Title:	Evolution of cross-tolerance in Drosophila melanogaster as a result of increased resistance to cold stress.
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Abstract:	Cold stress is a critical environmental challenge that affects an organism's fitness-related traits. In Drosophila, increased resistance to specific environmental stress may lead to increased resistance to other kinds of stress. In the present study, we aimed to understand whether increased cold stress resistance in Drosophila melanogaster can facilitate their ability to tolerate other environmental stresses. For the current study, we used successfully selected replicate populations of D. melanogaster against cold shock and their control population. These selected populations have evolved several reproductive traits, including increased egg viability, mating frequency, male mating ability, ability to sire progenies, and faster recovery for mating latency under cold shock conditions. In the present work, we investigated egg viability and mating frequency with and without heat and cold shock conditions in the selected and their control populations. We also examined resistance to cold shock, heat shock, desiccation, starvation, and survival post-challenge with Staphylococcus succinus subsp. succinus PK-1 in the selected and their control populations. After cold-shock treatment, we found a 1.25 times increase in egg viability and a 1.57 times increase in mating frequency in the selected populations compared to control populations. Moreover, more males (0.87 times) and females (1.66 times) of the selected populations survived under cold shock conditions relative to their controls. After being subjected to heat shock, the selected population's egg viability and mating frequency increased by 0.30 times and 0.57 times, respectively, compared to control populations. Additionally, more selected males (0.31 times) and females (0.98 times) survived under heat shock conditions compared to the control populations. Desiccation resistance slightly increased in the females of the selected populations relative to their control, but we observed no change in the case of males. Starvation resistance decreased in males and females of the selected populations compared to their controls. Our findings suggest that the increased resistance to cold shock correlates with increased tolerance to heat stress, but this evolved resistance comes at a cost, with decreased tolerance to starvation.
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