Does the chemical environment impact the survival of a host-specific symbiont? A transcriptomic approach of a "host-separation syndrome"

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ABSTRACT

Symbioses are intimate and durable associations between at least two heterospecific organisms, commonly named host and symbiont. Coevolution allows intrinsic adaptations that induce advantages for the symbionts, which may become strongly host dependent. Moreover, the chemical environment produced by the host can be crucial for symbiosis. Recent research has shown that polyhydroxynaphthoquinones, also called spinochromes, are kairomones produced by the sea urchin *Echinometra mathaei* which are involved in host recognition by the symbiotic shrimps *Arete indicus and Tulearicoaris holtuisi*. They may also be involved in other functions for the latter: when they are isolated from its host, a "host separation syndrome" is induced. This syndrome is defined as an alteration of the health status of a host-specific symbiont that may rapidly induce its death. Spinochromes seem to be linked to the symbiont survival rate, as their addition into the environment of an isolated symbiont can improve drastically its survival. Our study aims to identify key genes and molecular pathways that may be involved in the "host-separation syndrome" occurring in the symbioses cited above. Three conditions were tested: (*i*) symbiont with the host; (*ii*) isolated symbiont and (*iii*) isolated symbiont with an addition of spinochromes. We performed transcriptomic analyses and observed an important number of differentially expressed genes between the different conditions. Some gene candidates have been identified as genes coding for histone-binding proteins, heat shock proteins and metallothioneins, specifically expressed in the "isolation" condition. Additional analyses are currently in progress to better understand molecular pathways leading to the host-separation syndrome.

Keywords: Crustacea; Gene expression; Kairomone; Spinochrome; RNA-seq