Analysis of Glucose Uptake and Doubling Time in Breast Cancer Cells

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Introduction

The Graham Lab utilizes published data depicting 46 individual breast tumor cell lines. The 46 breast tumor cell lines were closely studied to analyze the metabolism of the breast cancer cells. If our research is successful we may help find metabolic vulnerabilities and potential therapeutic targets.

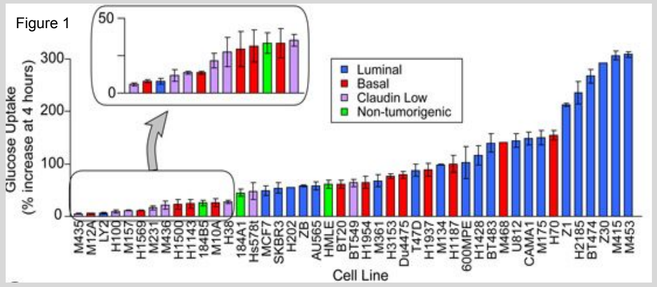

Figure 1: Bar graph with all 46 breast tumor cell lines and their glucose intake after 4 hours. . (Timmerman LA, et al. Cancer Cell. 2013.)

Objective of Research

The objective of my research project in the Graham Lab is to find if there is a significant correlation between the glucose consumption and the doubling time of 46 independently derived breast cell lines. We hypothesize that cells that grow the fastest will consume the most glucose.

Impact of Professor's Research

Through this research, we are increasing the understanding of breast cancer cell metabolism. In addition to increasing understanding, this specific research project can help successfully identify metabolic vulnerabilities in the 46 breast cancer cell lines. Finding a metabolic vulnerability has the potential; to help find therapeutic targets that could help introduce new therapies to more than 75% of invasive breast cancer patients who do not have targeted therapies.

Skills Learned

This summer I learned a variety of things. All of the things I learned have only added to my love for science and engineering as a whole. Through the SHINE Program I was able to:

- Utilize R Software to create a correlation table and a scatter plot using the Gray lab data

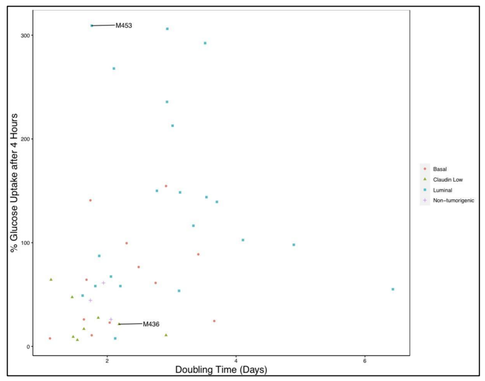

Figure 2: scatter plot created using R Software

Subtype	Correlation Type	Correlation Estimate	p value	N
Basal	Pearson	0.2820	0.375	12
Claudin Low	Pearson	–0.4984	0.209	8
Luminal	Pearson	–0.0737	0.751	21
Non–tumorigenic	Pearson	–0.3844	0.749	3
Basal	Spearman	0.3636	0.245	12
Claudin Low	Spearman	–0.3571	0.385	8
Luminal	Spearman	0.0747	0.748	21
Non–tumorigenic	Spearman	–0.5000	0.667	3

Table 1: correlation table created using R Software

- Completed DataCamp: Intro to R Basics
  - Vectors
  - Matrices
  - Factors
  - Data Frames
  - Lists
- Successfully completed MATLAB training course
- Successfully completed lab safety training
- Successfully completed UNITE-LA WorkForce Readiness program
- Completed LabXchange laboratory simulations that taught me how to pipette and how to run a protein gel

Results

- Upon examination of the cell line metabolism no significant correlations were found in the data.
- Our hypothesis was incorrect
- Cells showed no significant correlation that indicated the cause of growth being caused by amount glucose being consumed.

Next Steps

The next step in research project:

- studying enzymatic regulation of glycolysis in breast cancer cells
- increase enzyme expression levels and metabolomics to quantify the effect on flux through glycolysis
- Test the hypothesis that two specific breast cancer cells with differing glycolysis rate have different regulatory nodes
- Target the enzymes with the most effect on flux to evaluate if they are potential therapeutic targets.

Advice for Future SHINE Students

To future SHINE students:
You have all been granted the amazing opportunity to participate in this program. Remember, this program is only 7 weeks long. 7 weeks might sound like a lot but they will go by fast! Enjoy every moment and take this opportunity to ask for help. This program will allow you to strengthen your abilities and further your goals. Everyone is more than willing to help so do not be afraid to ask for help. This program will give you hands on experience in an exciting way! Enjoy every moment of it!

How This Relates to Your STEM Coursework

My time at SHINE has taught me many things that will help me throughout my academic career.

- Through SHINE I learned how to read scientific literature. This is useful because as someone who wants to become a physician scientist I will need to read scholarly literature throughout my career.
- SHINE taught me how to create an annotated bibliography, I will use this in future. Bibliographies allow people to know where I got my sources from, what my sources are about, and how I used them in my writing.
- I have learned how to use MATLAB and R software. These softwares can be used in classes that use data because I can create tables and graphs that will allow me to create visuals to understand the data.
- I have learned various laboratory skills such as micro pipetting and running a protein gel. These skills will help me in my science class because we run gels and perform many of the skills learned through this simulations.

Acknowledgements

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