Investigating Mitochondrial-Nuclear Genome Interactions in Yeast: Is Fast Growth Linked to Accelerated Aging?

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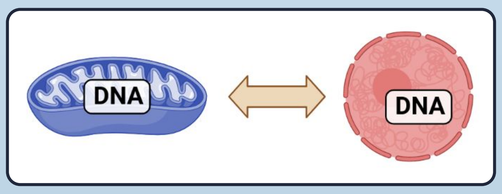
Background

- **Mitochondria evolved from an aerobic prokaryote that was engulfed by a eukaryotic cell.**
- **Mitochondria provide eukaryotic cells with energy and help maintain cellular homeostasis.**
- **Mitochondrial functions are controlled through coordinated interactions between mitochondrial and nuclear genomes (mito-nuclear interactions).**



- **Mitochondrial dysfunction is associated with aging.**
- **Mito-nuclear interactions influence complex traits but their roles in aging is unknown.**

Importance

- **Understanding if there is a genetic basis for aging and why biological aging occurs will make it easier to diagnose and treat aging related diseases.**

Main-Takeaways

- **Nuclear background, mitotype, and mito-nuclear interactions influence aging.**
- **CLS phenotype collection correlates with RLS and can be used to measure aging by observing changes in growth rate.**

Future Directions

- **Determine the optimal CLS aging assay approach.**
- **Phenotype recombinant collection of *S. cerevisiae*.**
- **Conduct GWAS to identify genes associated with with both the mitochondrial genome and longevity.**

Acknowledgments:

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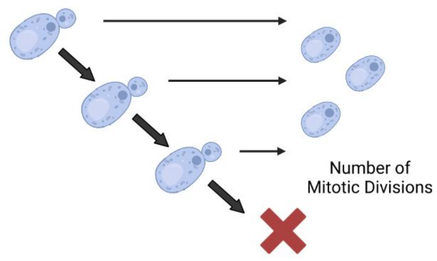
REFERENCES

What are the genetic variants that contribute to aging?

Exploring Various Approaches to Phenotype Collection

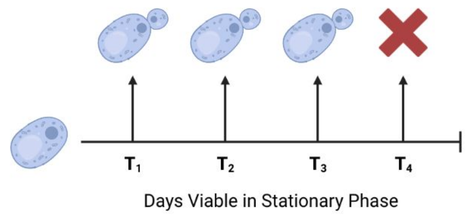
Aging Can be Measured in 2 Ways:

Replicative Lifespan (RLS)

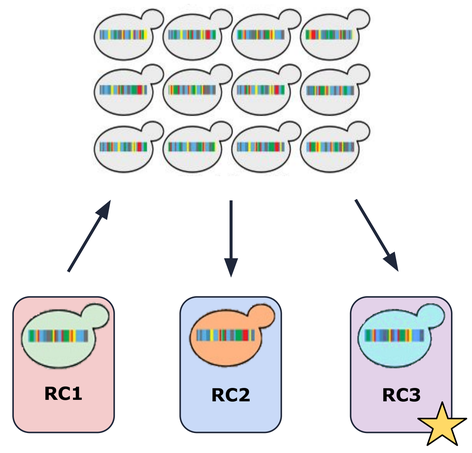


VS

Chronological Lifespan (CLS)



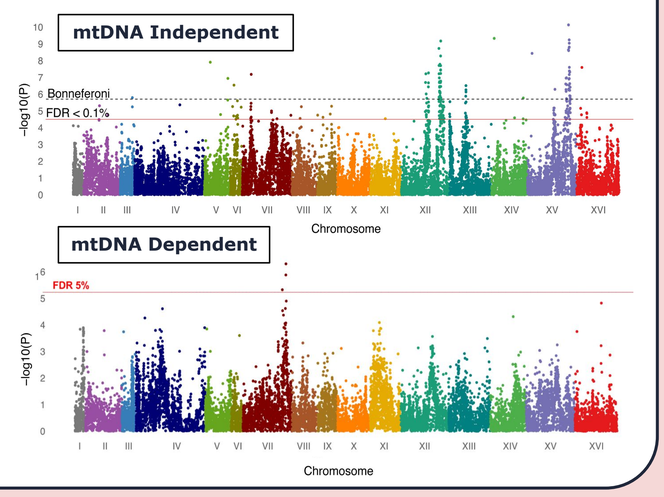
Introduction of Different mtDNAs to ~200 Yeast Strains to Facilitate Mapping of Mito-nuclear Interactions



~850 total strains

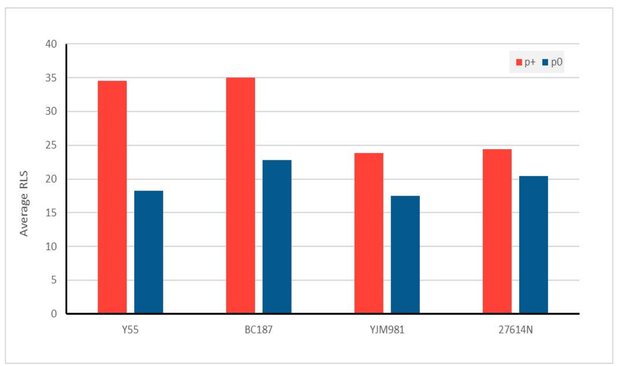
Conduct GWAS to Identify Genes:

Proof of Concept: (Nguyen et al., 2023)



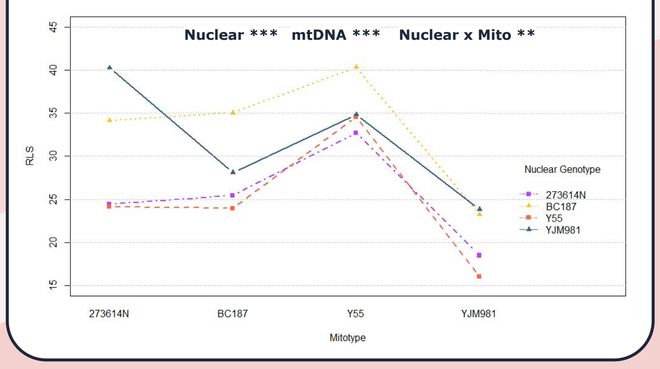
mtDNA Extends Lifespan

RLS aging assays for strains with and without mtDNA

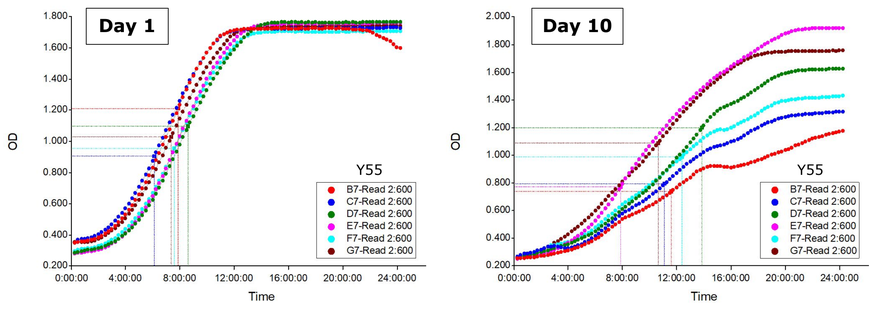


Mito-nuclear interactions Influence Aging

RLS assays were performed for strains with different mtDNAs (4 nuclear x 4 mtDNAs)



CLS Assays Provide a Method for High Throughput Screening



Time at V Max [2:600]	
~7.5 hrs	~11 hrs

RLS Correlates With Growth Rates (more data needed)