

## Hydrogen peroxide effects on Northern shrimp: dynamic modelling of mortality

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Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) is used as anti-parasitic veterinary medicine in salmon farming worldwide. Since the treatment water is discharged to the sea, there are concerns about the potential effects of H<sub>2</sub>O<sub>2</sub> on populations of the Northern shrimp (*Pandalus borealis*), an economically and ecologically important species in Norwegian fjords. In the present study, adult shrimp were exposed to short pulses of H<sub>2</sub>O<sub>2</sub>, followed by a recovery period in clean seawater. The exposure concentrations represented 100, 1000 and 10000 times dilutions of the prescribed treatment concentration for salmon. In the two lowest dilutions, substantial and delayed mortality was observed. The complete data set (survival over time, in all treatments) was modelled using a toxicokinetic-toxicodynamic model from the GUTS framework. This modelling framework has several distinct advantages over descriptive dose-response curves. Firstly, it can be meaningfully parameterised on data with pulsed exposure. Secondly, it can make extrapolations to meaningful LC<sub>50</sub>s for constant exposure. And finally, it allows for meaningful predictions for untested exposure situations. In this contribution, we show how the model explains the toxicity patterns over time, and demonstrate how the parameterised model can be used, in conjunction with results from dispersion modelling, to predict mortality under representative field conditions, and hence to support environmental risk assessment. Special attention will be given to the propagation of parameter uncertainty from the model calibration to the model predictions.