

The Effect of an Antioxidant Plant Extract in an In-vitro Model of Epilepsy

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Introduction

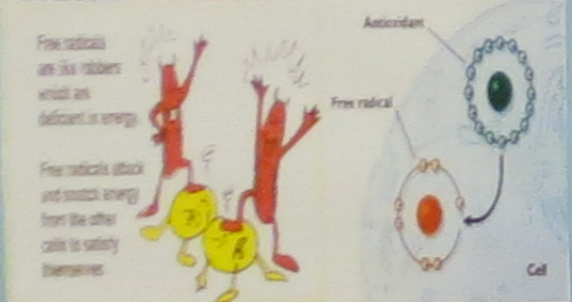
Studies have shown that one in twenty-six people will suffer from epilepsy in their lifetime [3]. Epilepsy is the abnormal synchronized electrical activity that can be recorded in neurons of brain regions such as the hippocampus [3]. In our brain we have what is known as free radicals which are formed every day by the metabolic processes helping our defense mechanisms by neutralizing toxins, protecting the tissues in our bodies against harmful microorganisms, and helping destroy waste products [4]. However, an excess of free radicals can negatively impact us by removing electrons from certain, important molecules in the brain creating a disproportion of ions and a production of excess nitric oxide [4]. The imbalance of nitric oxide contributes to epileptic activity. An antioxidant will be able to provide the electrons needed for the excess free radicals in order to prevent them from "stealing" from other molecules, making them harmless [4]. The antioxidant extract that will be used is known as *Arctium Lappa*, (Burdock) and each part serves a different purpose for example the root increases circulation of blood to the skin surface and detoxify blood [2]. The root also provides antioxidants and antidiabetic compounds. Seeds from this plant provide an anti-inflammatory effect and potential inhibitory effects on the growth of tumors. Leaf extract can inhibit the growth of microorganisms in the mouth and it is used in treating chronic diseases such as cancer [2]. Burdock has been used in many different ways throughout history whether it be culinary or medically.

- Minerals - Calcium: 0mg; Phosphorus: 0mg; Iron: 0mg; Magnesium: 0mg; Sodium: 0mg; Potassium: 0mg; Zinc: 0mg; [1]
- Vitamins - A: 0mg; Thiamine (B1): 0mg; Riboflavin (B2): 0mg; Niacin: 0mg; B6: 0mg; C: 0mg; [1]

If the antioxidant may show positive results we will see a decrease in frequency and amplitude of epileptic-like events, helping patients with this neurological disease known as epilepsy to have a better and healthier life.

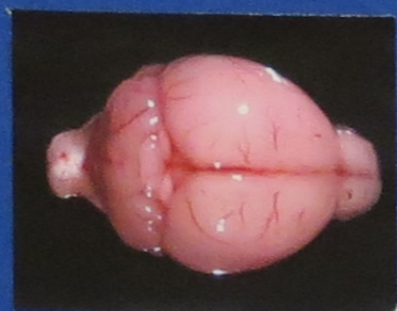


What are Free radicals?



Objective

The goal is to test if the antioxidant extract of *Arctium Lappa* (Burdock) will have a positive effect on epilepsy by decreasing the frequency and/or amplitude of epileptic-like events.



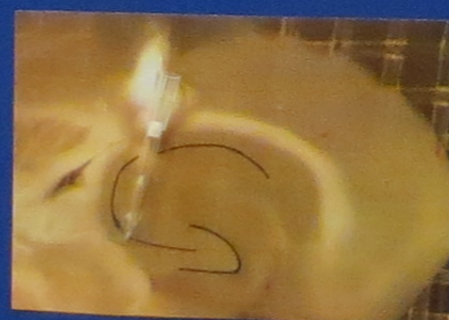
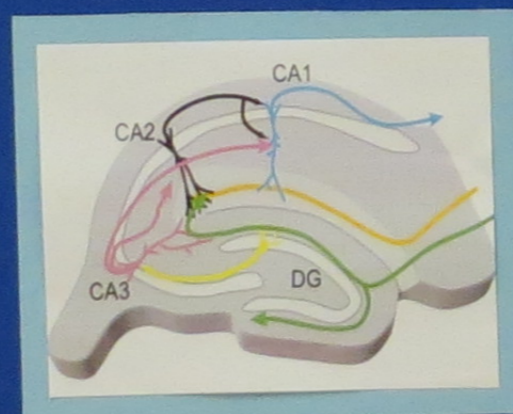
Methods

In-vitro model of epilepsy:

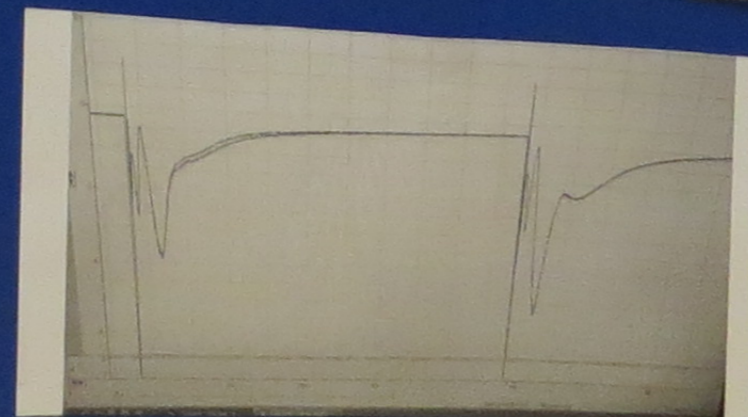
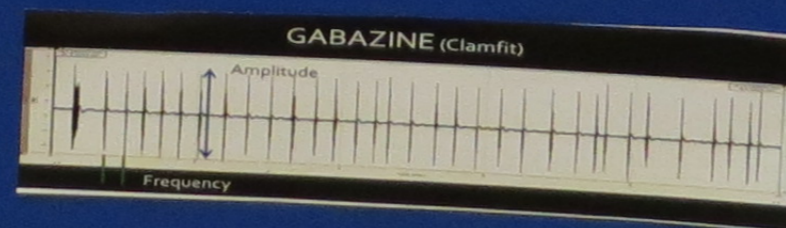
By euthanasing the mice, we will extract the brain and then submerge it in cerebral spinal fluid to mimic the environment of a mouse as if it was alive to record the electrical activity of the neurons. The plate containing the brain will be placed inside the Vibratome, which will be used to obtain hippocampal slices at a thickness of 300 micrometers. After the slices are obtained, we will transfer the hippocampal slices onto an electrophysiological setup, equipped with a stereo microscope to visualize the slices.

These slices are submerged in cerebral spinal fluid and allowed to rest for two hours before being stimulated. By the placement of a stimulating electrode and recording micropipette we can confirm if the slices are healthy, we call this step "control".

In the electrophysiology set up we will proceed to perfuse the slice with Gabazine to induce epilepsy. We will place a recording micropipette in the CA3 region of the hippocampus to record the epileptic-like events. After epilepsy is induced into the slices, the plant extract (Burdock) will be added in the presence of Gabazine. The recording micropipette will be able to record the activity of the neurons using Clampex software by displaying them in a computer. Then by analyzing the results of our experiment we will use software called Clamfit to measure the frequency and amplitude of the epileptic-like events.



Expected results



Beginning this experiment, we will analyze the frequency and amplitude of an epileptic like event. These factors should be notably high before the introduction of the extract of Burdock to our tested brain slices. Due to recent research we believe that Burdock should have positive effects in reducing the intensity of these events due to its antioxidant like properties. After several trials we believe to witness a significant and notable progress with putting a yield on the taking of electrons by free radicals and hopefully dramatically changing the effects of the epileptic like events.

Future work

We will be conducting two experiments weekly using the plant extract Burdock on hippocampal brain slices. During the first two weeks of experimentation we will use different concentration levels of the plant extract (Burdock) determining which is the best level for the purpose of our project.

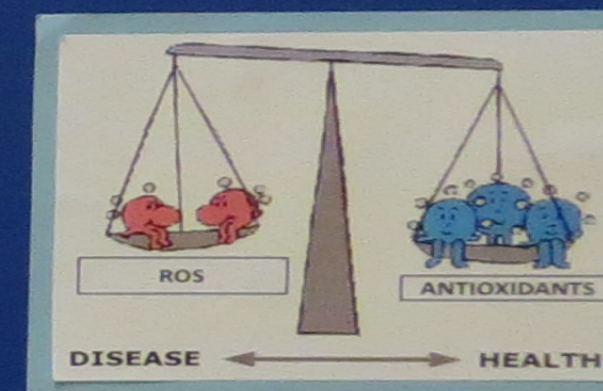
By using the same concentration level, for at least two experiments before changing it, we will ensure that our results and final decided concentration by analyzing our data to insure the effect of the antioxidant.

Each week we will also continue to research further into previous studies and uses for the antioxidant Burdock as well as gathering with Dr. Skouta to better understand the advantages of the antioxidant in normal cells.

Using this research we will practice presenting the information to familiarize ourselves with what we obtained throughout the week, making us more aware and prepared of our grand presentation at the end of the summer.

Once we have established a concentration level for the antioxidant, we will continue onto the next step of our experiment in which we gather and analyze results of the effects of antioxidant plant extract (Burdock) in epilepsy.

Analyzing the results will conclude our experiment in the decrease of epileptic activity due to the use of a plant extract from Burdock and allow us to confidently present any new data or knowledge about how Burdock effects in an epileptic brain for future studies.



References

- [1] *Arctium lappa* Great Burdock, Gobo PFAF Plant Database. (N. d.).
- [2] Chan, Y. (2011, October 19). *A review of the pharmacological effects of Arctium lappa (burdock)*.
- [3] Holland, K. (2014, October 20). *Epilepsy by the Numbers: Facts, Statistics, and You*.
- [4] Kim, B. (2008, June 26). *Making Sense of Free Radicals and Antioxidants*.
- [5] *The CA3 region of the hippocampus: How is it? what is it for? how does it do it?* (2015, February 5)

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