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 hooded seal (Cystophora cristata) induced by Brucella pinnipedialis has not been documented. A lack of intracellular survival and multiplication in hooded seal macrophages and epithelial cells indicates that B. pinnipedialis does not induce a chronic infection. This suggests that hooded seals acquire a transient B. pinnipedialis infection from their environment, likely through their diet. Documenting that Atlantic cod (Gadus morhua), part of the hooded seal's diet, sustain a B. pinnipedialis infection and assessing the influence of water temperature on the outcome of the infection. Atlantic cod were infected intraperitoneally with 108 B. pinnipedialis. Tagged uninfected in-contact cod were kept with infected cod. Uninfected control cod were kept in separate tanks. The experimental infection was run at 6°C and 15°C, mimicking Arctic water and increased water temperatures expected in the Northern Atlantic during the 21st century (International Panel on Climate Change scenarios). At 6°C, viable bacteria were found in the blood of all infected cod at all times post infection (pi) (day 1, 7, 14, 21, 35, and 49). Neither gross pathology nor mortality were recorded in fish kept at 6°C. Anti-Brucella antibodies were detected earlier at 15°C than at 6°C. At 15°C, bacteria were eliminated more quickly, however mortality was observed between day 7 and 20 in 5/60 fish. No B. pinnipedialis was cultured from these 5 dead fish, as from any in-contact fish. At 15°C, 1/60 fish in the uninfected in-contact group died at day 9 and 1/60 fish in the uninfected control group died at day 21. Our results suggest a possible trade-off between immunocompetence and other vital functions at sub-optimal temperatures and raise questions on the influence of increased water temperatures in the oceans and the emergence of diseases in aquatic ectotherms.