ARC (Activity Recording CAFE): A High-Throughput Behavioral Phenomic Assessment Using Machine Vision

Evaluating Phenomics in *Drosophila melanogaster*

Jafari Lab:
Serena Wu, Vivian Pham, Tiffany Nguyen, Corrina Cannell, and Dr. Mahtab Jafari
Screening Lifespan and Healthspan Algorithm

2005-present

100+ Compounds and Botanicals → Mortality / Lifespan → Reproduction / Fecundity

Mechanism ← Locomotion ← Nervous System

- Rhodiola rosea
- Curcumin
- Rosa damascena
- Cinnamon
- Angelica keiskei

Jafari M, Rose MR. Aging Cell 2006;5:17-22
Challenges with Phenomic Assays

Labor Intensive and Not High Throughput

Locomotion Assay
ARC: Automated System

❖ How does this system work?
  ➢ High-resolution machine vision tracks
    ■ *Drosophila* location and movement
    ■ food meniscus level

❖ Advantages
  ➢ replicable and ↓ human error
  ➢ measures multiple behaviors in one assay
ARC Set-up
Live Data Collection

Murphy, K. et al. Nature 2017
Drosophila Populations Tested

Mean Lifespan: Short-lived
31 Days

Mean Lifespan: Long-lived
66 Days

Rutledge GA, et al. Rejuvenation Research 2021
Results: Proof of Concept

Differences in feeding

Caffeine (a stimulant) and haloperidol (a sedative) induced differences in locomotion, sleep and feeding.

Unpublished data
Takeaways & Future Direction

ARC can be used as a platform for pharmaceuticals and natural products phenomic screening in drug discovery.

Optimizing ARC
- Testing additional *Drosophila* populations
- Testing pharmaceuticals
- High throughput phenomics in multi-omics (phenomics, transcriptomics, and metabolomics) natural products drug discovery
Selected References


Collaborators
Ja’s Lab (University of Florida)
Rose Lab (UCI)
Mueller Lab (UCI)

Graduate Students
Scarlet Park (University of Florida)
Kenneth Arnold
Zachary Greenspan