Gitika Gorthi

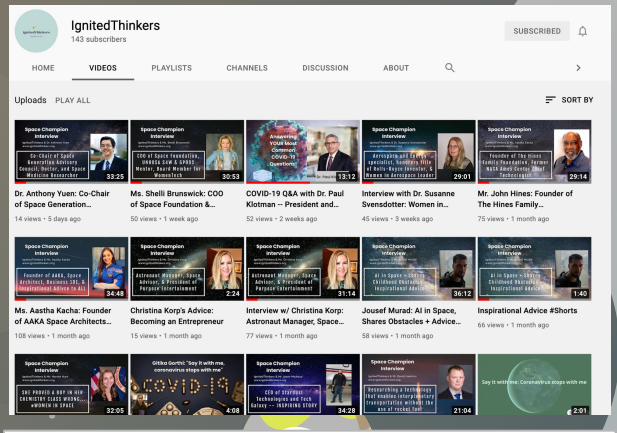
Founder/CEO of IgnitedThinkers

Who Am I?

A NORMAL, TEEN GIRL STUDENT

My first rocket launch

GITIKA GORTHI
Founder/CEO of IgnitedThinkers



www.ignitedthinkers.org
spreadingrocketrytogether@gmail.com

Middle School Rocketry Club

NASA SISTERS Program

Founded IgnitedThinkers

Discovering Aerospace Medicine

- Baylor College of Medicine
- Belgian Nuclear Research Center
- Brown University

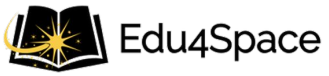
Research

NASA Ames Research Intern

Space Needs to Become **Accessible** to **ALL**

SEDS India

INFINOSCOPE™



Space Career And Leadership Center

Vision for IgnitedThinkers

Space Clubs in Every School

Space Education into Every School Curriculum

Illustrate Diversity

(in workforce, job opportunities, and skill sets)

Break Stereotypes

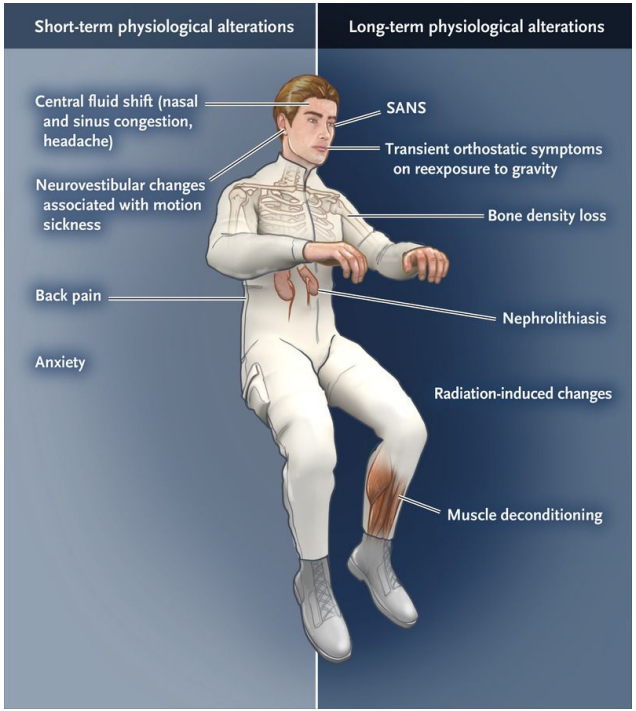
IgnitedThinkers

Inspire, Ignite, & Educate

Aerospace Medicine

Importance of Aerospace Medicine

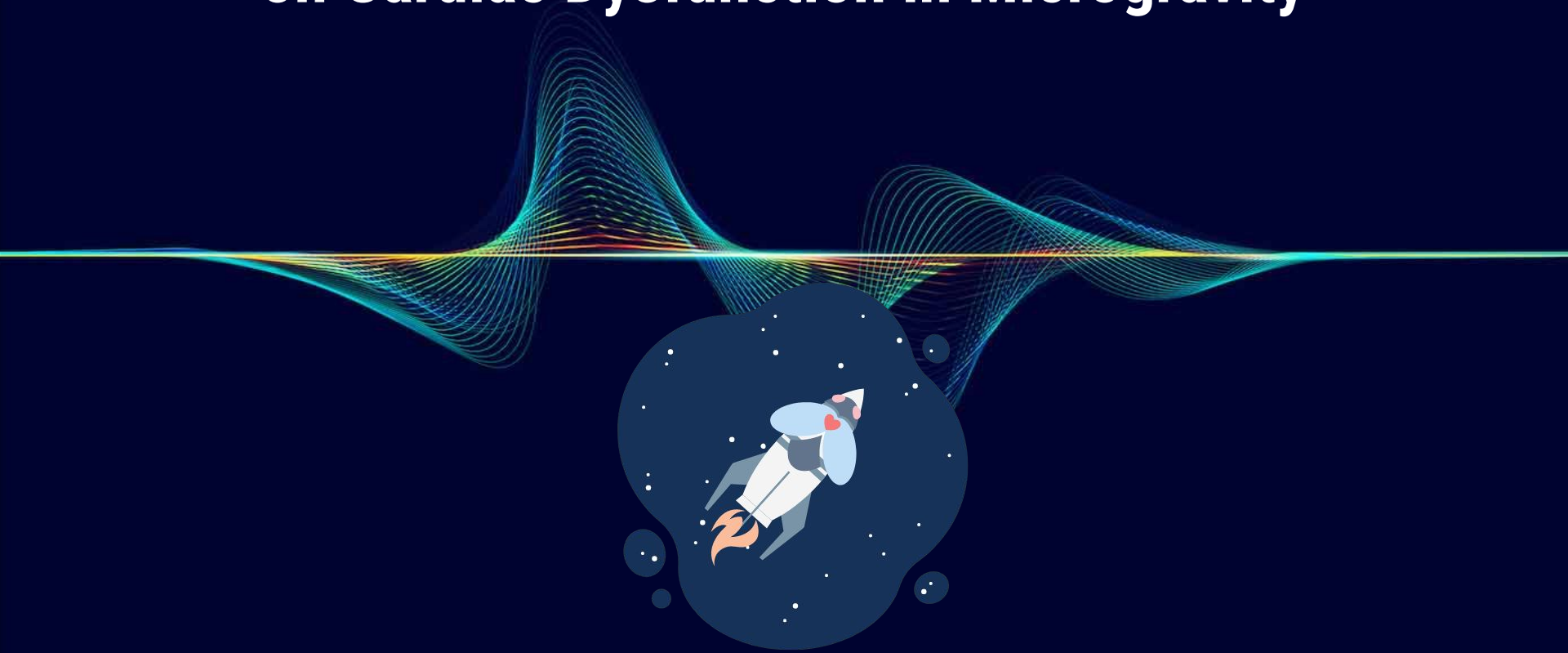
- Protect Astronaut health
- Enables deep-space human space exploration
- Helps us understand human diseases/conditions better



My Research

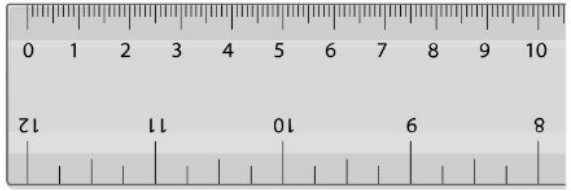
NASA Ames Research Center
GeneLab Intern

Finding the Beat: Analyzing the Role of Actin on Cardiac Dysfunction in Microgravity



Benefits of Studying Drosophila

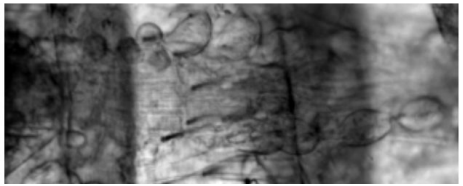
Small Size



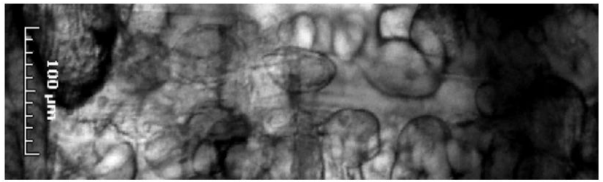
Well-Defined and Conserved Genes

Short Lifespans

1 week fly (~10 years old in human years)



7 week old fly (~70 years old in human years)



K.Ocorr & R.Bodmer

Introduction to Metadata of GLDS–347 Dataset

Organ:

Drosophila Melanogaster Heart Tissue

Test Specimen:

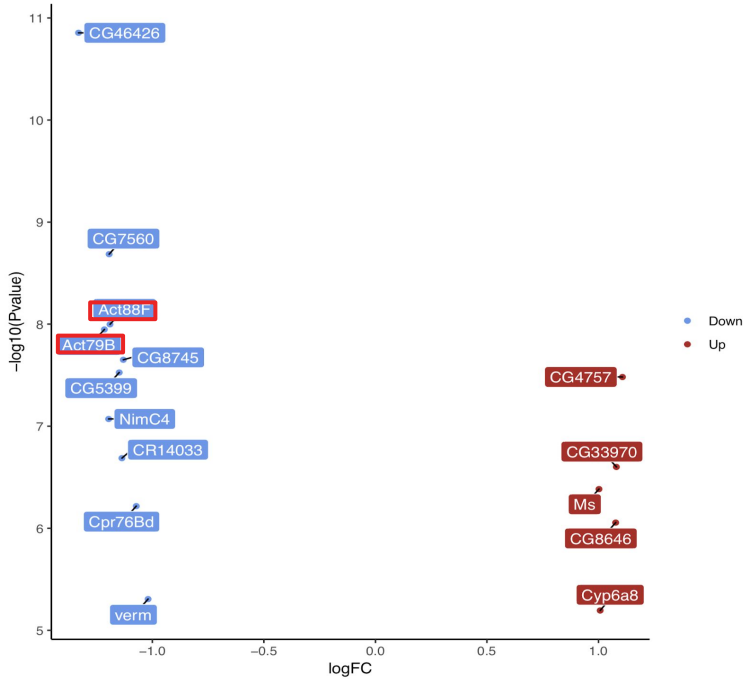
- Canton S wildtype flies (CS)
- K+ channel mutant seizure (SEIZ or sezurets1)

Conditions:

- Vials of flies (10 virgin females & 5 adult males) → new generation
- 30 days of flight in VFB
- Only surviving adult flies were collected upon reentry

Data Analysis – Volcano Plot

Filtered for Significant Adjusted p-Value and FC



GeneID	Base Mean	log2(FC)	StdErr	Wald-Stats	P-value	P-adj	Chromosome	Start Position	End position	Strand	Feature	Gene Name
FBgn0000045	93.6646975	-1.214882104	0.2127525333	-5.710306172	1.13E-08	1.48E-05	3L	21985209	21987190	+	protein_coding	Act79B
FBgn0000047	96.9951563	-1.18983055	0.2076544359	-5.729858573	1.01E-08	1.48E-05	3R	15439968	15442177	+	protein_coding	Act88F

Act88F & Act79B

Genes of Interest

Act88F & Act79B's Role in the Dataset

"Prolonged Exposure to Microgravity Reduces Cardiac Contractility and Initiates Remodeling in Drosophila"

(Walls et al., 2020)

Key Takeaways:

- Genes play a role in cardiac sarcomeric function in Dme
- Orthologs to human ACTB gene

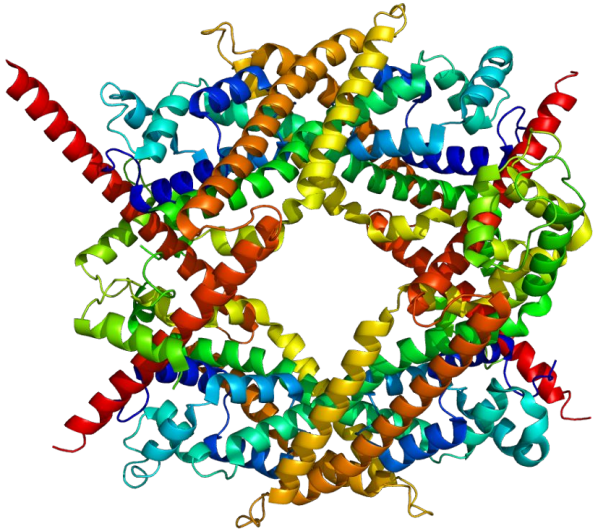
Relation Between Act88F & Act79b

“Absence of the Drosophila Jump Muscle Actin Act79B is Compensated by Up-regulation of Act88F”

Dohn, Tracy E., and Richard M. Cripps. “Absence of the Drosophila Jump Muscle Actin Act79B Is Compensated by up-Regulation of Act88F.” Developmental Dynamics, vol. 247, no. 4, 2018, pp. 642–649., doi:10.1002/dvdy.24616.

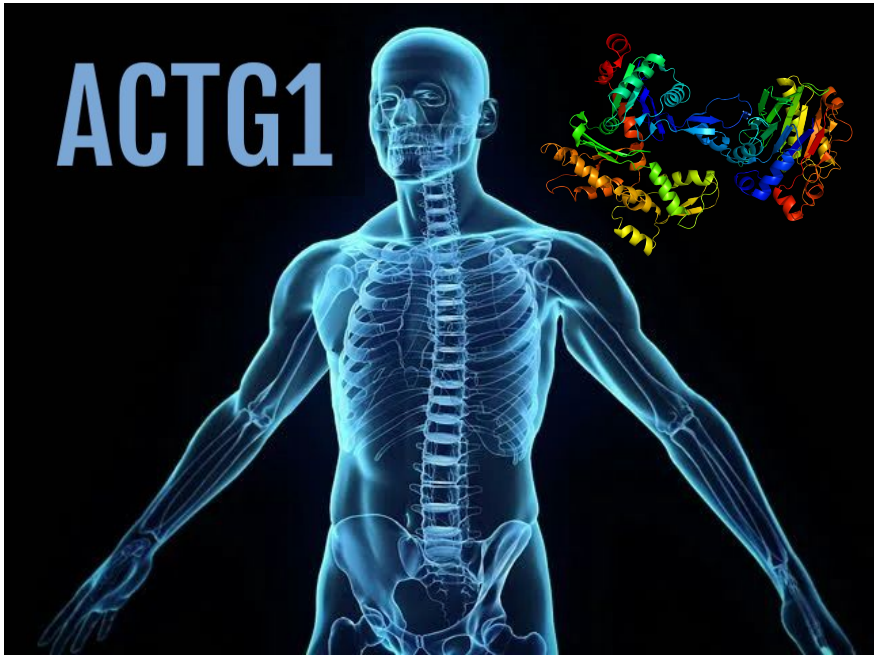
Key Takeaways:

- Act88F compensates for Act79B on Earth
- Act88F can enable jump muscle function itself



Act88F and Act79B are both downregulated in *microgravity*

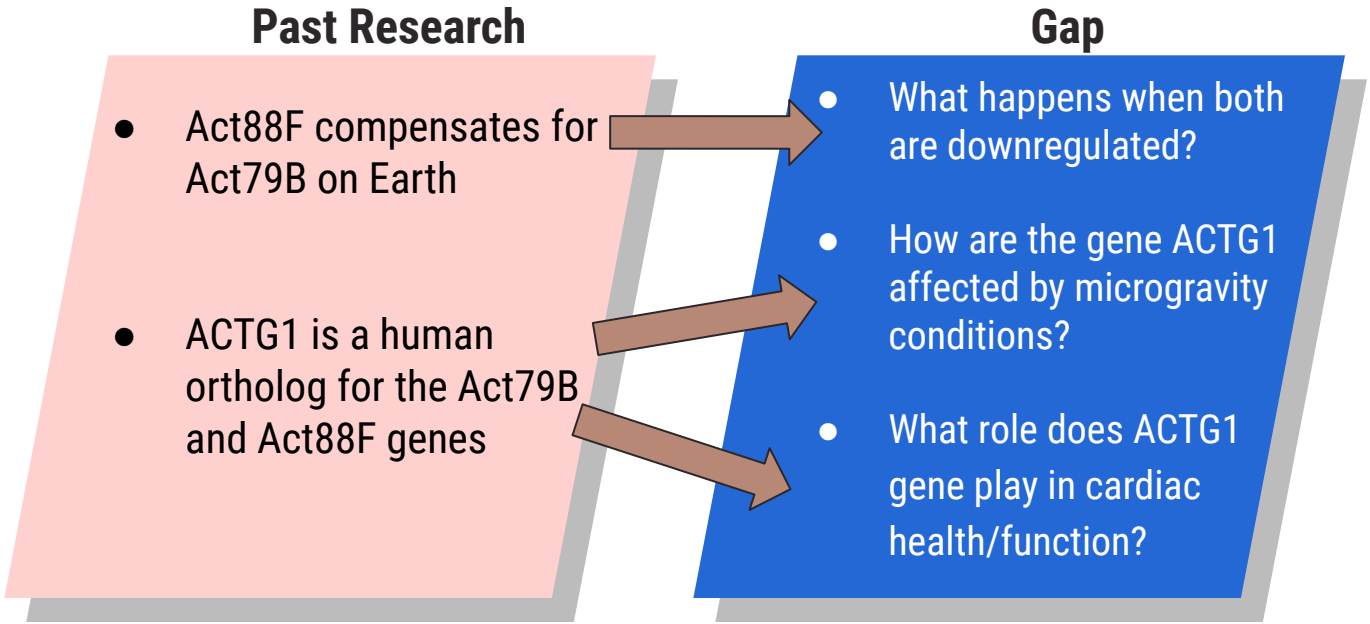
Human Ortholog of Act88F and Act79B



Key Takeaways:

- ACTG1 is the main human paralog
- ACTG1 is related directly to the cardiovascular system

Knowledge Gaps



Hypothesis

Microgravity downregulates the key actin genes Act88F and Act79B, leading to reduced cardiac contractility and impaired cardiac function.

Aim #1

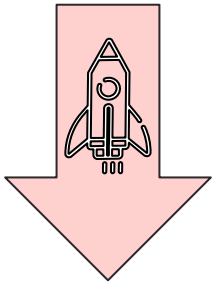
Gap

Only looked at the compensatory relationship between Act88F and Act79B.

Aim

Investigate the effects on contractility caused by downregulation of both Act88F and Act79B that is seen in microgravity environments.

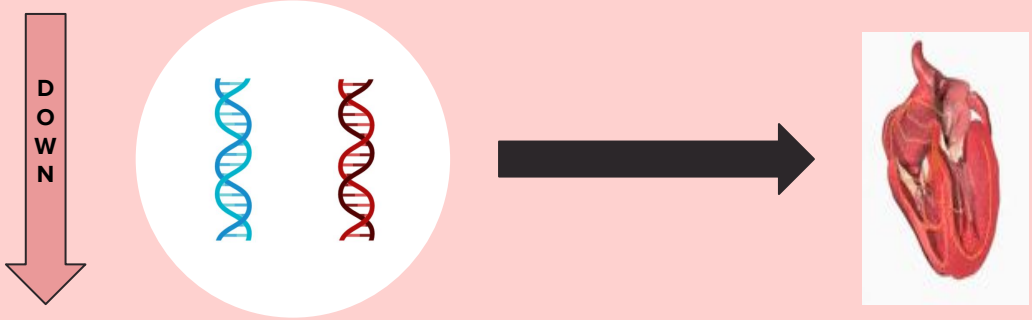
Act88F



Act79B

Aim 1 Expectation

- Less efficient cardiac contractility in Drosophila due to downregulation of the actin genes



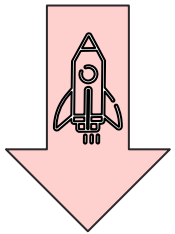
Aim #2

Gap: How is the human ortholog gene ACTG1 affected by microgravity conditions?
What role does the ACTG1 gene play in cardiac health/function?

Part 1

Analyze the effects of microgravity on the ACTG1 gene

ACTG1

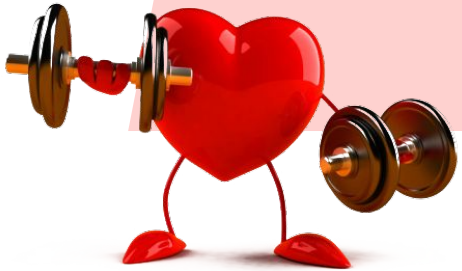


Part 2

Study the implications ACTG1 has on cardiac health

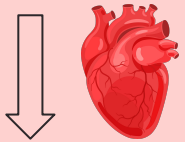
Aim 2 Expectation

- **Part 1**: Downregulation of the ACTG1 gene
- **Part 2**: Detrimental effect to cardiovascular health → Large amounts of cell death

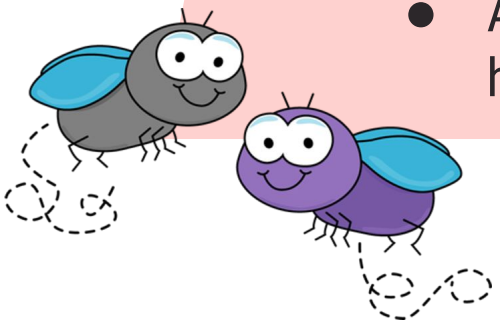


Experiment Overview

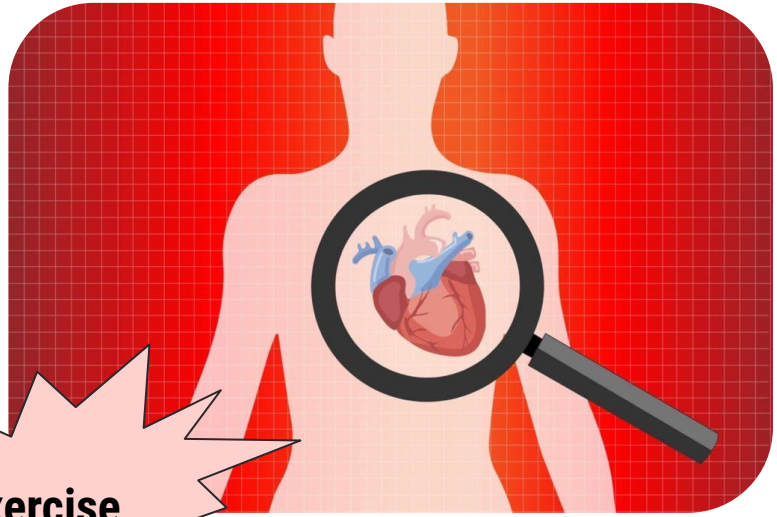
- Further analyze Act88F and Act79B relationship
- Understand impact of down-regulation of Act88F and Act79B on contractility



- Analyze human ortholog ACTG1 for human health applications



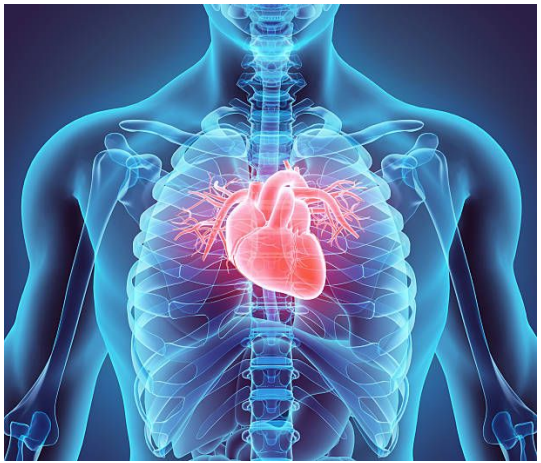
Space & Earth Based Significance of Research



Exercise

Future Studies and Outlook

- Understanding further highly conserved paralogs and homologs
  - ACTB
- Unmasking asymptomatic cardiovascular diseases
- Examine cardiac output in Drosophila and humans



Thank You! Questions?