

Regulated Research Institutional/Industrial Setting Form (1C) Continued

Student's Name(s) Siean Benson

4. Detail the student's role in conducting the research (e.g. data collection, specific procedures performed). Differentiate what the student observed and what the student actually did.

The research Siean conducted was meant to aid laboratory personnel in understanding the benefits of pursuing similar work. As such, she independently conducted the entire experiment. Siean was offered to study the balance of two currents in human ventricular cardiomyocytes *in silico* based off of significant results from a previous experiment in guinea pigs. She performed a literature review before reaching the hypothesis that the results seen in guinea pigs would only hold true for humans to a small extent. She familiarized herself with the O'Hara-Rudy (ORd) model of the human ventricular cardiomyocyte and initially began to modify the code to present only the necessary parameters. In later discussion, I suggested the creation of a means to detect an EAD *in silico* by identifying times of multiple, sequential positive changes in voltage. Siean both implemented and tested her new system to minimize as many false-positives as possible before supplementing it to the ORd model. I helped her in understanding the multiple constraints surrounding the independent variable and she was able to independently assign varying concentrations to achieve these ratios without adversely skewing the outcome of the experiment. Siean built multiple loops to account for these ratios and multiple calcium perturbations before running the simulation and generating data. It seemed evident to both of us to determine whether the human data set was statistically different to the guinea pig data set. After noticing a trend, Siean lastly recommended comparing the human data set to itself and identified a threshold in which cellular stability does not significantly change, surprising us in her eagerness to develop a deeper understanding of these currents.

5. Did the student(s) work on the project as part of a group?
If yes, how many individuals were in the group and who were they (e.g. high school students, graduate students, faculty, professional researchers)?

☐ Yes ☒ No

I attest that the student has conducted the work as indicated above and that any required review and approval by institutional regulatory board (IRB/IACUC/IBC) has been obtained. Copies are attached if applicable.
I further acknowledge that the student will be presenting this work publicly in competition and I have communicated with the student research regarding any requirements for my review and/or restrictions of what is publicized.

Trine Krogh-Madsen

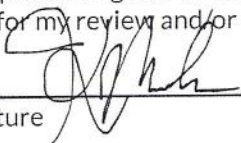
Supervising Adult's Printed Name

Weill Cornell Medical College

Institution

413 E 69th St, New York, NY 10021

Address

Signature 

Assistant Research Professor

Title

8/30/19

Date Signed (must be after experimentation) (mm/dd/yy)

trine.madsen@gmail.com

Email/Phone 212-896-0455

Regulated Research Institutional/Industrial Setting Form (1C)

This form must be completed AFTER experimentation by the adult supervising the student research conducted in a regulated research institution, industrial setting or any work site other than home, school or field.

Student's Name(s) Siean Benson

Title of Project The Role of Delayed Rectifier Potassium Currents in Human Ventricular Cardiomyocyte Arrhythmogenesis

To be completed by the Supervising Adult in the Setting (NOT the Student(s)) after experimentation:

(Responses must be on the form as it is required to be displayed at student's project booth; please do not print double-sided.)

The student(s) conducted research at my work site:

1. Did you or your proxy (e.g. graduate student, postdoc, employee) mentor or provide substantial guidance to the student researcher? ☒ Yes ☐ No
- a. If no, describe your and/or your institution's role with the student researcher and his/her project (e.g. supervised use of equipment on site without ongoing mentorship and sign below.

b. If yes, complete questions 2-5.

2. Is the student's research project a subset of your ongoing research or work? ☒ Yes ☐ No
- Use questions 3, 4 and 5 to detail how the student's project was similar and/or different from ongoing research or work at your site.

3. Describe the independence and creativity with which the student:
- a. developed the hypotheses or engineering goals for the research project

In the first week or so, it was obvious to me that Siean was first very intrigued by previous research on the balance of two ionic currents tested in a guinea pig ventricular cardiomyocyte model. Because of this, Siean was extended the possibility of conducting an *in silico* experiment on the nature of the two ionic currents in human ventricular cardiomyocytes. After a brief literature review, she presented her hypothesis that the original results would be less prominent in the human model due to one current being upregulated in the guinea pig heart.

- b. designed the methodology for his/her research project

With guidance, Siean redesigned a few aspects of a previous methodology to both account for new parameters and streamline the code. She independently modified the model to present only her desired parameters while implementing and testing a means to identify a certain cellular irregularity *in silico* based on changes in voltage. She lastly developed a means to adjust the ratio of the ionic currents being studied despite multiple constraints, such as maintaining a constant baseline action potential duration.

- c. analyzed and interpreted data

Siean conducted multiple statistical tests in order to analyze the data. She uniquely chose to both compare the human ventricular cardiomyocyte data set to itself and to the guinea pig model. She quickly identified that an increase in one of the two currents provided more cellular stability up until a certain threshold, where the cell's resistance to arrhythmogenic behavior did not significantly change. Her last analysis confirmed that the stability seen in the guinea pig model occurs to a smaller extent in humans.

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