Abstract

Title: The Evolution of Starvation Resistance in Relation to Nutrient Availability

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An animal's ability to withstand prolonged periods of food deprivation is called starvation resistance. Starvation resistance (SR) is a phenotypic trait of great environmental significance. In environments where there are shortages of food, those who can resist starvation for longer periods of time to thrive compared to other organisms. The purpose of this project is to study the underlying mechanisms in starvation resistance using *Drosophila melanogaster* as a model. We used a large- scale experimental evolution design, placing fruit flies on 3 different selection treatments, constant high, fluctuating, and deteriorating nutrients availability, for over 50 generations each with 12 replicates. For the first treatment, constant high availability (CHA), flies are given a high sugar diet their entire lifespan. In the second treatment, fluctuating availability (FA), flies on this regime are fed a standard diet then a low yeast diet then back to a standard diet to the end of their lifespan. In the final treatment, deteriorating availability (DA), flies are given a standard diet then are fed a low yeast diet to the end of their lifespan. Flies 12 days po, post oviposition, from each nutrient regime were placed on a maintenance diet, and then transferred to vials containing only nutrition less agar. These vials were checked approximately every twelve hours, beginning at 8:30am and 8:30pm daily. The number of flies confirmed dead in each period was then recorded until all flies were confirmed dead over the span of roughly two weeks. Flies on the fluctuating availability treatment are expected to exhibit higher levels of SR due to evolved higher rates of lipid and carbohydrate storage than the DA and CHA treatments. We link these phenotypic changes to changes at the genetic level in these lines. These results have implications for understanding the conditions that might select for higher or lower starvation resistance and the underlying genetic mechanisms determining those changes.

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