

University of Prince Edward Island

Faculty of Veterinary Medicine
Summary of Dissertation

Submitted in Partial Fulfilment
of the Requirements for the

**DEGREE OF MASTER OF SCIENCE IN VETERINARY
MEDICINE**

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**Expression and Identification of Biomarkers in Complex
Gill Disease: Using Jellyfish Toxins and Hydrogen
Peroxide Treatments as Laboratory Models of Gill Disease
in Atlantic salmon (*Salmo salar*).**

Aquaculture is a growing industry is important in supporting the world's growing demand for food. In Canada, Atlantic salmon (*Salmo salar*) is the top cultivated species. Farmed fish are susceptible to disease, which is a concern as farmers depend on high survival rate for marketing healthy fish. An emerging issue for Atlantic salmon culture has been Complex Gill Disease (CGD). This is a multifactorial disease caused by a combination of bacterial, parasitic, viral or farm management practices. Since this is an emerging syndrome, it is challenging to elucidate and understand what fully causes this disease and/or mortality in infected fish.

The purpose of the following studies was to examine two potential contributing factors to CGD in the field in two different experiments: (1) hydrogen peroxide exposures used for disease treatment and (2) jellyfish toxin exposure. Hydrogen peroxide has been used for decades as a topical treatment via bath exposures in the field to treat external infections such as sea lice and amoebic gill disease (AGD), however, with increasing ocean temperatures, treatments with this chemotherapeutant have become more prominent at certain times of the year. Jellyfish blooms often occur near aquaculture sites and due to the nature of the current, jellyfish can pass through net pens, stimulating nematocyst toxin release into the water column. Fish can aspirate pieces of the jellyfish through the gill causing direct tissue contact. Each of these exposures can have a severe effect on the gill, and in extreme cases, result in mortality.

Gill samples were collected during each experiment for histology and RT-qPCR to identify specific gene markers that could be useful markers for CGD. Genes selected focused on healing, redox, oxygen transport, cell death and DNA repair within the gill. The overall goal was to identify these biomarkers to help mitigate disease in the field.

Publications:

Veltman CV, Whye SK, Purcell SL, Groman DB, Jia B, Andrew S, Poley JD, Fast MD. In Press. Repeated, dose and temperature dependent hydrogen peroxide exposures stimulate sensitive wound repair and ion regulation expression even under mild histological impacts in Atlantic salmon. Manuscript submitted to Aquaculture.

Fast MD, Veltman CV, Purcell SL, McCurdy R, Maguire D, Groman DB, Jia B, Andrew S, Poley JD, Whyte SK. In Review. Impacts of jellyfish nematocyst homogenates on Atlantic salmon (*Salmo salar*) gill and head kidney cells. Submitted to FACETS.

Presentations

Veltman C. Expression and Identification of Biomarkers in Complex Gill Disease: Using Jellyfish Toxins and Hydrogen Peroxide Treatments as Laboratory Models of Gill Disease in Atlantic salmon (*Salmo salar*). UPEI Graduate Studies and Research Conference, Charlottetown, PE (October 13, 2022)

Veltman C, Eslamloo K, Whyte SK, Purcell SL, Groman D, Fast MD. Identification of gene expression patterns in complex gill disease: Laboratory models examining Atlantic salmon (*Salmo salar*) farm management practices (hydrogen peroxide and environmental insults such as jellyfish). Aquaculture Association of Canada Meeting, May 7-10, 2023. Victoria, BC, Canada. (Oral presentation by Veltman)

Veltman C, Eslamloo K, Whyte SK, Purcell SL, Groman D, Fast MD. Identification of gene expression patterns in complex gill disease: Laboratory models examining Atlantic salmon (*Salmo salar*) farm management practices and environmental insults such as jellyfish, *Chaetoceros* and *Tenacibaculum*. 46th Annual Eastern Fish Health Workshop, March 27-31, 2023. Atlantic Beach, South Carolina, USA. (Oral presentation by Fast)

Biographical Data

Born in Woodstock, Ontario, June 20, 1998