Transcriptional Profile of *Vibrio* Injected *Litopenaeus vannamei* under Hypoxic and Hypercapnic Hypoxic conditions

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The Pacific whiteleg shrimp, *Litopenaeus vannamei*, is a valuable commercial and recreational crustacean species which lives in a microbially rich environment. However, in shrimp the relationship between environmental stressors and potential modifications to the immune response has largely been understudied. Marine organisms which inhabit coastal estuaries routinely experience diurnal, tidal and seasonal changes in dissolved oxygen (hypoxia). Hypoxia is typically accompanied by increased levels of carbon dioxide (hypercapnia), which decreases water pH. To elucidate the potential effects of hypoxia and hypercapnic hypoxia, custom oligonucleotide microarrays were used to identify the transcriptional profile of *L. vannamei* exposed to sublethal levels of hypoxia (P_{O2} = 4.0 kPa, P_{CO2} < 0.06 kPa) and hypercapnic hypoxia (P_{O2} = 4.0 kPa, P_{CO2} = 1.8 kPa) at 4 and 24 hours (normoxic P_{O2} = 20 kPa, P_{CO2} < 0.06 kPa). In separate studies, incorporating selective plating and quantitative PCR, we also observed that exposure to hypoxia and hypercapnia reduced the bacteriostatic activity of *L. vannamei* to *Vibrio campbellii*. Pursuant to the data obtained in the two above mentioned studies, we intend to use custom oligonucleotide microarrays containing 22,000 unigenes expressed in *L. vannamei* to further explore the mechanisms which underlie the host:pathogen relationship. We test the hypothesis that the unique transcriptional profile of *L. vannamei* under hypoxia and hypercapnic hypoxia changes following sublethal bacterial challenge. We predict that the additional stress of a bacterial challenge will further compromise *L. vannamei*'s ability to maintain vital metabolic processes and to mount an effective immune response. Furthermore, we intend to use real-time RT-PCR to assess temporal changes in several immune-related genes at 0.5, 2, 4, 6, 12, 24, 48 and 72 hours to identify the timing and sequence of the immune response of *L. vannamei* stressed via bacterial challenge only compared to *L. vannamei* which are stressed by both bacterial challenge and hypoxia or hypercapnic hypoxia.

This work is supported by NSF IBN-0212921 and ISO-0725245