From: [redacted]
Sent: Tuesday, May 31, 2022 6:29 PM
To: Sitter, Laura; [redacted] Jones, Simon; McCorquodale, Brenda; Shaw, Kerra; Price, Derek; Manchester, Howie; Paylor, Adrienne; Oswell, Alexandria; [redacted] AQFF.FishHealth (DFO/MPO)
Cc: [redacted]
Subject: RE: Smon Jones ACRDP Presentation to AMD Staff
Attachments: Summary page S. Jones Sea lice viability post H2O2 exposure 21-P-01 (002).pdf

Good afternoon Laura,
As requested below, please find enclosed a one-page written summary of the analysis conducted by Dr. Jones.

We trust this satisfies condition of licence 6.13.

Best regards,

[redacted]
Mowi Canada West

Mobile: [redacted]
Email: [redacted]

-----Original Message-----
From: Sitter, Laura <Laura.Sitter@dfo-mpo.gc.ca>
Sent: May 27, 2022 3:37 PM
To: [redacted] Jones, Simon <Simon.Jones@dfo-mpo.gc.ca>; McCorquodale, Brenda <Brenda.McCorquodale@dfo-mpo.gc.ca>; Shaw, Kerra <Kerra.Shaw@dfo-mpo.gc.ca>; Price, Derek <Derek.Price@dfo-mpo.gc.ca>; Manchester, Howie <Howie.Manchester@dfo-mpo.gc.ca>; Paylor, Adrienne <Adrienne.Paylor@dfo-mpo.gc.ca>; Oswell, Alexandria <Alexandria.Oswell@dfo-mpo.gc.ca>; [redacted] <[redacted]; AQFF.FishHealth (DFO/MPO) <AQFF.FishHealth@dfo-mpo.gc.ca>
Cc: [redacted]
Subject: RE: Smon Jones ACRDP Presentation to AMD Staff

ALERT: This message originated outside of Mowi's network. BE CAUTIOUS before clicking any link or attachment.

Good afternoon,

We wanted to thank you for arranging the presentation for Dr. Jones to present his work to us in collaboration with BCSFA through the ACRDP re: viability of sea lice following hydrogen peroxide treatment. It was a very informative and helpful presentation.

To satisfy condition of licence 6.13, please submit a one-page written summary of the analysis conducted by Dr. Jones no later than June 1, 2022. This will accompany the powerpoint presentation previously submitted. Please also submit copies of the ACRDP report as they become available.

s.19(1)

CERMAQ

May 31st, 2022

Re: DFO Conditions of License 6.13

To fulfill the Marine Finfish Aquaculture License condition 6.13, "By June 1, 2022, the License Holder must complete and submit a scientific analysis, to the satisfaction of the Department, regarding the viability of sea lice that are captured before, during and after sea lice bath treatments", Cermaq Canada through the BCSFA contributed to an ACRDP project (ACRDP 21-P-01).

The project aimed to generate knowledge relating to the infectivity and reproductive potential of mobile *Lepeophtheirus salmonis* following treatment with hydrogen peroxide. Two separate studies were completed:

1. Viability and infectivity of mobile stages of *L. salmonis* following in vitro exposure to H_2O_2
2. Study hatch rate and development of larval *L. salmonis* following in vitro exposure to H_2O_2

The conclusions from the above studies showed that laboratory treatment with 500 and 1500 ppm H_2O_2 caused:

- Temporary loss of mobility of adult female *L. salmonis*
- Significant reduction in infectivity of adult female *L. salmonis*
- Significant reduction in abundance of nauplius 2 and copepodid larvae
- Prolonged presence of nauplius 1 larvae, suggesting inhibition of molting

These results match what was previously found in a published study from 1993 - Johnson SC, Constible JM, Richard J (1993) Laboratory investigations on the efficacy of hydrogen peroxide against the salmon louse *Lepeotheirus salmonis* and its toxicological and histopathological effects on Atlantic salmon *Salmo salar* and chinook salmon *Oncorhynchus tshawytscha*. Diseases of Aquatic Organisms (17) 197-204.

The outcomes from the project were presented to DFO Aquaculture Management Department on 26th May 2022. A final report for this ACRDP project will be submitted to the Department once it is available.

Fitness consequences of bath exposure to hydrogen peroxide in salmon lice *Lepeophtheirus salmonis* (ACRDP 21-P-01)

Introduction: This document briefly describes the research and summarizes the findings and conclusions. The objectives of the research were to generate knowledge relating to the infectivity and reproductive potential of motile stages of *L. salmonis* following treatment with hydrogen peroxide (H_2O_2). Three experiments were conducted: experiments 1 and 2 assessed the ability of motile lice to re-infect Atlantic salmon post-smolts following exposure to H_2O_2. Experiment 3 assessed the effect of H_2O_2 exposure on the number and development of larval *L. salmonis* in culture.

Methods: The design of the first two experiments was similar. Adult female lice were collected live from farmed Atlantic salmon during harvest and returned to the Pacific Biological Station in chilled aerated seawater. The lice were incubated for 20 minutes in glass containers of filtered SW containing 0, 500 or 1500 mg/L H_2O_2. After exposure they were monitored for 24 hours then allowed to reattach to anaesthetized salmon (approx. 60 g) which were examined at 0, 3 and 5 days post-exposure (dpe) (experiment 1) and at 0, 1 and 3 dpe (experiment 2). For experiment 3, egg strings from approx. 300 lice were allocated to 9 flasks containing 500 mL filtered SW at 35 strings/flask. Three flasks were assigned to 0, 500 or 1500 mg/L H_2O_2 each and incubated for 10 days at 10 °C, with daily sampling for number and larval developmental stage.

Results: In experiments 1 and 2, 500 mg/L H_2O_2 immobilized ~50% of lice, which fully recovered after 18 hours. In contrast, 1500 mg/L immobilized all lice which were fully recovered by 24 hours. The overall number of lice declined during both experiments. In experiment 1, there was no significant difference in the number of lice among treatment groups at 0 dpe. At 3 dpe, there were significantly fewer lice in the 1500 mg/L treatment group compared with controls. At 5 dpe, no lice were observed in the 1500 mg/L group, but differences among treatments were not significant. In experiment 2, there were significantly fewer lice in the 500 mg/L group compared with controls. No other differences were significant. In experiment 3, treatment of egg strings with 500 or 1500 mg/L H_2O_2 caused a significant reduction in the number of cultured nauplius-2 and copepodid larvae between 5 and 10 dpe, compared with untreated controls.

Conclusions: Laboratory treatment with 500 or 1500 mg/L H_2O_2 caused temporary loss of mobility of adult female *L. salmonis*, significant reduction in infectivity of adult female *L. salmonis*, and a significant reduction in the abundance of nauplius 2 and copepodid *L. salmonis* larvae. The presence of nauplius 1 larvae in cultures following treatment with 500 or 1500 mg/L H_2O_2 suggested an impairment of molting at this stage. In experiments 1 and 2, the overall reduction in infection severity between 3 and 5 dpe, probably resulted from small fish size, and limited the time available to measure the treatment effects.

In the Results, Jones experiment #1 saw no significant difference in the number of lice attached to fish across all exposures to H202 and in experiment #2 only the lice exposed to the lesser concentration of H202 were significantly lower than the control. The lice exposed to the higher concentration remained attached similar to the lice that were not exposed to H202.

But in the Conclusions Jones says H202 caused "significant reduction in infectivity"…