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Innovations in Animal Surgery: Minimally Invasive Techniques

Rugar Alvaro*

Department of Biotechnology, University of Monastir, Street Avicenne, 5019, Monastir, Tunisia

Introduction

In recent years, oxidative stress has emerged as a pivotal factor in the pathogenesis of various diseases and conditions, including cardiovascular diseases, neurodegenerative disorders and cancer. It results from an imbalance between the production of Reactive Oxygen Species (ROS) and the body's ability to counteract or detoxify their harmful effects through antioxidants. Environmental and chemical stressors, including pesticides, have been shown to induce oxidative stress, leading to cellular and systemic damage. Among these chemicals, sulfoxaflor, a novel sulfoximine-based insecticide, has gained significant attention due to its widespread use and potential toxicity [1].

Sulfoxaflor is primarily used to control sap-feeding insects, such as aphids and whiteflies, which are major agricultural pests. Its mode of action involves targeting the nicotinic acetylcholine receptors in the nervous system of insects, leading to paralysis and death. While effective against pests, sulfoxaflor's safety profile for non-target organisms, including mammals, has been a subject of ongoing research and debate. Acute exposure to sulfoxaflor has been associated with various toxicological effects, including oxidative stress and alterations in hematological and biochemical parameters, which are indicative of systemic toxicity [2].

Description

Fucoidan, a complex polysaccharide found in brown seaweeds such as Fucus vesiculosus and Laminaria japonica, has gained recognition for its wide range of biological activities, including antioxidant, anti-inflammatory and anticancer properties. The potential of fucoidan to mitigate the adverse effects of various toxicants, including those that induce oxidative stress, has been the focus of numerous studies. Fucoidan's antioxidant properties are attributed to its ability to scavenge free radicals, chelate metal ions and enhance the activity of endogenous antioxidant enzymes. Oxidative stress is a condition characterized by an imbalance between the production of Reactive Oxygen Species (ROS) and the body's antioxidant defenses. ROS, including superoxide anion, hydrogen peroxide and hydroxyl radicals, are highly reactive molecules that can damage cellular components such as lipids, proteins and DNA [3].

Exposure to environmental and chemical stressors, including pesticides, can overwhelm the body's antioxidant defenses, leading to oxidative stress. Sulfoxaflor, a sulfoximine-based insecticide, is one such chemical that has been shown to induce oxidative stress in various organisms. Enhancing biosecurity practices in agricultural settings requires a combination of regulatory measures, education and industry collaboration. Governments play a crucial role in developing and enforcing biosecurity regulations, setting standards for disease surveillance and providing support for research and capacity-building initiatives. Education and training programs help raise awareness among farmers, veterinarians and other stakeholders about the importance of biosecurity and provide guidance on implementing effective measures. Industry collaboration fosters the sharing of best practices, development of innovative solutions and coordination of response efforts in the event of disease outbreaks. Biosecurity measures constitute a comprehensive set of practices and protocols aimed at reducing the risk of disease introduction and spread within animal populations. These measures are multifaceted, encompassing various strategies and interventions that address different stages of disease transmission. Establishing biosecure facilities is another key aspect of biosecurity [4].

Overall, biosecurity measures are essential for preventing the spread of EADs and protecting livestock populations from devastating outbreaks. By implementing strict hygiene protocols, controlling animal movement, conducting vaccination programs and establishing biosecure facilities, stakeholders can minimize the risk of disease introduction and transmission within and between animal populations. Through collaboration and adherence to biosecurity standards, policymakers, veterinarians, industry stakeholders and researchers can enhance emergency disease prevention and control efforts, safeguarding animal health, food security and economic stability. Fucoidan, a sulfated polysaccharide found in brown seaweeds, has been extensively studied for its diverse biological activities. Its antioxidant properties are of particular interest in the context of oxidative stress induced by chemical toxicants. Fucoidan's antioxidant effects are attributed to its ability to scavenge free radicals, chelate metal ions and enhance the activity of endogenous antioxidant enzymes. These properties suggest that fucoidan could potentially mitigate the oxidative stress and associated toxicity induced by sulfoxaflor [5].

Conclusion

In oxidative stress and hematological/biochemical changes induced by acute sulfoxaflor exposure pose significant health risks to non-target organisms, including mammals. The protective effects of fucoidan, a bioactive polysaccharide derived from brown seaweeds, against these adverse effects highlight its potential as a therapeutic agent for mitigating pesticide-induced toxicity. Fucoidan's ability to scavenge free radicals, chelate metal ions and enhance the activity of endogenous antioxidant enzymes plays a crucial role in reducing oxidative stress and preventing cellular damage. Additionally, its anti-inflammatory properties and organ-protective effects further contribute to its overall protective actions. Studies using animal models, such as male mice, provide valuable insights into the mechanisms through which fucoidan exerts its protective effects. By normalizing oxidative stress markers, antioxidant enzyme activities and hematological/biochemical parameters, fucoidan demonstrates its potential to counteract the toxic effects of sulfoxaflor.

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***Address for Correspondence:** Rugar Alvaro, Department of Biotechnology, University of Monastir, Street Avicenne, 5019, Monastir, Tunisia, E-mail: alvarorugg888@gmail.com*

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