

Chemosensory perception in copepods: physiological, behavioural and molecular responses to biotic stimuli

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Abstract

Copepods dominate marine zooplankton communities and play a central role in the carbon transfer from lower to higher trophic levels. The efficiency of this transfer relies on their ability to remotely perceive waterborne chemical cues associated with prey and mate in diluted environments, and in their fast and plastic behavioral and physiological responses. Molecular perception of chemical signals in metazoans occurs via sensory structures, where the transport of the chemical to receptor proteins activates a downstream signal transduction pathway leading to the phenotypic response (prey ingestion/avoidance, mating, spawning). The goal of the present PhD proposal is to gather synergistic information at physiological, behavioural and gene levels, to explore the molecular mechanism of the chemosensory perception in copepods exposed to different biotic stimuli (phytoplankton and mates) and anchor it to well-defined phenotypic responses of the organisms. Among the phytoplankton preys, we will include diatom species producing lipid-derived bioactive molecules (oxylipins), acting as defensive infochemicals against copepod grazers. Ecophysiology and molecular responses will be investigated in two target copepods, *Temora stylifera* and *Acartia clausi*, that are dominant species in the Mediterranean Sea and the Gulf of Naples and show different feeding strategies. A panel of chemosensory genes (GOIs), identified by our team in several copepod transcriptomes, will be selected and their expression quantified in the target copepods exposed directly and indirectly to the prey and the mate. Specifically, the objectives and methodology used will be:

PHYSIOLOGY - measurements of grazing rates in both sexes of the two target copepods exposed to single and mixed phytoplankton diets along consecutive days;

BEHAVIOUR - evaluation of swimming trajectories and attraction/avoidance behaviour, in both sexes of the two target copepods, exposed to phytoplankton, oxylipins and mates;

GENE EXPRESSION - quantitative expression analysis of GOIs in both sexes of the two target copepods, exposed to phytoplankton, oxylipins and mates, along hourly and daily exposures.

The results of the study could open new possibilities for the use of the chemosensory genes as biomarkers in chemical ecology studies on copepods, and in general for the assessment and management of healthy marine ecosystems.