



Identification of Genes Necessary for Heat Shock Response in Tardigrades

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What are tardigrades?

Tardigrades are eight-legged microscopic animals that are well-known for their survival abilities. They enter a cryptobiotic tun state when desiccated that allows them to withstand extremes in pressure, heat, radiation. Terrestrial tardigrades, like the species *Hypsibius exemplaris*, live in moisture trapped in lichens and mosses.



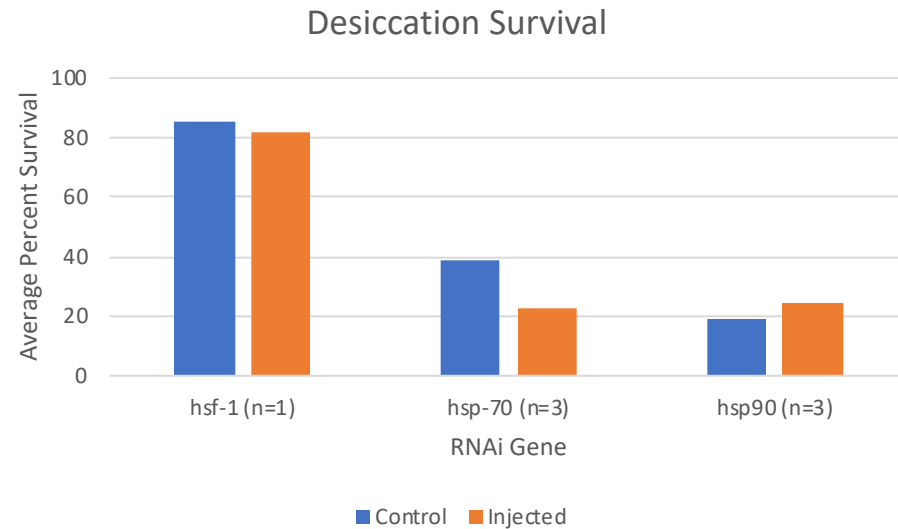
What genes allow tardigrades to survive extreme heat?

Understanding what genes allow tardigrades to survive heat shock will help reveal the proteins responsible for their uncanny survival abilities. These proteins can then be used by scientists for various projects. For example, these proteins could be used in vaccines, allowing the vaccines to be sent to regions where they may not be properly refrigerated and yet still be viable.

Can we create transgenic tardigrades?

The Goldstein Lab is working to make tardigrades, specifically *Hypsibius exemplaris*, a model organism. We believe that tardigrades' natural survival abilities make them the a great organism to study life in extreme environments. However, it is important that there be a way to edit the genome of these animals in order to perform more experiments testing these abilities. Creating a transgenic tardigrades is an important step in elevating them to model organism status.

Results



This graph shows the comparison between RNAi injected tardigrades and non-injected tardigrades after desiccation. For all three genes there is no significant difference between the treatment and control, suggesting that the knockdown of each gene does not affect desiccation survival. Therefore, when I expose injected and noninjected tardigrades to heat shock, I should be able to attribute any significant difference in survival to their ability to survive heat shock alone.

This photo is from a two-week, lab-wide project focused on creating transgenic tardigrades. I injected this tardigrade with a *C. elegans* plasma-membrane-targeted mKATE protein mRNA synthesized by a lab member. The tardigrade appears to be expressing distinct fluorescence patterns in some of its cells. This may be the first ever tardigrade to express something experimentally introduced!

