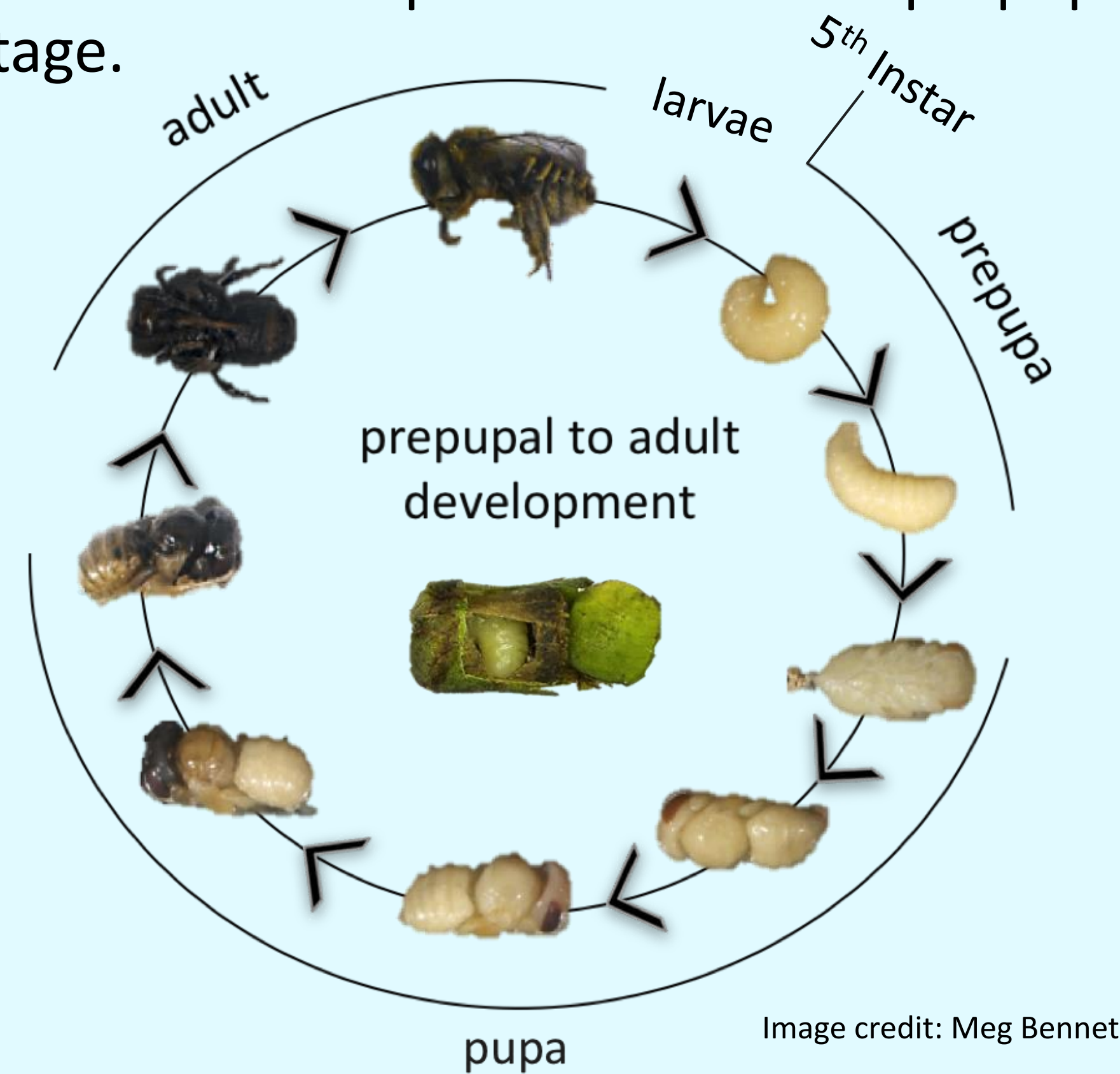


# The Effects of Oxidative Stress on Development in *Megachile rotundata*

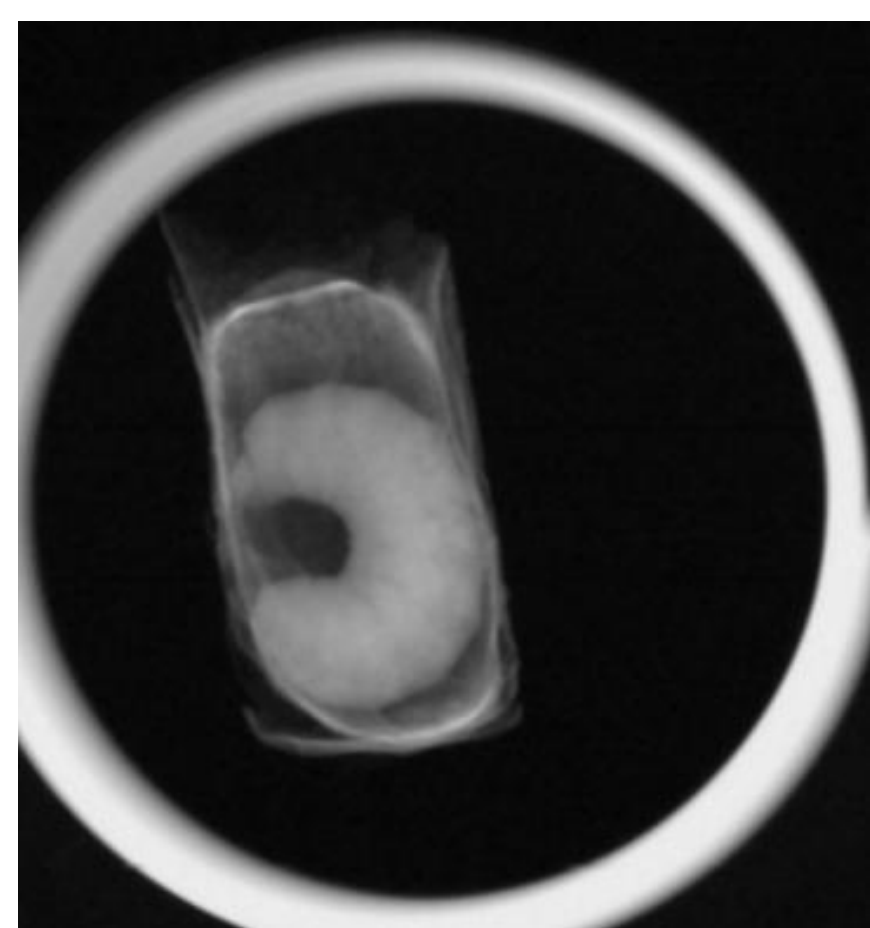


## Background and Introduction

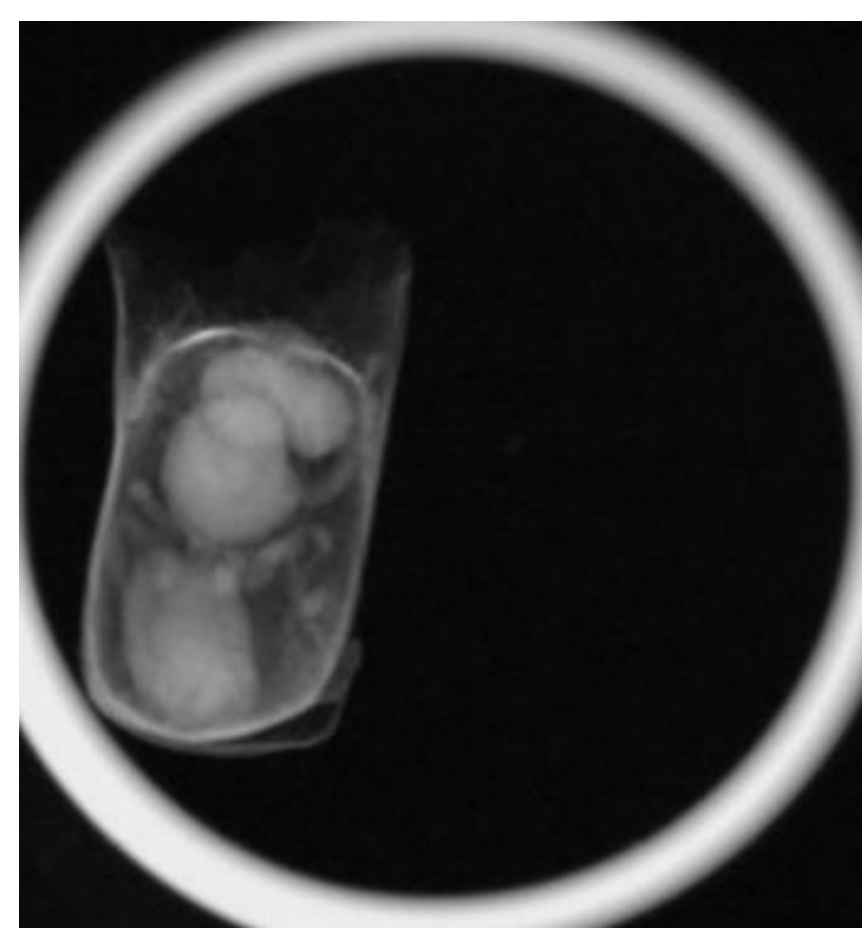
- The Alfalfa Leafcutting Bee, or *Megachile rotundata*, is the most extensively managed solitary bee and is used for alfalfa production.
- Web spinning is a developmental stage when *M. rotundata* spin silk to create a cocoon to continue development before the prepupal stage.



**Diapausers** delay development as prepupa until the next summer.



**Nondiapausers** continue to develop into pupa and then adults.



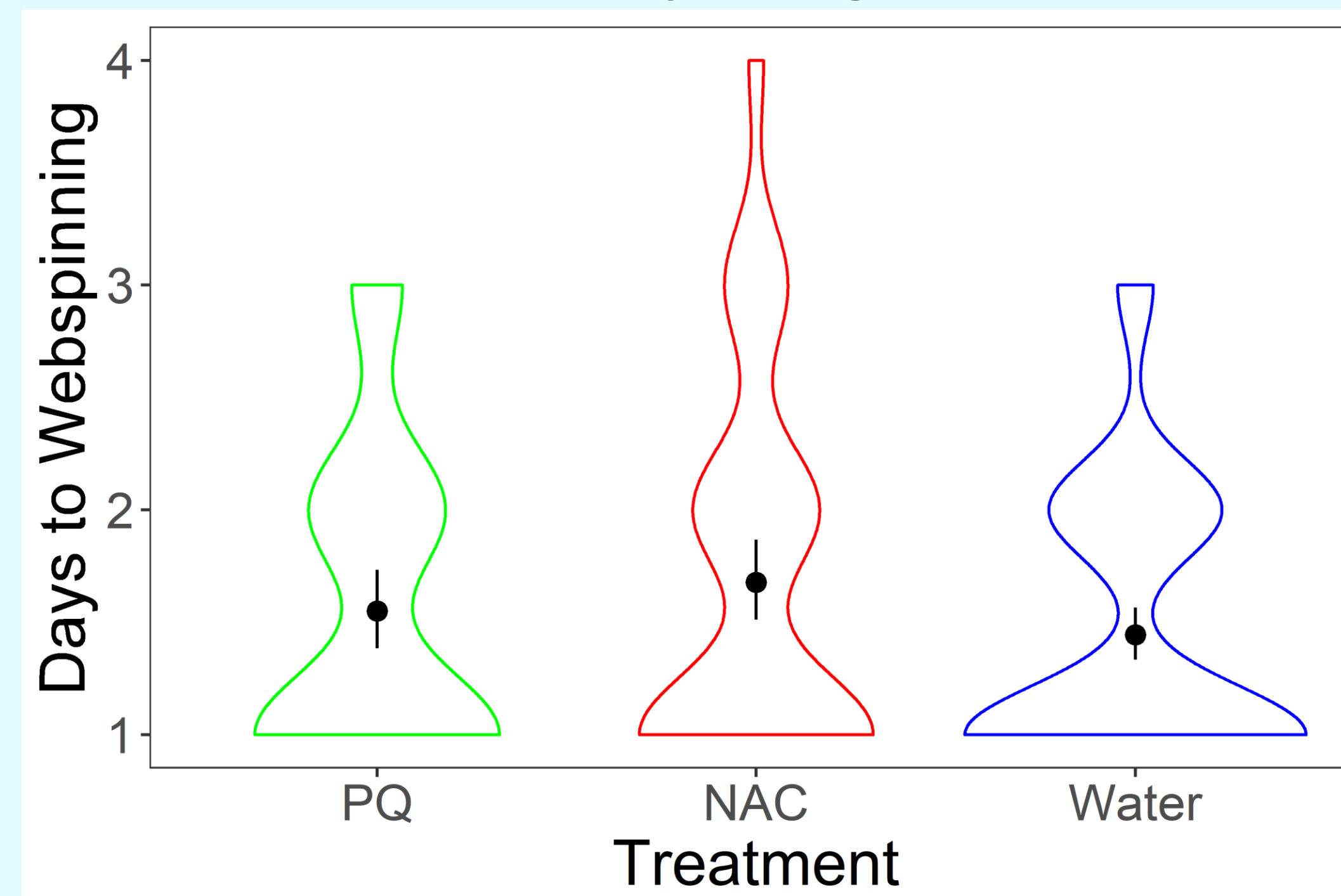
- Oxidative stress is an increase in reactive oxygen species which can damage lipids, proteins, DNA and other complex molecules.
- Previous data suggests oxidative stress delays diapause arousal<sup>1</sup>.

## Hypothesis

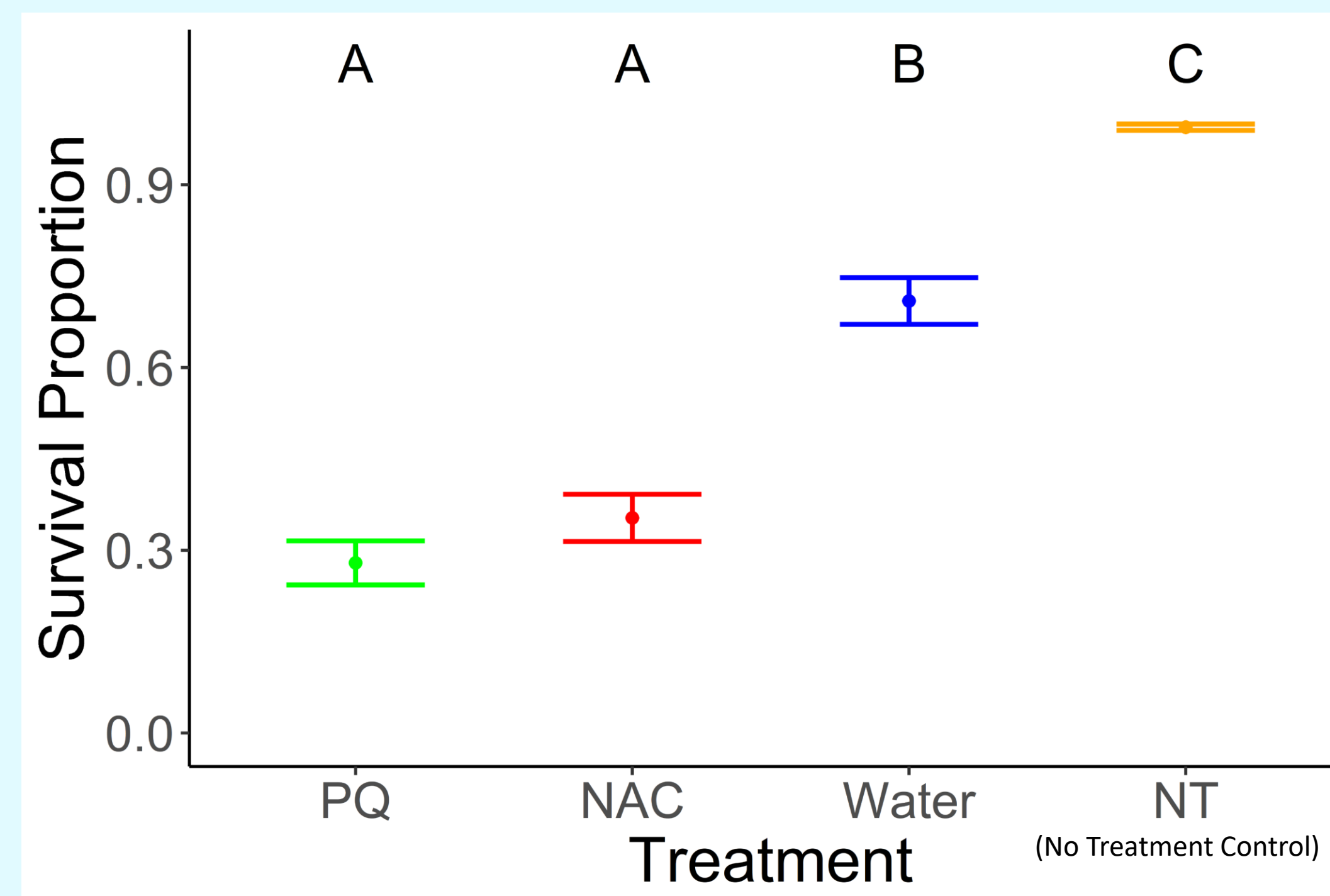
Oxidative stress will prolong time to web spinning and increase diapause instances.

## Results and Conclusions

### Oxidative stress has no effect on time to web spinning



### Treated larvae have decreased survival



### Web spinning

- The data does not support my hypothesis that oxidative stress will prolong time to web spinning (PQ – NAC P = 0.5393, NAC – Water P = 0.0631, Water – PQ P = 0.6363).
- In future research, web spinning could be monitored in intervals in hours instead of days to add more precision in the data.

### Survival

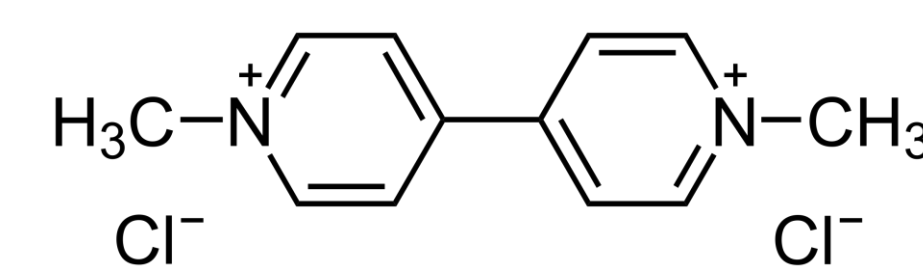
- Survival is significantly different between all treatments (P < 0.001) except PQ and NAC (P = 0.673).
- Survival was significantly different based on collection date (P = 0.00234 & P = 0.04212). This may be because injection skill got better over time, which increased survival.
- Letters A-C indicate significant differences in survival between treatments (Tukey HSD).

### Diapause Instances

- Treatment did not impact diapause instances (P = 1). This may be due to the low number of nondiapausers (n = 4) this year which may have been caused by environmental factors such as drought, temperature and pests.

## Treatments and Methods

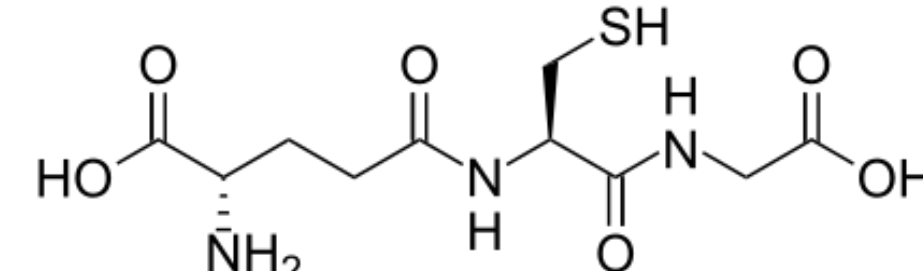
**Paraquat (PQ) is used to increase oxidative stress.**



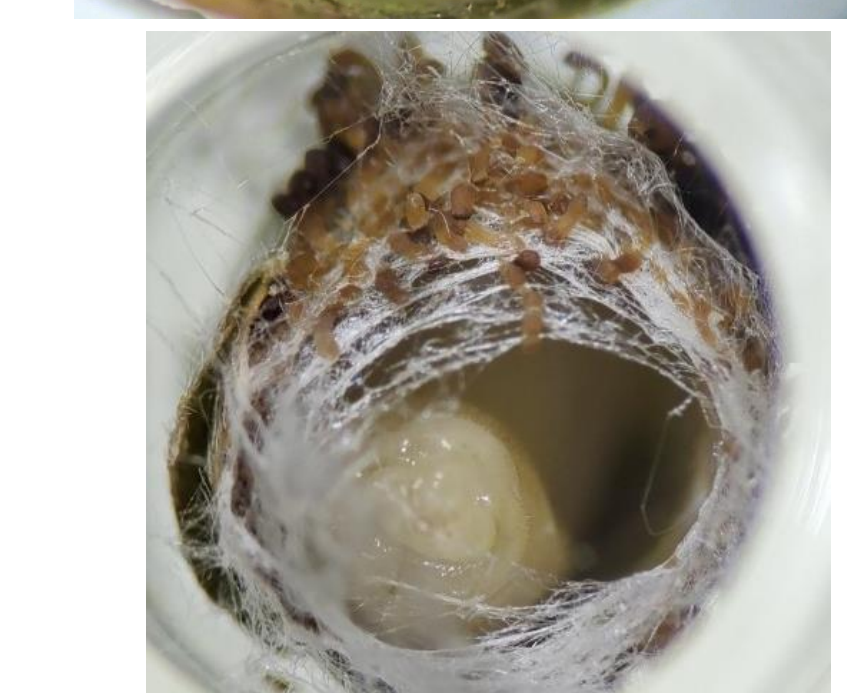
1) Each larva was injected with 0.5  $\mu$ L of PQ (10 $\mu$ g/ $\mu$ L in water), NAC (75 $\mu$ g/ $\mu$ L in water) or water at the beginning of the 5<sup>th</sup> instar.



**NAC (N-Acetyl Cysteine) removes oxidative stress.**



2) The larvae were monitored for web spinning and survival.



3) Diapause state was identified using X-rays and emergence.



Image credit: Nicolas Vereecken