

Introduction

- There are about 41,000 new cases of Liver Cancer in 2017 (U.S. Department of Health and Human Services).
- Hyperthermia is a common treatment for Liver Cancer that involves heating the cancerous tumor.
- There is no definite research on what happens to the noncancerous cells surrounding the tumor.
- The Liver and the Kidney have the purpose of filtering within the body.
- The project is designed to determine if hyperthermia is a safe treatment for the noncancerous cells surrounding the cancerous tumor.

Hypothesis

Research Hypothesis: If hyperthermia can kill cancerous liver cells then there will be negative long term effects on the noncancerous cells.
 Null Hypothesis: Hyperthermia will have no effect on the noncancerous cells.

Background

- Hyperthermia is a treatment for liver cancer that is designed to make the tumor more susceptible to chemotherapy (National Cancer Institute).
- The process of Hyperthermia heats the tumor to about 45 degrees Celsius (National Cancer Institute).
- The purpose of the Liver is to detoxify chemicals within your body.
- Liver failure can result in bruising easier than normal.

The Effect of Hyperthermia on Liver Cell Viability

Hypothesis: If hyperthermia can kill cancerous liver cells then there will be negative long term effects on the noncancerous liver cells .

IV: The amount of time the organisms are exposed to heat

Concentration	Control	30 min	1 hour	2 hours
Kidney Cells	4	4	4	4
Zebrafish	No specific trials were conducted due to limits on number of zebrafish			

DV: Cell health and number of dead cells/Zebrafish

Constants: Growth conditions of cells/zebrafish, Temperature the organisms are exposed to

Materials

- Kidney Cells
- MTT assay Reagent
- PBS
- Cell Media
- Hot plate
- Well Plates
- Micropipette tips
- Trypan Blue
- Trypsin

Procedures

Cells:

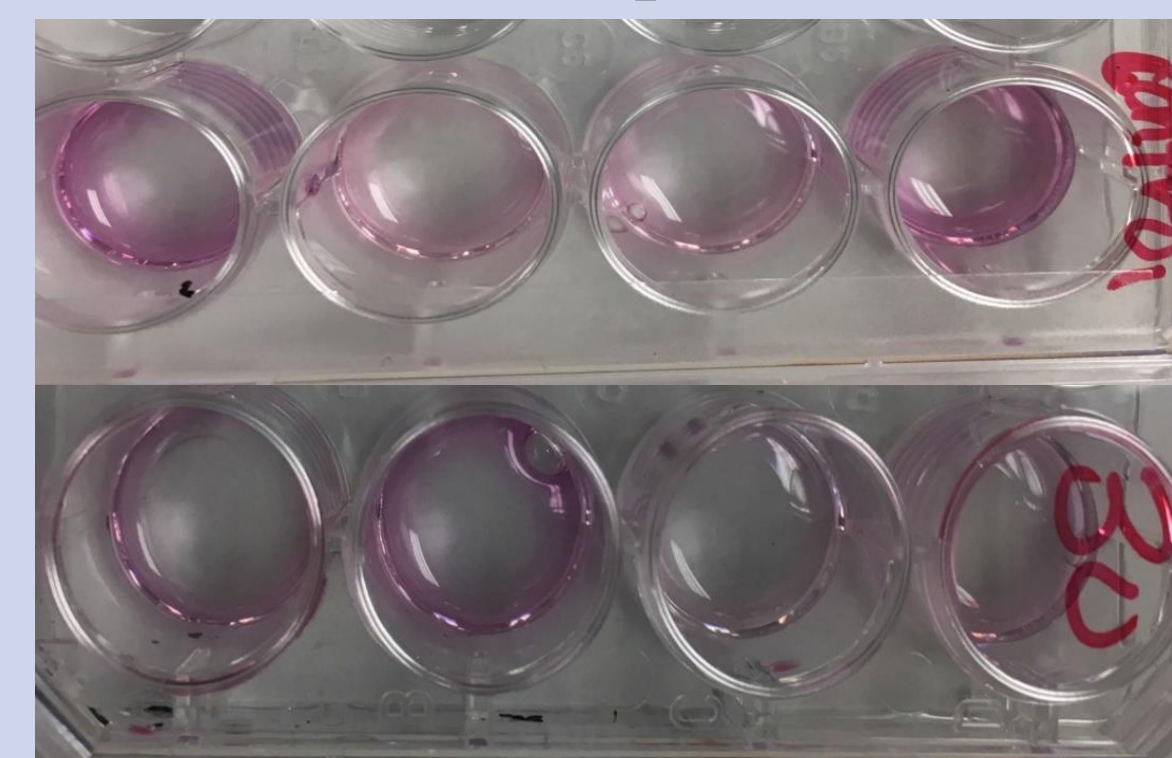
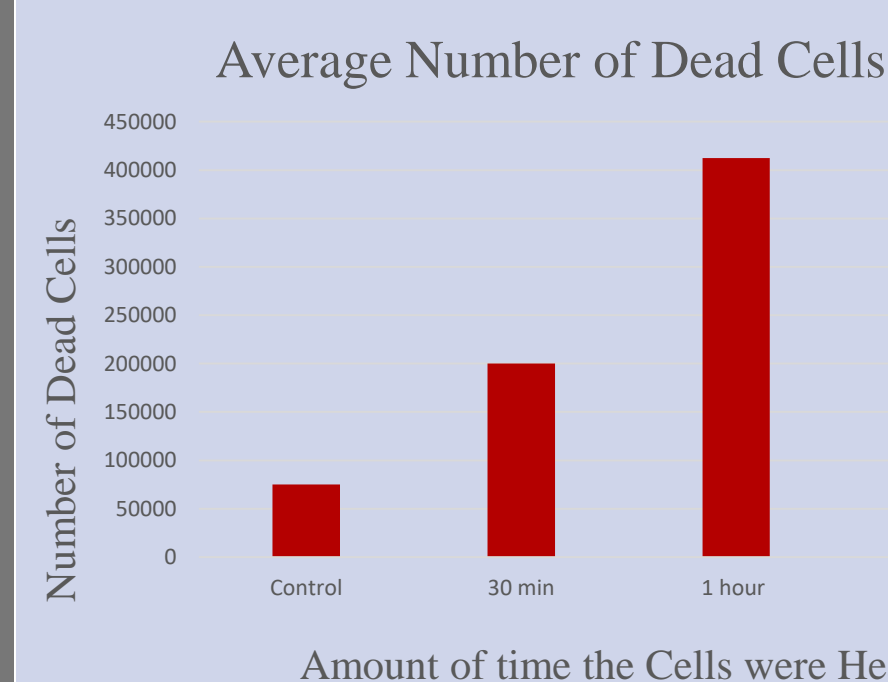
- 1.The cells will be plated
- 2.The cells will be heated for 30 min, 1 hour and, 2 hours
- 3.A MTT Assay will be performed on the cells
- 4.A cell count will be performed on the cells

Zebrafish:

- 1.The eggs will be transferred to Petri dishes
- 2.The eggs will be heated for 30 minutes and 1 hour
- 3.The zebrafish will be examined to determine if they were able to survive.

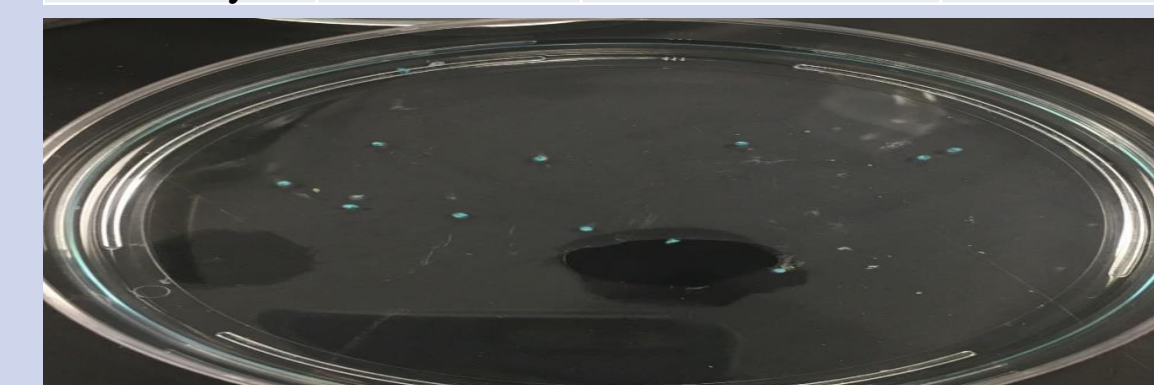
Data Analysis

The data from the zebrafish shows that when heat is applied, if not all close to all of the zebrafish are killed. For the MTT assay data, all of the cells appeared to be healthy. All of the trials had a pinkish purple color to them, including the control. For the cell count, there were low numbers of cells that died. The 1 hour treatment had the highest number of dead cells. An ANOVA test was performed and the P-Value was .0000356.



Life and Mortality of Zebrafish

Treatment	Control	30 min	1 hour
Dead/Alive	Alive	Dead	Dead
How Many	All	12 Dead/1 Alive	All Dead



Conclusion

The results from the zebrafish portion of the experiment show that hyperthermia will have negative effects on the noncancerous cells. This could be because zebrafish are normally kept in 18 degree Celsius water and were heated to 45 degrees. The cell count data showed that very few cells were killed and the MTT Assay revealed that the cells were healthy. This data shows that little to no damage came to the noncancerous cells. The P-Value from the ANOVA test is less than .05 which means that my data is significant.

Future Research/ What I Learned

- For future research I would like to test hyperthermia on Liver cells to see if I was given similar data, and test on Cancerous cells to determine if the heat is sending a signal for the cell to go through apoptosis.
- During hurricane Irma, the power went out at school and all of the cells died. This taught me to adapt to the situation and continue my research with the resources available to me.

Acknowledgements

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Citations

- "Hyperthermia in Cancer Treatment." *National Cancer Institute*. National Cancer Institute, n.d. Web. 18 Apr. 2017.
- U.S. Department of Health and Human services. (2009). *Ablation. What You Need to Know about Liver Cancer*, 15-15. Retrieved March 15, 2017.