Chapter

# Introductory Chapter: Molluscs

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## 1. Introduction

Molluscs are one of the great animal phyla after arthropods. There are more than 90,000 living species and about 70,000 fossil species. It is a highly diverse group that includes eight classes: Caudofoveata, Solenogastres, Monoplacophora, Polyplacophora, Gastropoda, Bivalvia, Cephalopoda, and Scaphopoda, which have a wide variety of body shapes and structures [1]. They are quite simple molluscs, without eyes or shell, and even the most complex organisms on the planet. They are found in a great diversity of habitats, from the tropics to the polar seas and from the shallow muddy plains to the open ocean or the abyssal plains. They present diversity in their life strategies: they can be benthic, pelagic, or burial drills, molluscs originated in the sea, estuaries, fresh water and terrestrials [1–5].

Molluscs have a wide variety of food strategies, including herbivores, carnivores, predators, filter feeders, detritivores, and even some parasites [1], which are of great ecological importance due to their trophic relationships. They also have great ecological importance, since they are the link of pelagic and benthic processes, because they filter organic matter and phytoplankton from the water column, and their undigested remains, expelled as mucus or pseudofeces, become part of the sediment [6]. Several investigations showed strong evidence that natural populations of filtering bivalves can exert top-down control over phytoplankton in coastal areas [7].

The importance of molluscs as a fishing and aquaculture resource is well known, since there are enormously developed and productive fisheries of octopus, squid, cuttlefish, numerous species of bivalves, and some gastropods, as well as the use of various species in monitoring programs to analyze the effects of pollution and other disturbances on benthic communities [8, 9]. A large number of species have commercial importance since their meat is used as food and their shells as pieces of ornaments or in crafts. They are also useful as bioindicator of pollution or environmental processes and in the industry as a source of cosmetic and pharmaceutical products.

The mechanisms of defense in molluscs fulfill an important function against bacteria, fungi, protozoa, and metazoans. The immune response is mediated by cellular and humoral factors, and it has been shown that there is a close link between these two components. The hemocytes are cells capable of generating shape changes by the emission of pseudopodia, phagocytic activity, cytotoxicity, and encapsulation of large particles [10]. These circulating cells are responsible for generating different types of innate responses such as phagocytosis, encapsulation, production of cytotoxic substances, and antibacterial peptides. These cells are present in the hemolymph, but they are also able to leave the circulation and migrate to other tissues of the animal where they can be added to restrict infection or some tissue damage [11]. Its capacity of phagocytosis is one of the essential functions of hemocytes to eliminate exogenous agents such as bacteria or protozoa [12]; in this case, the production of reactive oxygen species is induced [13, 14]. In Pectinidae bivalves, the phagocytic capacity has been evaluated in *Pecten maximus* with various types of bacteria and yeasts [14].

The encapsulation allows the immobilization of larger particles than the hemocytes; this response involves the formation of concentric layers, formed by hemocytes. The formation of capsules of hemocytic origin against protozoan parasites has been studied in detail in the oyster *C. virginica* [15] and in the clams *Tapes semidecussatus* [16] and *Mercenaria mercenaria* [17]. The most studied model in the innate immune response of hemocytes against *the Schistosoma mansoni* trematode larvae has been the gastropod mollusc *Biomphalaria glabrata* (Mollusca: Pulmonata), where it has been shown that the parasite has a modulating effect on several hemocytic parameters, such as suppression of phagocytosis, change in mobility, variation in the number of hemocytes, cytoadherence, and metabolic capacity [18, 19].

Among the biggest challenges that arise in the culture of molluscs are the constant mortality events, which cause a significant reduction in production. The presence of diseases within cropping systems affects in particular the larval and post-larval stages in production laboratories, as well as juveniles and adults grown in the natural environment. Particularly in breeding places, the massive mortalities caused by diseases imply the total loss of production, with serious economic consequences. In most cases, studies have shown that the problems are caused by bacterial pathologies, being the main etiological agent members of gender *Vibrio* [20, 21]. In relation to the stages cultivated in natural banks, where the first studies focused on the pathologies are caused by parasitic protozoa, in recent years, research has focused on diseases of bacterial origin that affect the survival of crops.

At the present time, there is hardly any research being carried out on the bacterial populations that cause diseases which are associated with the culture of molluscs, and, therefore, there is little information on the subject, which has led to the search for alternatives aimed at the elimination of bacteria of crop water during the hatchery stages. Among the methods used in different water treatments as well as in chemotherapy, it has been observed that they are inadequate to avoid high mortalities. Therefore, the use of probiotic bacteria in mollusc culture is one of the most promising options in aquaculture, giving rise to a balanced bacterial population with self-regulatory capacity. In addition, their use avoids the dangers derived from antibiotics and other control measures, which help prevent diseases and avoid economic losses within this activity [22].

Molluscs can be used in monitoring plans, since these organisms have the peculiarity of having little or little movement, long life cycles, a high degree of tolerance to stress, an intimate relationship with sediment, and a rapid response to disturbances. Makes them ideal for the study of environmental changes of natural and anthropogenic origin.

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## Conflict of interest

We declare no conflict of interest.

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