Evolution of the FOXO Gene in the Drosophila Genus

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Background Information

- Foxo is responsible for mediating the inhibitory action of insulin or insulin like growth factors of specific key functions.
- Alterations to this gene can change an organism's lifespan through the insulin like receptor dInR
- INR occurs earlier on within the insulin signaling pathway and interacts with several genes before indirectly interacting with the FOXO gene.

Hypothesis

There are many proteins involved in the insulin signaling pathway. We hypothesized that the evolution of proteins acting earlier in the pathway will be more evolvable than those presented later in the pathway. More specifically we hypothesized that the gene PTEN will have more evolutionary changes than FOXO when comparing within the same species (Figure 1).

Research Objective 1

Annotate the orthologs of the FOXO gene on D. suzukii and D. navajoa using D. melanogaster as reference species (Figures 2-3).

Research Objective 2

Proteins encoded by the FOXO gene for Drosophila navajoa and Drosophila melanogaster were sequenced using the Molecular Evolutionary Genetic Analysis (MEGA) software. Compute the genetic distance of amino acid sequences.

Research Objective 3

Compare the Amino Acid substitution rates of three different proteins (CHICO, PTEN, and FOXO) as they exist in our Drosophila species compare to D. melanogaster to see if there are differing evolutionary rates of the coding sequences for each protein.

Summary of our Progress

<table>
<thead>
<tr>
<th>Protein</th>
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<tbody>
<tr>
<td>CHICO (early)</td>
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<tr>
<td>D. navajoa</td>
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<tr>
<td>D. suzukii</td>
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<td>D. rhopaloa</td>
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We were able to successfully determine the amino acid substitution rates for the miranda and rhopaloa version of CHICO to melanogaster as well as miranda and suzukii versions of PTEN to melanogaster and finally navajoa to melanogaster. This is our progress so far and future work will help us determine amino acid substitution rates of other comparisons here so that we may further test our hypothesis.

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