Inhibitory impact of pesticide and microplastics on marine fish health quality: A review

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Introduction

Today pesticides and microplastics known as emerging sea and marine biota pollutants. It trigger several destructive influences on marine organisms, particularly on fish.

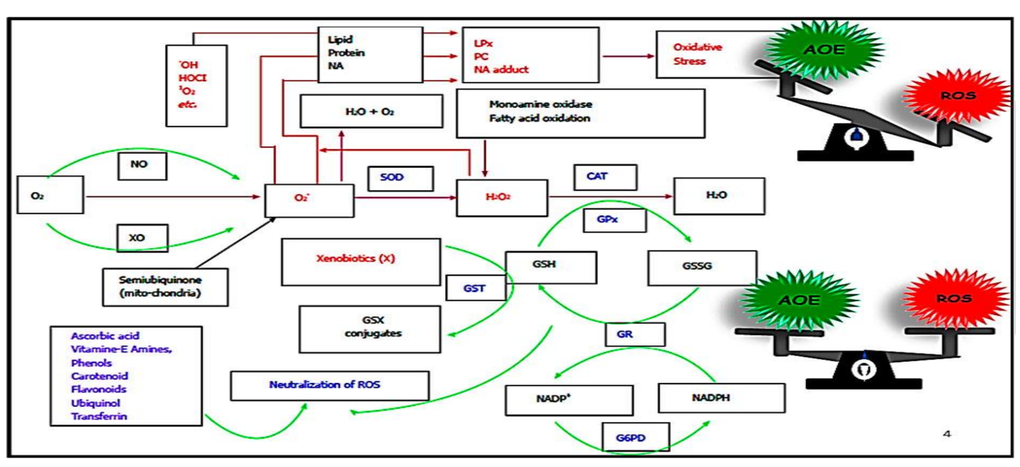
Methods

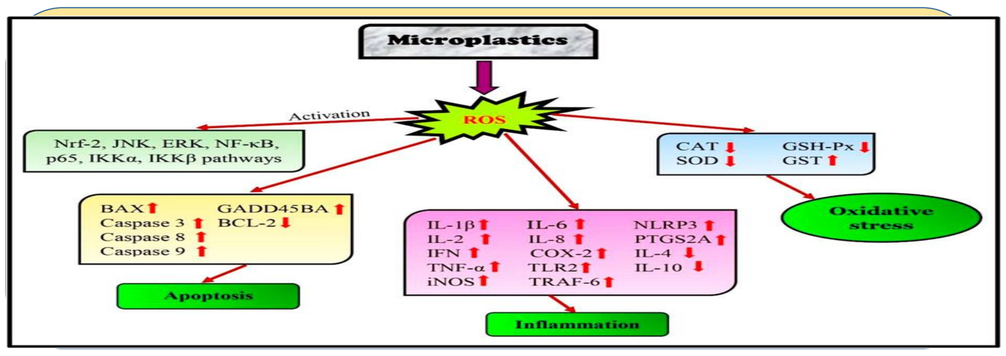
The databases, including PubMed, Research Gate, Google Scholar, ScienceDirect, Embase, Scopus, were searched in this study.

Result

Glutaredoxin system also uses the decrease state of the glutathione to conserve and manage the cellular redox cellular homeostasis and redox-dependent signaling routes (Figure 1). The Keap1-Nrf2-ARE (Kelch-like ECH-Associating protein 1) nuclear factor erythroid 2 related factor 2-antioxidant response element) adjusts the signaling routes for the transcription of the antioxidant enzymes (Hybertson et al.,2011; Mishra et al., 2019; Huang et al., 2021; Li et al., 2021; Paital et al., 2022). The ability for production of ascorbic acid is missed in development in higher animals due to the lack of the enzyme L-Gulonolactone oxidase or L-Gulonolactone synthase. Besides ascorbic acid other small non-enzyme antioxidants are GSH, vitamin A,vitamin E, polyphenolic composites, etc. It is to be noticed that all the mentioned antioxidants act unaccompanied or in cascade to guard the cell from the toxic activity of ROS, failing to which the cell involvement oxidative stress, which is obvious in animals, counting fishes (Bal et al., 2022a; Bal et al., 2022b). Microplastic pollution makes oxidative stress in proteins, lipids, and DNA by changing the antioxidant security mechanisms (i.e., CAT, SOD, GST, GPx, and GSH) at the catalytic and transcriptional stages. In biological systems, microplastics decontrol the gene expression that regulators oxidative stress. Thus, microplastics act as pro-oxidant stimuli, stimulating antioxidant gene expression through an Nrf2- related mechanism in aquatic vertebrates and invertebrates.

Polyethylene microplastics raised the expression of BAX, p53, NF-κB, p65, IKKα, IKKβ, caspase-3, and 9 genes in the gills of carp. A significant innate immunity element, NLRP3 (nucleotidebinding oligomerization domain-like receptor protein 3) was overactive. TNF-α, IFN-γ, IL-2, IL-6, IL-8,IL-1β, which cause immune complaints, increased, while IL-4 andIL-10, anti-inflammatory factors, reduced meaningfully.





Conclusion

The health and nutritious value of various marine organisms, specially fish, have been compromised due to pollutants similar microplastics and pesticides. Fish have many values for humans, counting food and economic advantages. Microplastics and pesticides lonely or with other environmental pollutants influence fish health situation in diverse routes. Toxic nano-particles were similarly found to impart (oxidative) stress in fish. Contact to these pollutants in fish reasons oxidative stress, immunotoxicity, neurotoxicity, inflammation, organ impairment, physical damage, decreased development, and behavioral changes. Also, microplastic and pesticide remains in the marine organism can shift within food webs and may origin harmful results on individual health condition. This review arranges an noticeable insight into microplastics and pesticides creating oxidative stress and involving the signaling routes in fish. While investigation in this field has improved in the latest few years, much is still not completely identified about the extended effects of microplastic exposure on aquatic organisms and human health. Studies have recommended that microplastics may accumulate in human tissues and organs, possibly resulting to health complications such as oxidative stress, inflammation, and damage to the organs including the liver, kidneys, brain, and gut. However, additional examination is essential to achieve a comprehensive construction of stated risks and advance strategies to mitigate potential exposure. The use of nano-technology in the fisheries industry has been suggested as a probable solution to address different challenges, mainly those related with fish disorders. Future study should include comparative and extended monitoring investigations to assess the attendance of microplastics and pesticides in fish that enter food webs, as well as their potential negative influences on individual health condition and overall quality of life during their lifecycle.

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