Influence of water temperature on the outcome of a *Brucella pinnipedialis* (hooded seal (*Cystophora cristata*) strain) infection in cod (*Gadus morhua*)

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In the natural environment, pathology in seals due to infection with *B. pinnipedialis* has not been documented. A lack of intracellular survival and multiplication in hooded seal (*Cystophora cristata*) macrophages *in vitro* indicates that *B. pinnipedialis* does not cause chronic infections in hooded seals, and the strain has previously shown an attenuated replication pattern in a BALB/c mouse model. An age related serological and bacteriological pattern in the hooded seal points to a transient infection of environmental origin, possibly through the food chain.

Atlantic cod (*Gadus morhua*), which is part of the hooded seal diet, were experimentally infected with 10^8 *B. pinnipedialis* intraperitoneally (ip). Uninfected in-contact cods were kept together with the infected cods. Uninfected control cods were kept in a separate tank. Fish of the in-contact groups were tagged with fluorescent tags for identification. The experimental infection was run using two different water temperatures; 6 and 15°C, in order to mimic respectively normal Arctic waters and the increased water temperatures expected during future climate change scenarios in the southernmost distribution area of the cod.

At 6 °C, bacteria were found in blood samples from all infected cods at all timepoints (day 1, 7, 14, 21, 35, and 49) post infection (pi). No disease or mortality was recorded. At 15 °C, bacteria were eliminated more quickly, however mortality was observed between day 7 and 20 pi in 5/60 fish, without any sign of gross pathology. Specific immune responses (i.e. antibodies) towards *Brucella* were also detected earlier at 15 °C than at 6 °C.

The concept of oxygen- and capacity-dependent thermal tolerance provides an explanation for animal specialization at limited temperature ranges and their sensitivity to other stressors at sub-optimal temperatures. This suggests a possible trade-off between immunocompetence and other vital functions that could be masked at optimal growth temperatures and raises questions on the influence of climate changes in the oceans and the emergence of diseases in aquatic ectotherms.