Sex, Stress, and Oxygen Deprivation: Gender-Specific Phenotypes Modulate Survival in Anoxia

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Oxygen Deprivation

• What is Anoxia?
  – <.001 kilopascal of oxygen in environment
  – Health Issues
    • Stroke
    • Ischemia
    • Center of cancerous tumors
  – Environmental Deficits
    • Oceanic dead zones
Suspended Animation

• Reversible state of dormancy
  – initiated due to environmental stress
• Mammals
  – Hibernation
  – Estivation
• We can study SA with the model organism *Caenorhabditis elegans*!!
Caenorhabditis elegans

Image adapted from Wormbook
Hypothesis

- An modification in gonad function will modulate survival of long-term oxygen deprivation.
  - Sterile animals may survive anoxia differently than wild-type animals.
  - Sex may modulate survival in anoxia.
dsRNA

RNase III-like enzymes bind to dsRNA

Cleavage

siRNA

siRNAs form RISC complex

RISC

RISC recognizes target mRNA

Cleavage

Target mRNA

Target mRNA degradation
Experimental Schematic

- L1 from hypochlorite
- 48 hours
- 24 hour post L4 molt
- 50 L4 per plate
- Anoxia - 3 days
- 24 hour recovery in normoxia
- Assay survival and motility
RNAi of sterile-reported genes

<table>
<thead>
<tr>
<th>RNAi</th>
<th>3 Day Anoxia Survival Rate</th>
<th>Wild-type Motility Post 3 Day Anoxia</th>
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<td>47.12%</td>
<td>16.01%</td>
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<tr>
<td>*plc-1</td>
<td>83.54%</td>
<td>67.97%</td>
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<td>*ksr-1</td>
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<td>62.72%</td>
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<td>*unc-45</td>
<td>73.67%</td>
<td>54.68%</td>
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<td>Normoxia</td>
<td>3 days anoxia</td>
<td>24 hour recovery</td>
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Gender in Anoxia

Phenotype Frequency

- **Survival**
- **Normal Motility**

**wild-type males**

- Survival: 100
- Normal Motility: 90

**wild-type hermaphrodite**

- Survival: 50
- Normal Motility: 20
Male Genotype vs Phenotype

- **Survival**
- **Normal Motility**

Phenotype Frequency

- **wild-type males**
- **wild-type hermaphrodite**
- **tra-2(q276) males**

XX males
Females in anoxia

Percent Survival Post Three-Day Anoxia

Strains

- N2
- fog-2(q71) virgins
- fog-2(q71) mated

Legend:
- Survival
- Normalcy
Oocyte flux and survival

Percent Survival Three Day Anoxia

- N2
- spe-9(hc52)
- glp-4(bn2)
Future Aims

• What underlies the *fog-2(q71)* phenotype?
  – Sperm signaling
  – Signaling from fertilized embryo

• Does oocyte flux affect survival?
  – *spe-12(hc76)* and *fer-15(hc15)*
    • Animals that cannot produce spermatids
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References


