Copepods as model organisms to evaluate the toxicity of emerging contaminants: an ecotoxicogenomic approach.

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Project Summary

Copepods are small crustaceans representing up to 90% of the total zooplankton in aquatic ecosystems. Copepods are worldwide distributed and represent the link between phytoplankton microalgae and higher trophic levels. Due to their role in aquatic ecosystems any alteration of environmental conditions affecting copepod survival and fecundity can reduce the productivity of the oceans. Copepods represent ideal model for investigating the effects of stressors and specific alteration in biological and physiological processes (*end-points*) are considered for the assessment of ecological risk. The copepod *Acartia tonsa* is largely used in ecotoxicology and the knowledge on its physiology, ecology and, more recently, transcriptomic has allowed to better understand the effects of pollutants at molecular, cellular, and population level. However, *A. tonsa* is not representative of the copepod community in several coastal regions. For example, this species is not present in the Tyrrhenian Sea where the co-generic *A. clausi* is dominant within the Family of *Acartiidaea*. Whereas, in the Adriatic Sea *A. tonsa* was introduced by ballast water and has displaced the native species. The diffusion of *A. tonsa* in other marine areas could pose a threat for the zooplankton biodiversity.

The objective of this PhD project is to propose the copepod *A. clausi* as alternative copepod species in ecotoxicology. The first step will be focused to obtain a multigenerational culture of *A. clausi* in laboratory conditions all over the year. In the second phase of the research *A. clausi* will be exposed to toxicants under acute and chronic conditions, following the protocols used for *A. tonsa*. The sensitivity of *A. clausi* to referent toxicants, nickel chloride and nickel nanoparticles, inducing well-known physiological alterations in *A. tonsa*, will be compared. Quantitative gene expression analysis of both *A. tonsa* and *A. clausi* will be also compared.

The intellectual merit of this project is to widen the knowledge on new copepod species to be used in ecological risk assessment of marine coastal areas where *A. tonsa* has never been reported. Moreover, toxicogenomic approach is strongly encouraged in recent ecotoxicology studies as chemical-specific expression profiles can be used as potential new biomarkers.

The broader impact of the project is in ecological risk assessment, highlighting on the effects of pollutants on zooplankton and providing more information on the effects at ecosystem level. Furthermore, impact is also in the management of polluted areas by ecologists and environmental agencies.