Effect of temperature on transfer of MLO (Midichloria-like organism) and development of RMS (Red Mark Syndrome) in rainbow trout.

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RMS is a skin disease of uncertain aetiology affecting farmed rainbow trout mainly in Europe, but also in the Middle East, and the Americas. It consists of single or multiple skin lesions usually localized on the trunk of fish approaching market size. Morbidity can reach up to 60%, leading to significant economic impact due to product downgrading, treatment costs, increased labour costs and increased susceptibility to secondary infections. This disease is generally associated with water temperatures below 16 °C and can still be present at 2°C, but it may subside at higher temperatures, as the healing time seems to be associated with the water temperature.

No aetiological agent has been unequivocally identified for RMS, but RMS can be transmitted to naïve fish by indirect contact, which together with the response to antibiotics, suggests that RMS may be caused by a bacterial agent. Bacteria Midichloria like organism (MLO) are supposed to be involved in RMS. Studies of RMS so far almost entirely use diseased fish from farms, where the epidemiology and history of exposure to MLO is unknown. Thus, the fish has usually experienced a large range of temperatures during the incubation period, which can last from weeks to months, as shown by cohabitation studies carried out at DTU Aqua. Since RMS cohabitation experiments with this disease at DTU Aqua, Denmark, have so far been conducted only at 12°C, disease progression at different temperatures needs to be formally established under controlled settings.

This research project has involved Italian and Danish researchers from University of Udine, DTU-AQUA (Denmark) and was kindly supported by the 2020 EAFP Small Grant Scheme and MSD Animal Health UK 2020 Aquaculture bursary.

We tested the effect of 3 temperatures (12°C, 15.5°C 19°C) on the transfer of MLO from RMS affected fish to naïve SPF cohabitants, and the development of skin pathology at DTU-AQUA (Denmark) facilities. The trial was carried out in duplicate 180 L tanks and included one negative control tank per temperature. To each tank was added 4 seeder fish and 18 SPF fish. The fish were followed for 11 weeks, during which samples were taken from each tank on three occasions. Samples consisted of skin samples for MLO detection by qPCR and fullthickness lesion skin and control skin samples for histology. Lesions were classified macroscopically on the fish and microscopically on H&E-stained sections by a scoring system recently proposed by the authors.

Preliminary results show that at 12°C the development of skin lesions peaked in severity at 11 weeks post-cohabitation (wpc). At 15.5°C the skin pathology was most severe at 8 weeks, and 3 weeks later skin lesions were in the healing phase or healing completely resolved. At 19°C only three fish developed mild and moderate macroscopical and microscopical skin lesions. The amount of detected MLO in affected fish measured by PCR reflected the observed pathology (results not presented yet).

The project was delayed due to COVID-19 pandemic and electronic microscopy analysis and conclusive results of this study are still pending.

References:


- Matthijs Metselaar et al. (2020) Investigating the involvement of a Midichloria -like organism (MLO) in red mark syndrome in rainbow trout *Oncorhynchus mykiss* *Aquaculture* 528(2020) 735485 doi.org/10.1016/j.aquaculture.2020.735485

