IISAGE 2024 Summer REU

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Project Title: Rates of aging, reactive oxygen species, and their relationship to mitochondrial genome features in ectotherms

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Introduction

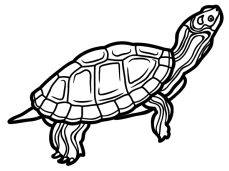
- Gap in knowledge
  - how aging evolves across different species remains limited, especially in ectotherms
  - link between mitochondrial DNA (mtDNA) base composition has been hypothesized to correlate with lifespan, but no such relationship has been found.
- Questions
  - Does mtDNA base composition affect rates of aging in ectotherms?
  - Does temperature affect ROS (reactive oxygen species) production in reptiles (*Chrysemys picta, Salvator merianae, and Thamnophis elegans)*

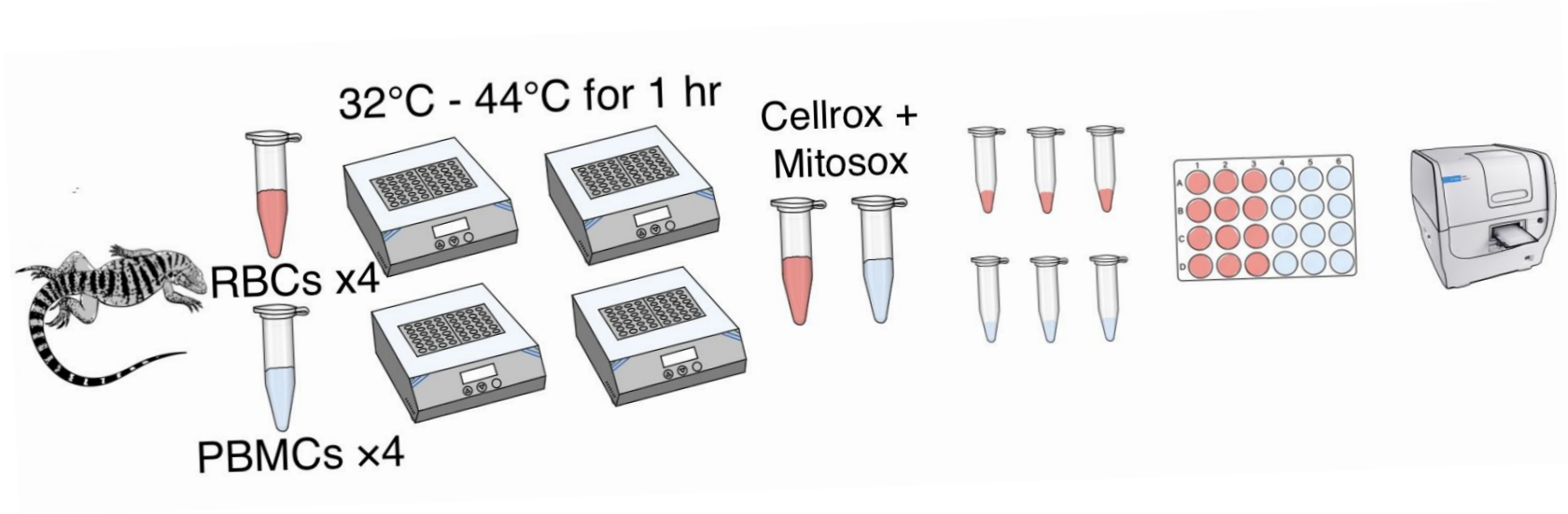
Methods

mtDNA base composition:

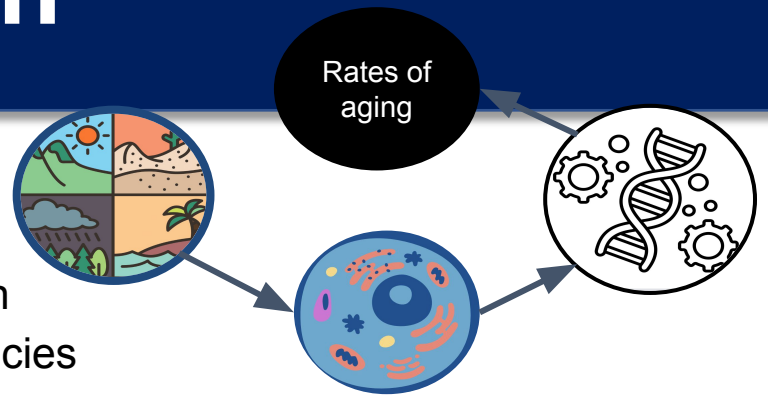
- Download mitochondrial genomes from Reinke et al. 2022 using NCBI's E-utilities.
- Obtain aging rates from Reinke et al. 2022, estimated by the Gompertz slope parameter.
- Produce genome summary statistics using the R package seqinR.
- Perform Pearson's correlation and PGLS to test base composition vs. mean aging rates.

ROS Measurements:





Results and Discussion



- We observed that GC% has a moderate positive correlation with mean rates of aging in ectotherms, even when taking into account the phylogenetic relationships between species
- We also found that increases in temperature resulted in higher production of superoxide (Mitosox fluorogenic dye) for RBCs in *C. picta* and *S. merianae*, and PBMCs in *S. merianae*.

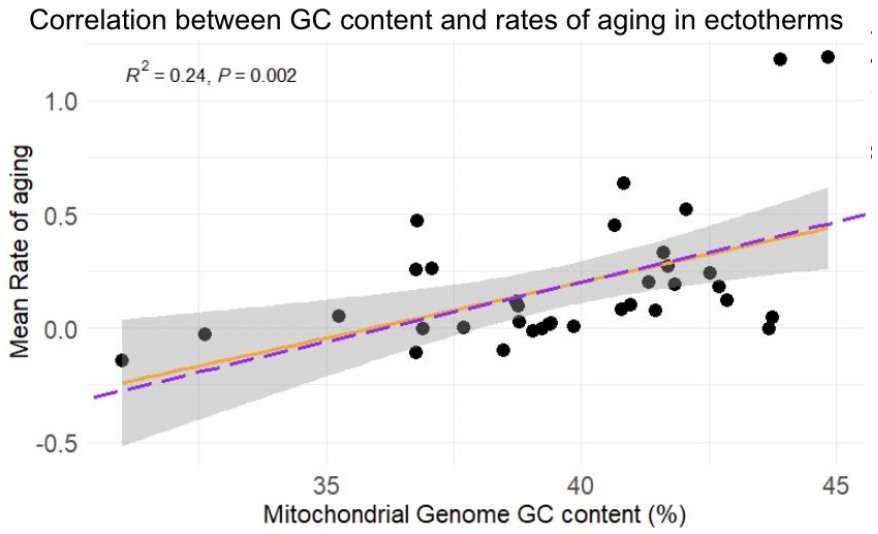


Figure 1: Correlation between GC content and mean rates of aging. Ordinary Least Squares regression line in orange, Phylogenetic Generalized Least Squares presented in purple.

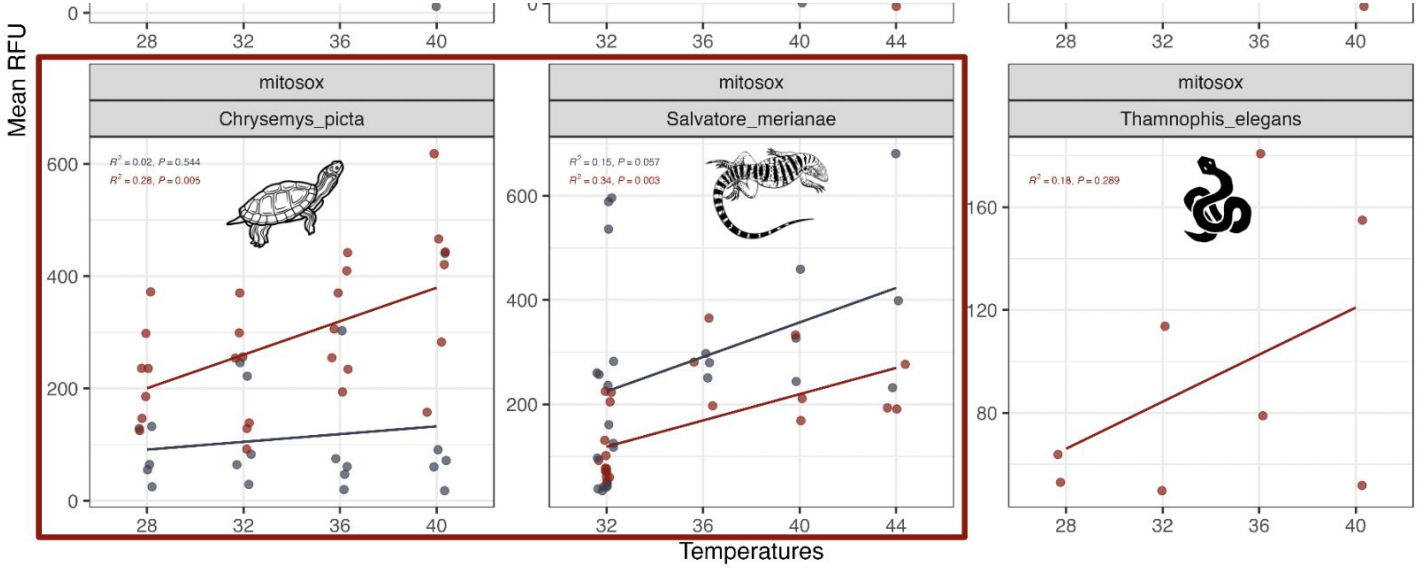


Figure 3: Correlation between temperature and mean Relative Fluorescence units among species. Colors represent different cell types. For T. elegans we used pooled blood. Significant results are indicated by a red box.