Investigating Muscle-Specific Rho1 Knockdown on Climbing Speed and Endurance in Aging Drosophila melanogaster

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Genetic variation plays a key role in individual patient outcomes, particularly with age due to physical vulnerability. Rho1 is a gene in Drosophila melanogaster encoding proteins in the family of GTPases involved in wound repair, cell shape, and cell migration through regulation of the actin cytoskeleton. Rho1's human ortholog, RhoA, fulfills similar biological functions. In a genome-wide analysis, Rho1 was identified as a candidate gene with potential age-dependent effects on physical performance. I utilized the GAL4-UAS system with RNA interference lines to knock down expression of Rho1 in the muscle tissue of the fly, to test the effect of reduced expression on climbing ability. Virgin females of the GAL4 muscle-driver line were crossed with males of the UAS RNAi Rho1 responder line and males of a control line. Offspring from the crosses were separated into young groups 3-7 days of age and older groups 4-5 weeks of age, and measured with a stopwatch for climbing speed and endurance. My findings indicate the knockdown of Rho1 in muscle tissue did not have a statistically significant effect on climbing speed and endurance in female flies at young and old age, and male flies at young age. Due to external circumstances, older male flies of the experimental group died before experimentation, so no conclusion can be made on the significance of Rho1 for this group. These results clarify the role of Rho1 on physical ability in D. melanogaster, aiding understanding of Rho1's human ortholog, RhoA, within personalized medicine. Future research should investigate the effect of Rho1 knockdown in other tissues of D. melanogaster, such as the brain, fat body, or a full-body knockdown, and explore additional measures such as physical strength and behavioral patterns.

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