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The immune response of rainbow trout to
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The bacterial fish pathogen Flavobacterium psychrophilum is a major cause of mortality in farmed
rainbow trout (Oncorhynchus mykiss) and other salmonid fish. The disease following infection is
called bacterial coldwater disease (BCWD) or rainbow trout fry syndrome (RTFS). To our
knowledge, no commercial vaccine is currently available and the disease is treated with antibiotics.
Injection-based challenges with F. psychrophilum are standardized but the route of infection does
not reflect a natural situation. Therefore, we established an immersion-based model investigating if
hydrogen peroxide (H₂O₂) pre-treatment could elevate infection and mortality.

The model consisted of four groups: 1) Un-exposed control, 2) H₂O₂ exposure, 3) F. psychrophilum
immersion and 4) H₂O₂ + F. psychrophilum. Pre-treatment with H₂O₂ increased mortality two-fold
if fish also were exposed to F. psychrophilum after pretreatment. Tissue samples were taken from
the involved groups 4 h, 48 h, 125 h and 192 h post-exposure and investigated for regulation of
immune genes. Following genes were examined in the head kidney and gills by qPCR: IgT, IgM,
CD8, CD4, MHC I, MHC II, IL-4/13A, TcR-β, IL-10, IL-6, IL-1β, IL-17, SAA and FoxP3.

A pro-inflammatory response was indicated, but only a weak indication of an adaptive response was
recorded (most evident in the F. psychrophilum group). Further, pre-treatment with H₂O₂ affected
the correlation gene expression and pathogen load in several cases. Morphological changes in the
gill tissue were evaluated using hematoxylin and eosin stained tissue sections. Exposure to both
H₂O₂ and F. psychrophilum intensified tissue damage and postponed healing. The results indicate
that F. psychrophilum may have an immunosuppressive action and that environmental stress may be
one of several factors playing a role in RTFS outbreaks.

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