

# Evaluating the risks of increasing potential pollutants on sea creatures and in the ocean

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## ABSTRACT

Against this historical backdrop, the Mediterranean Sea faces an increasing threat from emerging pollutants such as pharmaceuticals, personal care products, heavy metals, pesticides and microplastics, which pose grave threats to the environment and human health. In this regard, aquatic invertebrates and fish are particularly vulnerable to the toxic effects of these contaminants, and several species have been identified as biomarkers for their detection. Of these, mussels and Erasmobranchs are now widely used as biomarkers to accurately assess the effects of pollutants. This study focuses on the dogfish *Scyliorhinus canicularis* and the Mediterranean mussel *Mytilus galloprovincialis*. The first value is a useful indicator of local pollution levels due to exposure to contaminants that accumulate on the seafloor. In addition, it has a high nutritional status and plays an important role in the Mediterranean ecosystem. On the other hand, the mussel *Mytilus galloprovincialis*, as a filter organism, can absorb and bioaccumulate foreign substances present in the environment. It also has a direct impact on human health as it is a kind of commercial purpose. In summary, the increasing presence of new pollutants in the Mediterranean Sea is a serious problem that requires immediate attention. Mussels and elasmobranchs are two of her examples of bioindicators that should be used to accurately determine the impact of these contaminants on marine ecosystems and human health.

**Keywords:** Bioindicators; Emerging contaminants; Environmental toxicity; Mediterranean Sea

## INTRODUCTION

There is a link between environmental quality standards and emerging pollutants. Amid growing concern, data are accumulating on the ecochemistry, ecotoxicology, human toxicity and epidemiology of new drugs. This will ultimately lead governments to create environmental norms and standards to ensure adequate protection [1]. Direct measurements in invertebrate models and fish are the best way to study the toxic effects of some emerging pollutants on marine organisms. In addition, several models can be used to better assess difficult impacts on the environment and conservation [2]. The Mediterranean Sea is a unique and diverse marine ecosystem that is home to a wide variety of invertebrates, fish and other aquatic life. Recently, however, the presence of new pollutants such as pharmaceuticals and personal care products, heavy metals, pesticides and microplastics has made the Mediterranean Sea a concern [3].

Many of these substances enter coastal and marine waters through direct emissions and river transport from human activities, such as pharmaceutical use on farms, untreated wastewater discharges, and heavy metal and pesticide releases from industry. All of these spontaneous or involuntary release patterns of toxic substances into the environment can pose threats to aquatic ecosystems [4].

In general, all these pollutants are highly toxic to marine life. Studies have shown that they can lead to physiological changes, reproductive problems, and even death. Numerous species have been reported in the Mediterranean region as biomarkers for the detection of toxic substances in the environment. Most of them belong to invertebrates such as the mollusk *Mytilus galloprovincialis* and are one of the most suitable biological indicators as benthic filter organisms. In fact, it is often used to learn more about the effects of medicines and personal care products. The effects of two toxins, namely acetylsalicylic acid (a drug commonly used as an analgesic) and quaternium 15 (a surfactant readily found in soap), have been shown to affect the function of digestive gland cells in *Mytilus galloprovincialis*, a species that lives on the Ionian coast. It was studied with variation in mind. Strait of Messina. Specifically, these studies demonstrated a decrease in normal cell volume in the regulatory volume depletion (RVD) test [5]. Regulation of cell volume is important for maintaining the metabolic physiology of the cell and is involved in certain critical functions such as maintaining the proper pH of the cell and ensuring proper conditions for membrane trafficking. In particular, cell volume regulation involves the process of regulatory volume depletion (RVD), in which ions and osmolytes flow out of the cell to

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reduce its volume. However, exposure to contaminants and other environmental stressors can damage cell membranes and associated proteins, leading to loss of RVD response. When this happens, cells are unable to return to their original volume, disrupting normal cellular processes and may contribute to the progression of physiological changes [6]. This mechanism reflects the physiological state of cells in animals through the analysis of this capacity and has been especially appreciated as a method to test the toxicity of numerous contaminants in model organisms such as *Mytilus galloprovincialis*.

Mediterranean invertebrates and fish are particularly susceptible to pesticides, according to a study of haematological parameters in freshwater catfish. However, it is clear that the presence of these pollutants has a significant impact on the health of Mediterranean fish and invertebrates, and further research is needed to understand the full extent of the damage caused [7]. It is important to understand the long-term effects of contaminants on species health and the possible bioaccumulation of contaminants in fish tissues. For example, two commercial fish caught in the Mediterranean Sea were used to compare total aliphatic hydrocarbon (TAH) bioaccumulation, and each fish had a unique bioaccumulation capacity, with liver. It turns out that it correlates with the number of fatty acids it contains. . In summary, investigating the effects of emerging pollutants on Mediterranean invertebrates and fish should be a priority for researchers. It has been reported to be associated with various adverse health effects on these organisms [8].

## **Bivalve molluscs and elasmobranchs as suitable indicators of emerging pollutants**

### **Bivalve Molluscs**

Among the model organisms commonly used in experimental studies, invertebrates play an important role due to their intermediate position in the food chain. Among mussel species, *M. galloprovincialis* plays an important role in environmental monitoring programs and is therefore highly valued as an early indicator of contamination [9]. These mussels are the basis for such programs because of their unique ability to accumulate and reflect contaminants within their tissues. As filter feeders, they actively remove water from the environment and unintentionally absorb various substances, including pollutants. Therefore, the levels of contaminants found within the mussel tissue provide valuable information about the surrounding water quality. Additionally, using mussels as a bioindicator offers several advantages. The stationary nature allows for convenient and economical sampling, making it suitable for long-term monitoring. Additionally, the ability of mussels to integrate the effects of multiple contaminants over time provides a comprehensive picture of the overall state of pollution [10].

## **DISCUSSION**

Unfortunately, environmental pollution has increased in recent years and may also have certain impacts on

human health in the future, so scientific progress in the field of environmental pollution research is of utmost importance. It is precisely for this reason that we consider it fundamental to disseminate information and raise public awareness about the risks associated with pollution. In fact, toxicology research is one of the priorities of those who wish to protect the environment, organisms and even human health in line with the 'One Health' approach. It must be taken into account that different pollutants exist simultaneously in aquatic ecosystems as mixtures and thus may exert synergistic, antagonistic or neutral toxic effects on each other. That is, synergistic effects lead to increased toxicant effects on established endpoints, and antagonistic effects lead to decreased pollutant toxicity, directly affecting the analyzed biomarkers. Therefore, toxicological studies of water pollutants require knowledge not only of the effects of individual pollutants, but also of the effects resulting from their interactions. In addition, there is growing public interest in the scientific community, and more data are available in the literature for some of the emerging contaminants described in this review. However, according to our study, the effects of personal care products and pharmaceuticals are still understudied, and relatively recent data on the detection of heavy metals in model organisms such as *Mytilus galloprovincialis* in the Mediterranean are not yet available.

It is also important to recognize these impacts at large ecological scales, from individual organisms to interactions at the biodiversity level. In fact, ecosystem health depends on the interaction of several physical, chemical and biological factors. In particular, ecosystem processes such as productivity and nutrient recycling are directly related to the functional diversity of communities, which is determined by species diversity. Nonetheless, biodiversity can change in response to stress from environmental change, which is directly reflected in the functioning of ecosystem processes.

## **CONCLUSION**

The research conducted has shown how negative interventions are possible at different biological and ecological levels, starting with our daily habits and social and industrial developments. The point is to make people aware of the impact that today's society has on the environment. This impact is reflected in both animal organisms and their biodiversity, which are very important indicators of health in any environment and indirectly affect our own health. The purpose of this overview is therefore to provide information on toxic effects on suitable model organisms in order to raise awareness of the responsible and conscious handling of most of the mentioned products which are currently in very widespread use. That's it. It is clear from the analysis performed in this review that monitoring contamination levels and implementing effective control strategies are critical to prevent further damage to the environment and vulnerable species. It is essential to take steps to mitigate the impact of emerging pollutants on the Mediterranean Sea and its inhabitants. Our aim was to explain the nature of the differences between the two

different organisms used as models despite belonging to different levels of the food web. This review highlighted how all effects are coordinated at the physiological system

level. If we do not pay enough attention to protect the environment from pollutants, we risk the outbreak of serious diseases and eventual extinction of the human race.

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