Experimental anal infection of rainbow trout with Flavobacterium psychrophilum: A novel challenge model

Flavobacterium psychrophilum is a Gram-negative psychrophilic bacterium causing rainbow trout fry syndrome (RTFS) in fry and bacterial coldwater disease (BCWD) in older fish. Both diseases challenge fish welfare and economy in hatcheries and in on-growing facilities. The bacteria enter hosts through gills, skin, and the gastrointestinal tract, and transfer horizontally in contaminated water and vertically with sexual products of both male and female fish (Madetoja, Dalsgaard, & Wiklund, 2002; Madsen & Dalsgaard, 1999; Nematollahi, Decostere, Pasmans, & Haesebrouck, 2003). Protection afforded by experimental vaccination (injection or immersion) using bacterins (formalin-killed whole cell) has been described (Hoare, Ngo, Bartie, & Adams, 2017; Madetoja et al., 2006), although no commercial vaccine is presently available for control of RTFS and BCWD. Further research on RTFS/BCWD vaccinology will benefit from an improved challenge method as current methods comprising intraperitoneal (i.p.) injection, bath, and bath exposure after treatment with stressors such as hydrogen peroxide (Henriksen, Kania, Buchmann, & Dalsgaard, 2015; Madsen & Dalsgaard, 1999) remain difficult to reproduce and rely on wounding the structural integrity of mucosal surfaces. The present study compares different infection methods and evaluates systems where the rainbow trout surface (skin, gills, and gut) is kept intact or injured. We compared six different challenge methods comprising anal intubation, i.p. injection, co-habitation, and bath challenge exposing either nontreated intact fish, fish chemically damaged by exposure to hydrogen peroxide or fish mechanically damaged by needle insertion in the tail-fin. Disease development was subsequently recorded for 4 weeks.

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Contributors: Chettri, J. K., Al-Jubury, A., Dalsgaard, I., Heegaard, P. M. H., Buchmann, K.
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