How marine invertebrates cope with environmental stressors: regulation of the inflammatory response through the endocannabinoids-microbiota interplay

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Abstract

Marine diseases are an emerging field. The appearance and spread of infectious agents driven by human activities and climate change have the potential to alter ocean life in many ways. Some agents like microorganisms (viruses, bacteria and fungi) threaten food security by affecting commercial species, others damage valuable marine ecosystems (e.g. coral reefs). To anticipate these potential problems and to understand how marine organisms cope with stressors, we need a better understanding of the activation and modulation of immune responses. Studying the cellular and molecular mechanisms of the inflammatory response in marine invertebrates is crucial to figure out the way they deal with biotic and abiotic stressors and helps to better understand the whole animal physiology in different environmental settings. Recently, an increasing interest has focused on the role of the interaction between the host endocannabinoid (eCBs) system and the symbiont microorganisms in the modulation of the inflammatory response to infectious diseases. The role of both the eCB system and microbiota is largely homeostatic in nature and provides resilience to the body to cope with internal and external adverse conditions. Current knowledge on eCBs, microbiota and immune system communication is in its infancy and is mostly limited to mammalian studies; however, the most fundamental elements that enable this interaction can be found deep in the evolution of multicellular organisms.

The objective of the present PhD project proposal is to fill the gap on the interplay between eCBs and microbiota in the regulation of the inflammatory response in a cosmopolitan marine invertebrate, the ascidian *Ciona robusta*. In detail, we seek to understand how inflammation is modulated by eCBs, and to gain insights on the eCBs-microbiota partnership in the regulation of the inflammatory response.

Molecular and organismal accessibility of *C. robusta* throughout its life cycle offers the opportunity to study the evolution of signaling programs. Using *C. robusta* larvae and juveniles, this research can add knowledge on the origins and fundamental principles that govern the role of endocannabinoids and symbiont microorganisms in the genetic program that specifies and modulates the biological response of innate immunity to infections. This has the potential to yield a greater understanding of immunology and introduce new concepts to further highlight the importance of a comparative analysis of chordate lineages.