentrarchus labrax* | The death rate augmented considerably. | Polyethylene microbeads | Mazurais et al. 2015 |
| *Oryzias latipes* | Males have lower levels of Chg H, whereas females have higher levels of Vtg I, Chg H, and ER. In a man, there is an abnormal multiplication of germ cells. change the way the endocrine system works. | MPs and chemical pollutants | Rochman et al. 2014 |
| *Pomatoschistus microps* | MPs prevented pyrene-induced mortality. MPs enhanced the level of pyrene metabolites in fish bile. AChE activity was inhibited by MPs alone and in conjunction with pyrene. IDH activity was decreased by a pyrene-MPs combination. | Pyrene MPs | Oliveira et al. 2013 |
| *Oryzias latipes* | Change endocrine system working way. | MPs and contaminants sorbed | Rochman et al. 2013 |