GENETIC ARCHITECTURE OF RESISTANCE TO VIRAL HEMORRHAGIC SEPTICEMIA IN RAINBOW TROUT

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Infectious diseases represent a significant brake on the development of aquaculture. Genetic improvement of stocks and prophylactic measures such as vaccination are important and represent sustainable strategies to limit economic losses associated with mortality outbreaks. In France, VHSV, the causative viral agent of the Viral Hemorrhagic Septicemia (VHS), is a potential threat for the production of rainbow trout.

To understand the genetic determinism and molecular mechanisms underlying the resistance to VHS, 2,500 offspring of a factorial cross of 32 dams and 60 sires of the INRAE synthetic line were challenged by intramuscular injection with VHS virus. Parentage assignment had been carried out for the first 276 dead fish and 276 survivors. Among parents with enough offspring assigned (11 to 23 assigned offspring per parent), fourteen (7 susceptible and 7 resistant ones) were selected for sequencing based on their progeny with contrasting phenotypes. The 7 susceptible parents had progeny survival rates between 0 and 20%, while the resistant ones had progeny survival rates between 83 and 100%.

The sequenced genomes were aligned with the Arlee rainbow trout reference genome (USDA_OmykA_1.1). A variant calling was performed to identify single nucleotide polymorphisms (SNPs). A panel of 13 223 132 SNP with MAF >= 0.107 (at least 3 minor alleles over all individuals) was retained and a genome-wide association study was performed by Fisher's exact test at each SNP position considering a correction for multiple testing and correlations between close SNP.

The whole analysis revealed 4 new SNP related to resistance to VHS in rainbow trout. These SNP are located on chromosomes 6, 8, 13 and 32. Only one SNP was positioned within a gene, while the 3 others were in intergenic regions close to some genes, whose function will be further investigated in *in vitro* experiments (qPCR, Knock-out).

This new knowledge will contribute to defining relevant and efficient strategies to limit VHS's impact on rainbow trout aquaculture.

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