

Correlation of mRNA Profiles, miRNA Profiles, and Functional Immune Response in Rainbow Trout (*Oncorhynchus Mykiss*) During Infection With Viral Hemorrhagic Septicemia Virus (VHSV) and in Fish Vaccinated With an Anti-VHSV DNA Vaccine

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CORRELATION OF MRNA AND MICRO-RNA PROFILES AND FUNCTIONAL IMMUNE RESPONSE IN RAINBOW TROUT (*ONCORHYNCHUS MYKISS*) DURING INFECTION WITH VIRAL HEMORRHAGIC SEPTICEMIA VIRUS (VHSV) AND IN FISH VACCINATED WITH AN ANTI-VHSV DNA VACCINE

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This project seeks to characterize molecular genetic and immunological mechanisms involved in rainbow trout (*Oncorhynchus mykiss*) immunity towards *Viral hemorrhagic septicemia virus* (VHSV). To do so, we consider both relevant genes and the newly discovered small double-stranded RNAs called microRNAs (miRNAs), which are 18- to 22-nucleotide long RNAs that regulate gene expression. By targeting mRNAs, miRNAs could be involved in controlling the expression of fish immune response genes. As immune regulators, miRNA expression analysis may thus help explain differential immunocompetence in fish.

MRNA and miRNA levels in organs of fish coming from families showing high and low mortality in previous VHSV infection trials will be analyzed using quantitative real-time PCR and cDNA microarray. Highly expressed and down-regulated genes and miRNAs during infection can be identified in the fish and expression profiles will be measured relative to highly susceptible fish, allowing the identification of mRNA and miRNA signatures of immunological competence. These markers of immunity will be correlated with phenotype and genotype, as well as to correlates of protective immune (innate, humoral, and cell-mediated) responses. MRNA and miRNA profiles will be correlated and combined with in vitro work in cell culture to describe target relationships between miRNAs and mRNAs and the effect of this targeting in fish. Vaccinated fish will also be used for mRNA/miRNA profiling and in challenge studies alongside non-vaccinated fish.

Linking mRNA and miRNA profiles with phenotypic, genotypic, and immunological data will provide an integrated view of the mechanisms of resistance and the strong protective immune responses provided by vaccination. This information is important in designing effective strategies to mitigate the danger of potential VHS disease outbreaks.