Survivability Rates in Wild–Type and DAF–2 *Caenorhabditis elegans* Exposed to Acute Heat and Cold Shock

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Adjustments in temperature are a prominent environmental stimulus to many organisms and affect the life processes of almost all organisms. Environmental temperatures that diverge from optimal physiological temperature have been shown to exert physiological stresses and death in organisms, including invertebrates such as the nematode *Caenorhabditis elegans*. *C. elegans* is a model organism widely used in scientific studies because of its short lifespan, transparent body, sequenced genome, and availability in a wide array of mutant strains. *C. elegans* have been subjected to various environmental stresses and tested for their effects on the organism's development physiology, development, and fecundity. Temperature shock (heat or cold) is an example of an environmental stress. For *C. elegans,* heat or cold shock can be defined as the divergence above or below the optimal *in vitro* temperature of 20°C, respectively. Three categories of shock were established; heat shock (37°C), cold shock (12°C), and heat shock followed by cold shock (37°C–12°C). The effects of heat shock and cold shock on *C. elegans* have been investigated individually, but responses to heat shock followed by cold shock have not been tested. In this investigation, wild type and DAF–2 (e1370) *C. elegan*s survival was measured following heat shock (37°C for 12 hours) and cold shock (12°C for 12 hours) and heat shock followed by cold shock (heat/cold shock). DAF–2 worms that are thermotolerant, hypoxia–resistant, and longer–lived were hypothesized to tolerate sub-optimal culture temperatures better than wild type worms. Heat shock resulted in 36% vs. 23% survival for the DAF–2 and the wild–type worms, respectively. Cold shock resulted in 93% vs. 63% survival rate for the DAF–2 and the wild–type worms, respectively. Heat/cold shock resulted in 90% vs. 80% survival for the DAF–2 and the wild–type worms, respectively. These results support previous work that the DAF–2 worms *in vitro* have a higher survival when exposed to both colder and hotter temperatures than wild type worms. The higher survival rate of the DAF–2 worms exposed to heat/cold shock treatment as compared to the heat shock alone is a surprising result. One possible explanation is the short time period (30 seconds) between the change from heat to cold compared to the much larger time that it requires to quantify the death rate after exposure to the heat/cold shock treatment. These results suggest that DAF–2 worms have a higher survival rate than wild type worms when exposed to heat quickly followed by cold.