

ABET Addendum
Team #32 - Kylie Chan

1 - Desired Needs

1. Create lineage-specific network models that will predict graded gene activation levels in response to varied mechanical stress inputs
2. Develop lineage-specific engineered heart tissue models using hiPSC-derived cardiac fibroblasts and cardiomyocytes to generate experimental stretch-response RNA-sequencing data that will inform computational model accuracy.

2 - Major Constraints

1. *Budget* - Cost of quality reagents used in tissue culture and RNA-sequencing.
2. *Time* - Tissues were cultured for 8-10 weeks, infections would restart the process.

3 - Engineering Standards

1. *ISO 13022:2012* - Medical Products containing Viable Human Cells – Application of Risk Management and Requirements for Processing Practices
2. *ASTM F2027* - Standard Guide for Characterization and Testing of Raw or Starting Materials for Tissue-Engineered Medical Products
3. *ASME V&V 40-2018* - Assessing Credibility of Computational Modeling through Verification and Validation for Decision Making

4 - Ethical, Environmental, or Societal Concerns

1. *Ethical* - Computational model predictions may be skewed or not completely biologically relevant to humans because the base model was created based on mice-derived data.
2. *Environmental* - The use of iPSCs in vivo raises the possibility of accidental release or improper disposal of genetically modified biological materials.

5 - Active Teamwork and Leadership

1. The entire team met on a weekly basis with our mentor, Dr. Chris Anderson, to share updates, receive guidance on issues, and determine objectives for the upcoming week.
2. Experimental bench-work responsibilities were shared between 2 students with prior wet-lab experience; computational responsibilities were shared between 3 students.
3. Digital tools including Zotero, Benchling, and GitHub were used for tracking progress.

6 - Motivating Factors

1. I was motivated to work on this project because it would strengthen my understanding of key engineering concepts such as ODE modeling and improve my proficiency with widely used tools like MATLAB, Python, and GitHub, all of which are highly transferable.
2. Our mentor's clear communication about upcoming grant deadlines and manuscript submissions, which depend on the data and progress we produce during work sessions, served as a strong motivating factor.

7 - Innovative and/or Entrepreneurial Ideas

1. The lineage-specific network model could be developed into an interactive web-based platform that could allow users to input experimental parameters and predict gene activation responses and stress-response behavior in cardiac tissue.
2. The experimental model could be adapted to use patient-specific iPSC lines to generate individualized cardiac stress-response profiles, which could inform more targeted therapeutic strategies for conditions such as heart failure.