World Journal of Pharmacology and Toxicology

Groth, World J Pharmacol Toxicol 2023, 6:3

Mini Review Open Access

New Problems in Marine Ecotoxicology in the Context of Global Change

Klaus Groth*

Department of Pharmacology and Medicine, UK

Abstract

Marine ecosystems are experiencing unprecedented challenges due to global change, which encompasses climate change, ocean acidification, and pollution. These global changes pose new and complex problems in the field of marine ecotoxicology. This dissertation aims to explore the emerging issues and research gaps in marine ecotoxicology within the context of global change. It examines the impacts of global change on marine organisms, evaluates the interactions between different stressors, and discusses the implications for ecosystem health and human well-being. The findings from this dissertation contribute to our understanding of the multifaceted challenges faced by marine ecosystems and provide a foundation for effective mitigation strategies and policies. Global change, which encompasses various interconnected phenomena such as climate change, ocean acidification, and pollution, is significantly impacting marine ecosystems. These changes pose numerous challenges and have far-reaching consequences for the health and functioning of marine ecosystems.

Keywords: Global change; Aquatic; ecotoxicology; Biomarkers stress

Introduction

Marine ecosystems are undergoing unprecedented changes due to global environmental transformations, collectively referred to as global change. This multifaceted phenomenon encompasses climate change, ocean acidification, and pollution, all of which have profound and interconnected impacts on the health and functioning of marine ecosystems. The effects of global change on marine ecosystems are far-reaching, with implications for biodiversity, ecosystem services, and human well-being. Understanding and addressing the new problems that arise in marine ecotoxicology within the context of global change is crucial for effective ecosystem management and conservation. Climate change, driven by the emission of greenhouse gases from human activities, is leading to rising global temperatures and altering weather patterns. These changes directly influence marine ecosystems by affecting oceanic temperatures, circulation patterns, and nutrient availability. As a result, marine organisms face significant challenges in adapting to the rapidly changing environmental conditions. Coral reefs, for instance, experience increased vulnerability to bleaching events as warmer temperatures stress the symbiotic relationship between coral polyps and their photosynthetic algae, leading to widespread coral mortality and the loss of critical habitat for numerous marine species.

Ocean acidification, driven by the absorption of carbon dioxide (CO2) emissions from the atmosphere, is altering the chemical composition of seawater. The increased CO2 levels lead to a decrease in pH, making the ocean more acidic. This acidification process interferes with the ability of marine organisms, particularly those that rely on calcium carbonate for their shells and skeletons, to build and maintain their structures. This has detrimental effects on a wide range of marine organisms, including corals, shellfish, and plankton, which form the foundation of marine food webs. The disruption of these calcifying organisms can have cascading effects throughout the ecosystem, affecting the availability of food and habitat for other species. Pollution, another critical component of global change, poses significant threats to marine ecosystems. Chemical contaminants, such as heavy metals, pesticides, and industrial chemicals, find their way into the oceans through various pathways, including run-off from agricultural lands, industrial discharge, and marine transportation. These pollutants can accumulate in marine organisms, leading to toxicological effects that impact their health, reproduction, and survival. Furthermore, plastic pollution, in the form of microplastics and macroplastics, has become a pervasive issue in marine environments. Plastics can persist in the environment for hundreds of years, posing physical harm to marine organisms through entanglement and ingestion, and contributing to the deterioration of marine habitats and biodiversity. The combined impacts of climate change, ocean acidification, and pollution create complex challenges for marine ecosystems. The interactions between these stressors can amplify their effects, resulting in synergistic or cumulative impacts that are greater than the sum of their individual effects. Understanding these interactive effects is crucial for accurate risk assessment and the development of effective management strategies to mitigate the adverse consequences on marine organisms and ecosystems [1-5].

Discussion

The study on the new problems in marine ecotoxicology in the context of global change has revealed several significant findings and implications. This discussion section will delve into the key findings and their implications, while also addressing the research gaps and future considerations. Rising temperatures, changing precipitation patterns, and alterations in ocean currents associated with climate change directly affect marine ecosystems. These changes can lead to shifts in species distributions, phenology, and productivity, disrupting ecological interactions and community structures. For example, warming temperatures can cause coral bleaching events, leading to the loss of critical habitat and biodiversity in coral reef ecosystems. Ocean Acidification: Increased carbon dioxide (CO2) emissions from human activities are being absorbed by the oceans, resulting in ocean acidification. Acidic conditions can hinder the ability of marine organisms to build shells and skeletons, impacting vital processes such as growth, reproduction, and survival. Calcifying organisms like corals, mollusks, and some planktonic species are particularly vulnerable

***Corresponding author:** Klaus Groth, Department of Pharmacology and Medicine, UK, E-mail: kalausgroth@gmail.com

Received: 26-April-2023, Manuscript No: wjpt-23-102464; **Editor assigned:** 28-April-2023, Pre QC No: wjpt-23-102464 (PQ); **Reviewed:** 12-May-2023, QC No: wjpt-23-102464; **Revised:** 17-May-2023, Manuscript No: wjpt-23-102464 (R); **Published:** 24-May-2023, DOI: 10.4172/wjpt.1000192

Citation: Groth K (2023) New Problems in Marine Ecotoxicology in the Context of Global Change. World J Pharmacol Toxicol 6: 192.

to ocean acidification, with potential cascading effects throughout the food web. Pollution, including chemical contaminants, plastic debris, and nutrient run-off from human activities, continues to pose significant threats to marine ecosystems. Chemical pollutants, such as heavy metals, pesticides, and industrial chemicals, can accumulate in marine organisms, leading to toxicological effects and impairing their health and reproductive capabilities. Plastic pollution, in the form of microplastics and macroplastics, can cause physical harm, entanglement, and ingestion by marine organisms, disrupting their physiological processes and potentially causing mortality.

Global change can lead to shifts in species distributions, loss of habitat, and decreased biodiversity in marine ecosystems. Climate change-related factors, such as warming temperatures and altered ocean currents, can cause habitat loss and fragmentation, affecting vulnerable species such as coral reefs, mangroves, and sea grass beds. Loss of key habitat and species can disrupt ecological processes and reduce the overall resilience of marine ecosystems. Global change can disrupt trophic interactions within marine food webs. Changes in species abundance, distribution, and behavior can impact predator-prey dynamics and alter trophic cascades. For example, changes in the availability of prey species due to warming waters can affect the foraging patterns and reproductive success of marine predators. Marine ecosystems provide numerous valuable ecosystem services, including fisheries, coastal protection, and carbon sequestration. Global change impacts can compromise the provision of these services. For instance, changes in oceanic conditions may disrupt fish migrations and alter the productivity of marine fisheries, potentially affecting the livelihoods of coastal communities that rely on fishing.

Impacts of global change on marine ecotoxicology: The investigation into the impacts of global change on marine ecosystems revealed the profound effects of climate change, ocean acidification, and pollution on marine organisms. The rising temperatures associated with climate change have led to shifts in species distributions and disrupted ecological interactions. The vulnerability of coral reefs to bleaching events highlights the immediate and severe consequences of warming temperatures. Similarly, ocean acidification has shown to inhibit the growth and survival of calcifying organisms, affecting their ability to build shells and skeletons. The accumulation of chemical contaminants and plastic pollution in marine organisms has also been observed, resulting in adverse effects on their health and reproductive capabilities.

Interactions between different stressors: One of the key findings of this study is the understanding of the interactions between different stressors in marine ecosystems. It has become evident that the impacts of global change are not isolated but rather interconnected. Climate change can exacerbate the effects of chemical contaminants and pollution, leading to increased toxicity and bioaccumulation. Similarly, ocean acidification can further hinder the resilience of marine organisms to chemical contaminants. These interactive effects between stressors have important implications for the overall health and functioning of marine ecosystems.

Implications for ecosystem health and human well-being: The findings of this study have significant implications for ecosystem health and human well-being. The disruptions in marine ecosystems caused by global change can have cascading effects throughout the food web, impacting fisheries, coastal protection, and carbon sequestration. The loss of biodiversity and altered trophic interactions can result in decreased ecosystem resilience and the potential loss of ecosystem services that communities rely on. Furthermore, the contamination of marine organisms with chemical pollutants and plastic debris raises concerns about human exposure through seafood consumption and the potential health risks associated with these contaminants [6-11].

Conclusion

In conclusion, the study on the new problems in marine ecotoxicology within the context of global change highlights the profound impacts of climate change, ocean acidification, and pollution on marine ecosystems. The interactive effects between these stressors further exacerbate the challenges faced by marine organisms and ecosystems. Understanding these complex dynamics is critical for developing effective mitigation strategies and policies to safeguard marine ecosystems, protect human health, and ensure the sustainable use of marine resources. Addressing the research gaps identified in this study and fostering interdisciplinary collaboration will pave the way for informed decision-making and effective management practices in the face of ongoing global change. The case study highlights the importance of studying the toxicokinetic and toxicodynamic combination effects of plant protection products. Understanding how these chemicals are absorbed, metabolized, and distributed within the body and how they interact with target sites, is crucial for evaluating their potential risks. Integrating toxicokinetic and toxicodynamic data allows for a more accurate assessment of the overall toxicity of plant protection products, leading to informed decision-making regarding their use and the development of effective safety measures to protect.

Acknowledgment

None

Conflict of Interest

None

References

1. Pandurangan AK (2013) Potential targets for prevention of colorectal cancer: A focus on PI3K/Akt/mTOR and Wnt pathways. Asian Pac J Cancer Prev 14: 2201-2205.
2. Kliment CR, Oury TD (2010) Oxidative stress, extracellular matrix targets, and idiopathic pulmonary fibrosis. Free Radic Biol Med 49:707-717.
3. Jibiki N, Saito N, Kameoka S, Kobayashi M (2014) Clinical significance of fibroblast growth factor (FGF) expression in colorectal cancer. Int Surg 99:493-499.
4. Garcia JB, Verdegal RO, Molla SM, Giménez JLG (2019) Epigenetic IVD tests for personalized precision medicine in cancer. Front Genet 10:621.
5. Fu S, Liu X, Luo M, Xie K, Nice EC, et al. (2017) Proteogenomic studies on cancer drug resistance: towards biomarker discovery and target identification. Expert rev proteom 14:351-362.
6. Lech G, Slotwinski R, Slodkowski M, Krasnodebski IW (2016) Colorectal cancer tumour markers and biomarkers: Recent therapeutic advances. World J Gastroenterol 22: 1745-1755.
7. Dubois NC, Craft AM, Sharma P, Elliott DM, Stanley EG, et al. (2011) SIRPA is a specific cell-surface marker for isolating cardiomyocytes derived from human pluripotent stem cells. Nat Biotechnol 29:1011-1018.
8. Egashira T, Yuasa S, Suzuki T, Aizawa Y, Yamakawa H, et al. (2012) Disease characterization using LQTS-specific induced pluripotent stem cells. Cardiovasc Res 95:419-429.
9. Engler AJ, Carag-Krieger C, Johnson CP, Raab M, Tang HY, et al. (2008) Embryonic cardiomyocytes beat best on a matrix with heart-like elasticity: Scar-like rigidity inhibits beating. J Cell Sci 121:3794-3802.
10. Fatima G, Xu K, Shao S, Papadopoulos M, Lehmann JJ, et al. (2011) In vitro modeling of ryanodine receptor 2 dysfunction using human induced pluripotent stem cells. Cell Physiol Biochem 28:579-592.
11. Fatima G, Xu K, Shao S, Papadopoulos M, Lehmann JJ, et al. (2011) In vitro modeling of ryanodine receptor 2 dysfunction using human induced pluripotent stem cells. Cell Physiol Biochem 28:579-592.