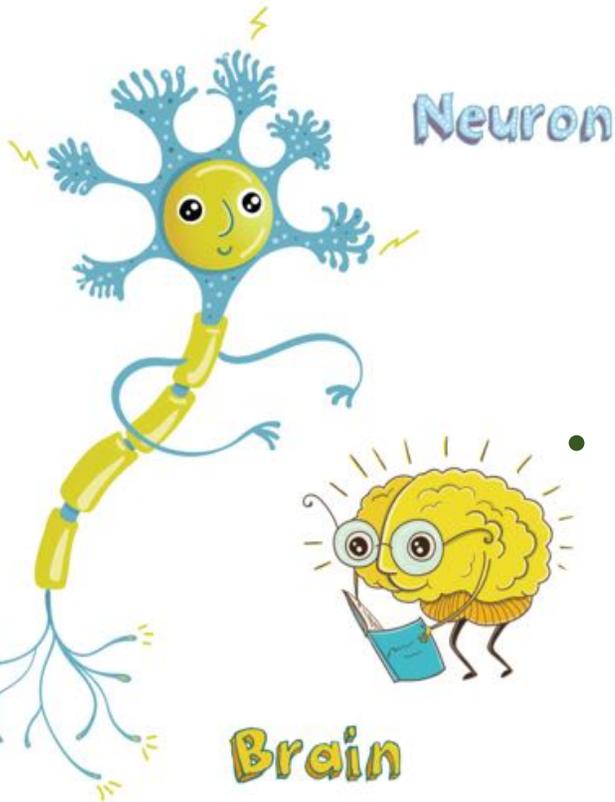


Introduction

- The brain:

- Organ that controls movement, memory, feelings, breathing, hunger, and every process that regulates the body.
- Weights about 3 pounds.
- Contains blood vessels and cells (**neurons** and glia cells).



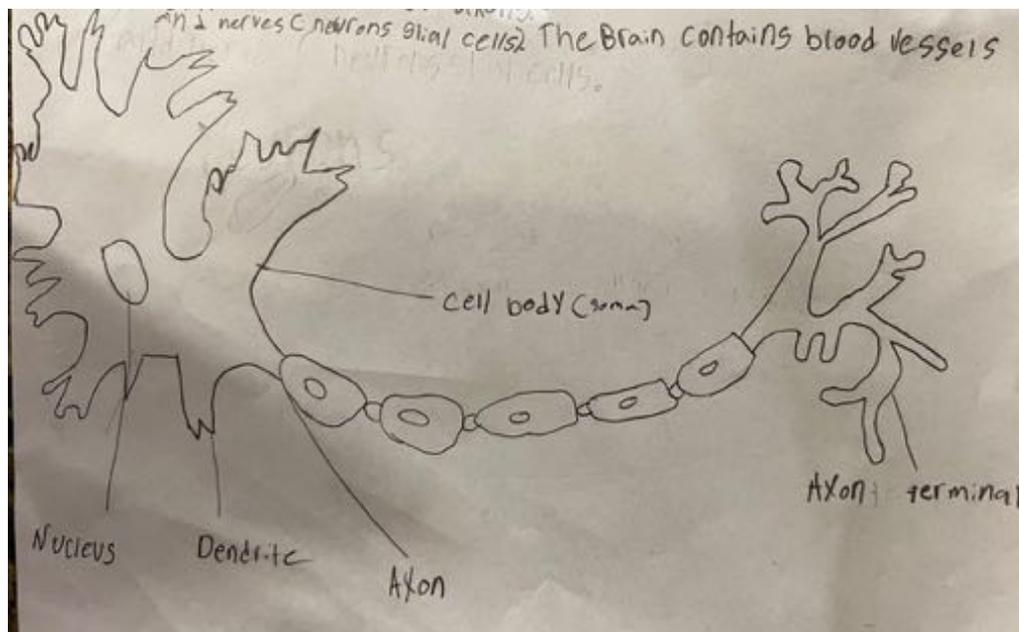
- Gray matter and white matter:

- Gray matter is the darker outer layer of the brain called the cerebral cortex.
 - It plays an important role in memory, thinking and understanding languages.
 - It is made out of neuron bodies called somas.
- The white matter is the lighter part of the brain underneath the cerebral cortex.
 - It is mostly made out of neuron tails called axons.

Introduction

- The neuron:

- Important for the brain and nervous system.
- It delivers messages to the brain and sends signals to other parts of our body.
- There are about 100 billion neurons in the body.
- They have a cell body that has a nucleus, dendrites and the axons.
- They use electrical and chemical signals to send information to the brain and nervous system.

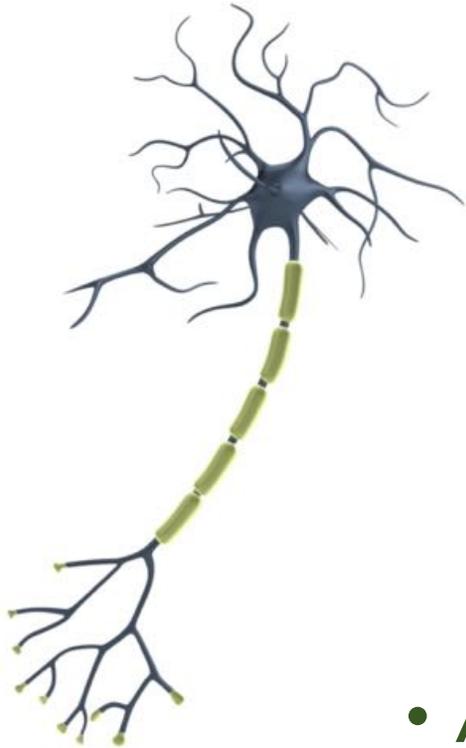


My drawing of a Neuron and its different parts

Introduction

- **Glia cells:**

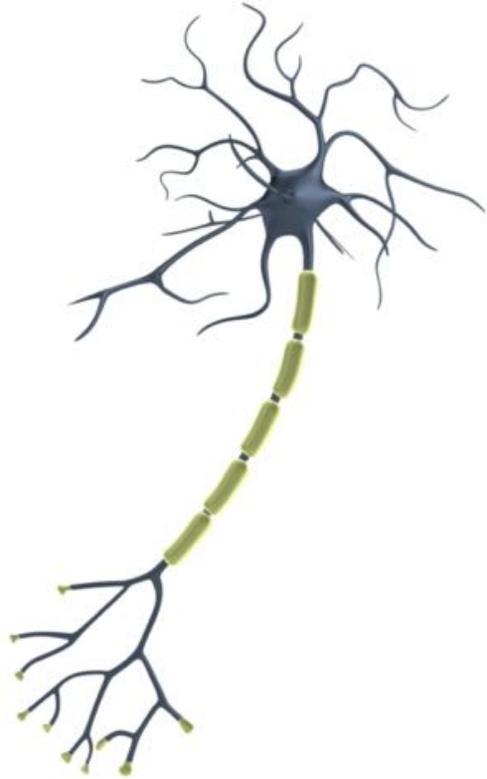
- Cells that are around neurons.
- They provide nutrients and oxygen to the neurons.
- They protect, clean and recycle important chemicals from the neurons.
- Microglia are part of the glia cells group. They remove damaged neurons and take out the junk in the brain. They are also known as the brain's janitors.
- When the brain is sick microglia do not work well and they release hydrogen peroxide.



- **Alzheimer's disease:** is a sickness of the brain that causes people to forget things they have learned.

Introduction

- Important definitions about my research topic:



- **Cytotoxicity** is when something is toxic or bad to the cell.
- **Inflammation** is the response when the body repairs itself after an injury.
- **Neuroinflammation** is an inflammation response in the brain.
- **Oxidative stress** is when an electron gets stolen from a cell by a free radical. That makes holes in the cell membrane and damages the cell.
- **Free radicals** are bad things that cause oxidative stress.
- **Hydrogen peroxide** is a chemical used to clean cuts or scrapes but that is a free radical in the brain. Its chemical formula is H_2O_2 .
- **Sprague Dawley Rat**: is an albino rat with white fur and pink eyes used in medical research because they are calm and easy to use.
- **Neural Basal Medium (NBN)**: solution used to maintain and grow neurons
- **HBSS special buffer solution**: solution made from sodium and glucose. It is used to rinse cells and tissues and to make solutions.



Question/Problem

Question

- How does hydrogen peroxide affect the neuron?

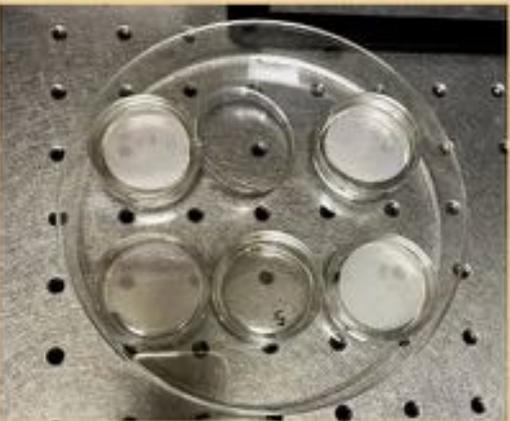
Hypothesis

- I think that hydrogen peroxide is going to damage the neurons because hydrogen peroxide is a bad chemical for the neurons.

Investigative Methods and Procedures

Materials:

- Cortical neurons from a Sprague Dawley Rat
- Hydrogen peroxide solution
- HBSS special buffer solution
- Neural Basal Medium (NBN) solution
- Pipettes
- Corning tubes
- Petri dishes
- Incubator
- Electronic Microscope and 10x microscope
- Lab coat
- Gloves
- Alcohol spray
- Timer



Investigative Methods and Procedures

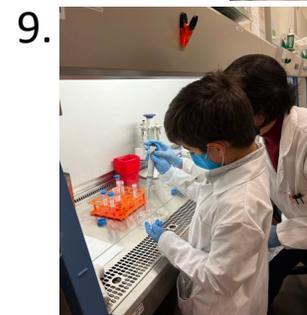
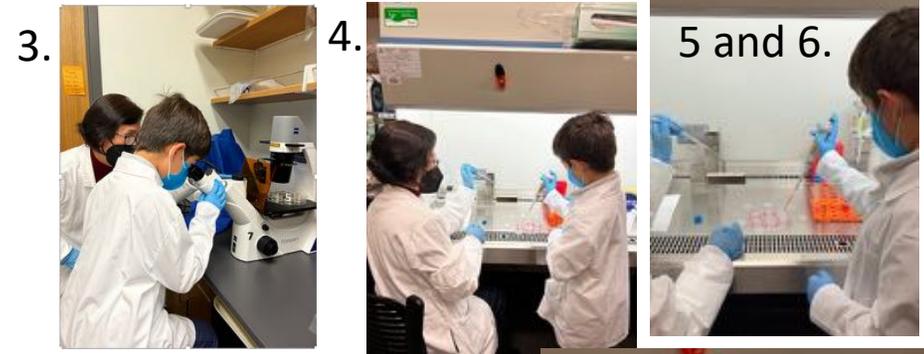
Design and Methodology:

- My experiment was done at the Center for Innovation in Brain Science (CIBS) at the University of Arizona under the guidance and supervision of the scientists Dr. Brinton and Dr. Chen.
- Brain tissue from a Sprague Dawley rat was provided by CIBS.
- Brain tissue was previously obtained by scientists from CIBS for another project that was approved by IACUC.
- I compared a group of neurons treated with hydrogen peroxide (test group) with a group of neurons treated with HBSS special buffer solution (control group).
- Variables
 - Control: Neurons treated with the HBSS special buffer solution.
 - Independent: Neurons treated with hydrogen peroxide
 - Dependent: Shape of the neuron to see if the neurons are damaged or not.

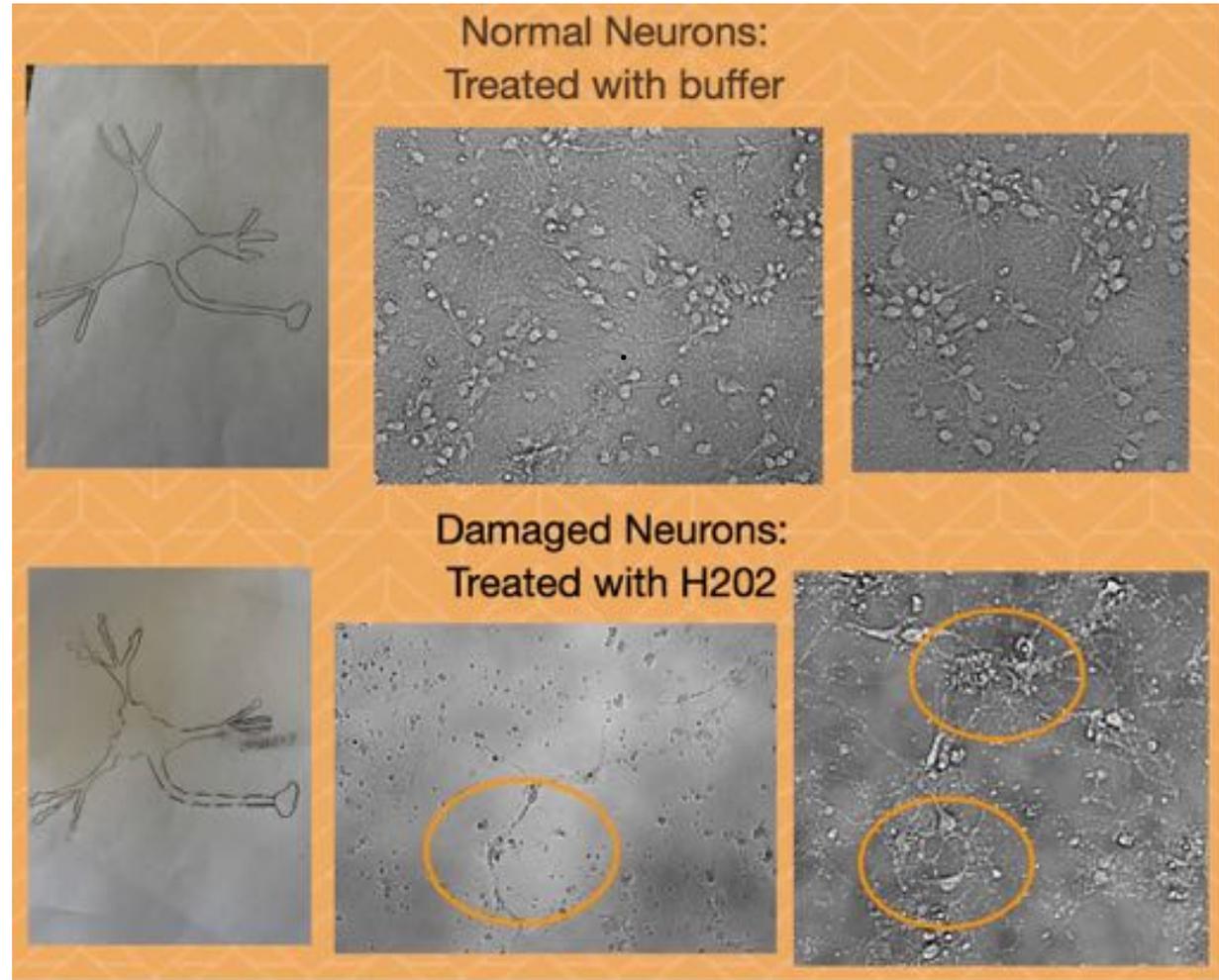
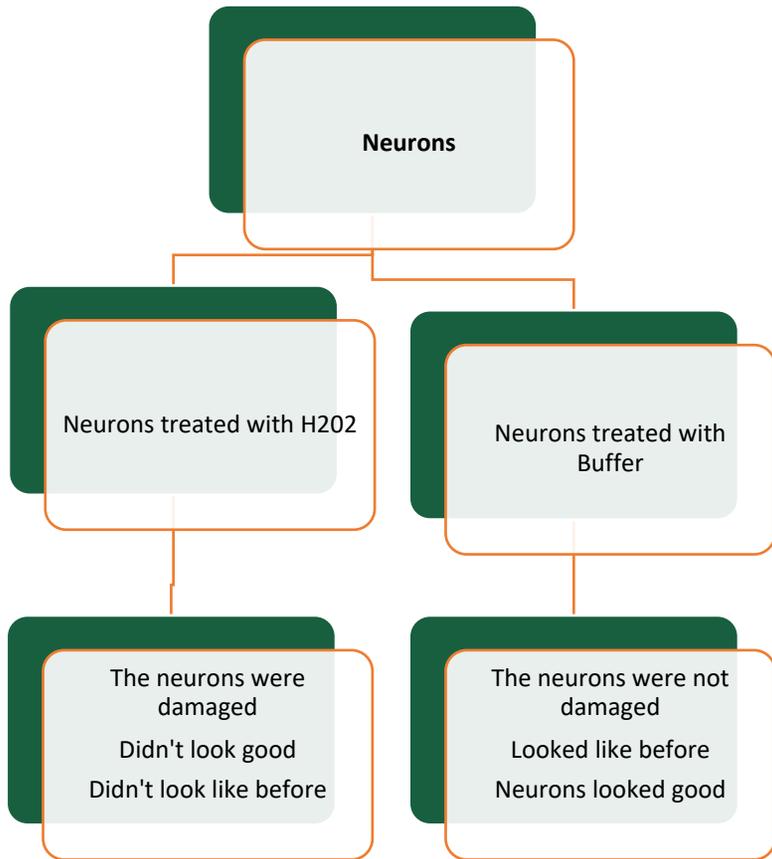
Investigative Methods and Procedures

Procedures:

1. Dr. Chen cultured the neurons for me, in 6 different petri dishes with NBN making sure they were alive and growing well before the experiment.
2. The day of the experiment I prepared the hydrogen peroxide solution with Dr. Chen.
3. Took out neurons from the incubator and viewed them in the microscope.
4. Rinsed the neurons in the 6 petri dishes with the special buffer solution.
5. Treated neurons in 3 of the petri dishes with hydrogen peroxide solution.
6. Treated the neurons in the other 3 petri dishes with buffer solution.
7. Put all the petri dishes back in the incubator for 15 minutes.
8. Suctioned hydrogen peroxide and rinsed neurons with buffer solution.
9. Added fresh medium then put them in the incubator for 24 hours.
10. Took out petri dishes from the incubator and viewed the neurons in the electronic microscope.

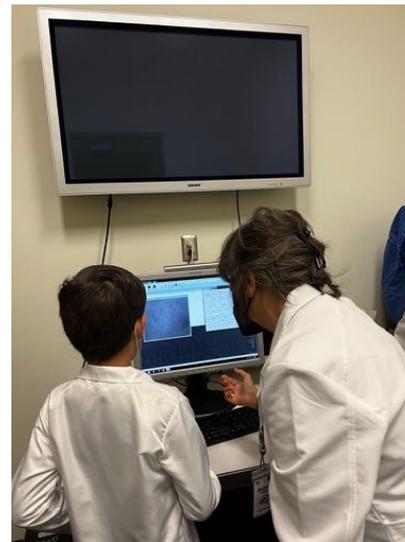


Results



Discussion and Interpretation

- I learned how hydrogen peroxide affects neurons. I was able to prove my hypothesis because the neurons were damaged when I treated them with hydrogen peroxide. The neurons got holes in their membrane and they lost their shape. My results showed me that hydrogen peroxide is bad for the neurons.



Discussion and Interpretation

Important points I learned about my topic are:

- The brain is an organ that controls the body.
- Neurons, microglia, and oligodendrocytes are brain cells.
- Neurons are the most important cell in the brain.
- Microglia are the cells that protect, feed, and clean the neurons.
- When the brain is sick microglia don't work properly and can damage the neurons by releasing free radicals like hydrogen peroxide.
- Free radicals are bad things that cause oxidative stress.
- Oxidative stress causes holes in the cell membrane of the neuron and makes it lose its shape and then it dies.
- Oxidative stress causes neuroinflammation in the brain.
- Neuroinflammation causes diseases in the brain.

Implications

- My experiment shows how free radicals like hydrogen peroxide can damage the neurons.
- In real life, when the brain is sick microglia can release hydrogen peroxide and damage the neurons. When this happens, it causes neuroinflammation in the brain. This can happen in diseases like Alzheimer's.
- I wanted to do an experiment in something about Alzheimer's disease because I want to help my parents find a cure for it. I also like neurons because I learned a little about them in my school's STEM program.
- In the future I would like to treat the neurons with something that will protect them and make them stronger so that diseases like Alzheimer's can be cured.

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- Meet Your Microglia: Your Brain's Overlooked Superheroes
- What Is Inflammation? And Why Does it Matter for Child Development?

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