



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

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## Introduction

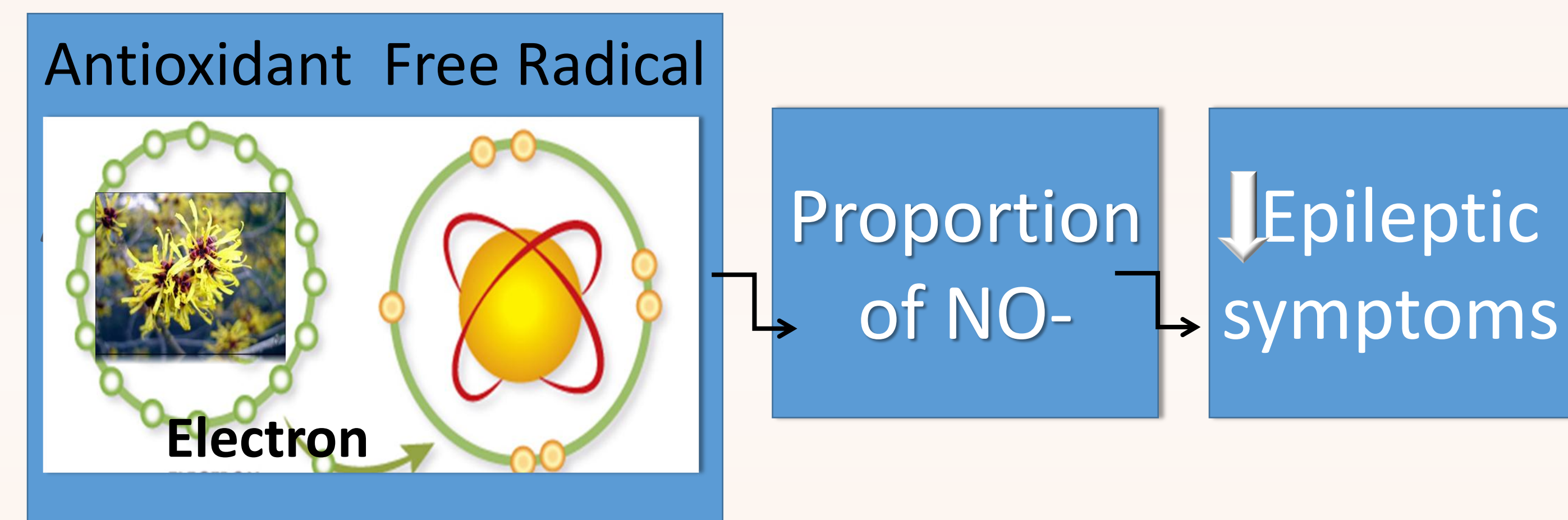
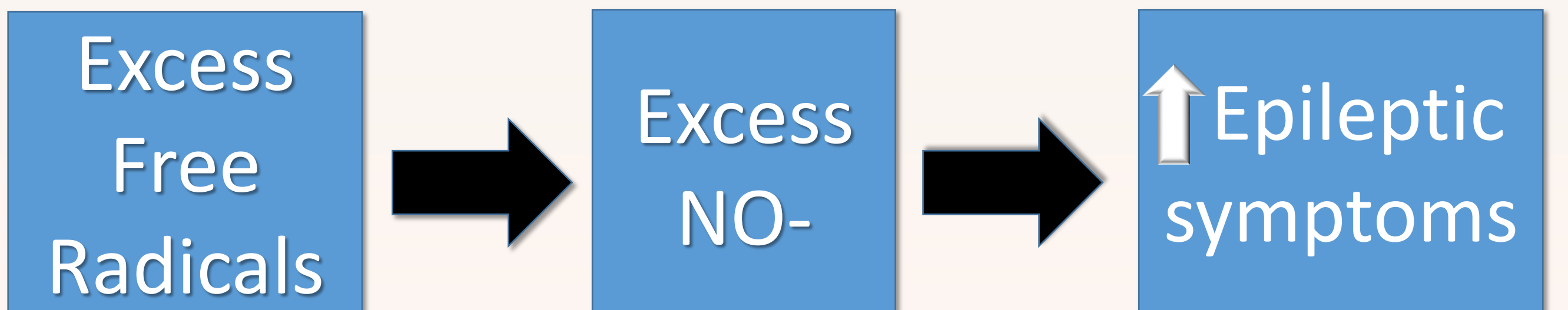
Studies have shown that one in twenty-six people will suffer from epilepsy in their lifetime [1]. Epilepsy is the abnormal synchronized electrical activity that can be recorded in neurons of brain regions such as the hippocampus [1]. In our brain we have what is known as free radicals which are formed every day by the metabolic processes helping our defense mechanisms[2]. 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 [2]. 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 [2].

The antioxidant extract that will be used is known as *Hamamelis Virginiana* (Witch Hazel). Witch hazel can be used for many medical reasons, for instance to help with diarrhea or vomiting blood. It may also be used to help treat more severe conditions such as colds, fevers, tumors, or cancer [3]. When studied, this plant shows to have about 168 (bark) compounds. [4]

We hypothesize that this antioxidant may show positive results on neuronal activity by decreasing the frequency and/or amplitude of epileptic-like events, helping patients with this neurological disease known as epilepsy to have a better and healthier life.



Witch Hazel



Free Radicals are like robbers which are deficient in energy and these attack and snatch energy from the other cells to satisfy themselves.

## Objective

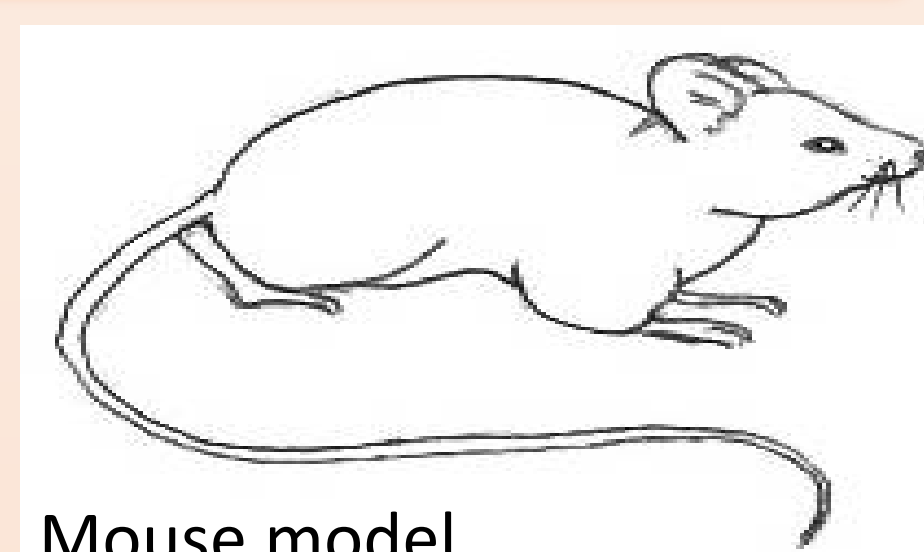
The goal is to test if antioxidant like extract of *Hamamelis Virginiana* (Witch Hazel) will have a positive effect on epilepsy by decreasing the amplitude and/or frequency of epileptic-like events reproduced *in-vitro*.

## Methods

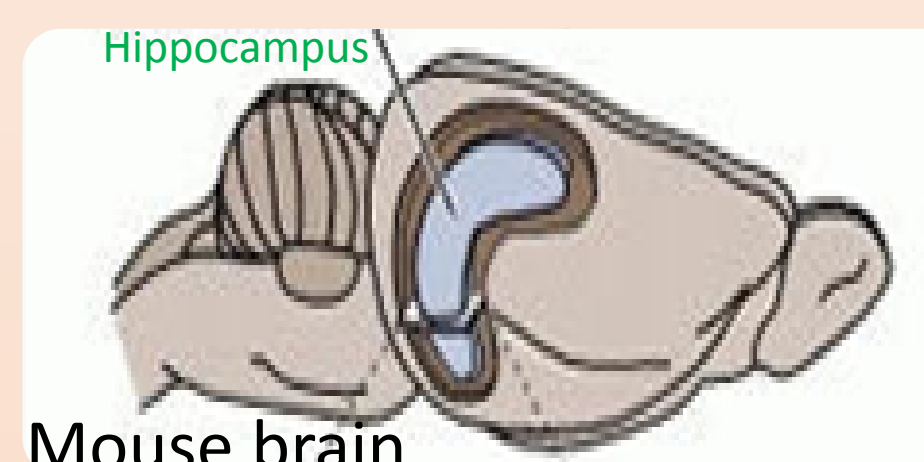
### *In-vitro* model of epilepsy:

We extracted the brain of mice and hippocampal slices were obtained. The slices were placed onto an electrophysiological setup. After a two hour-recovery period, stimulating and recording electrodes were placed on the slices.

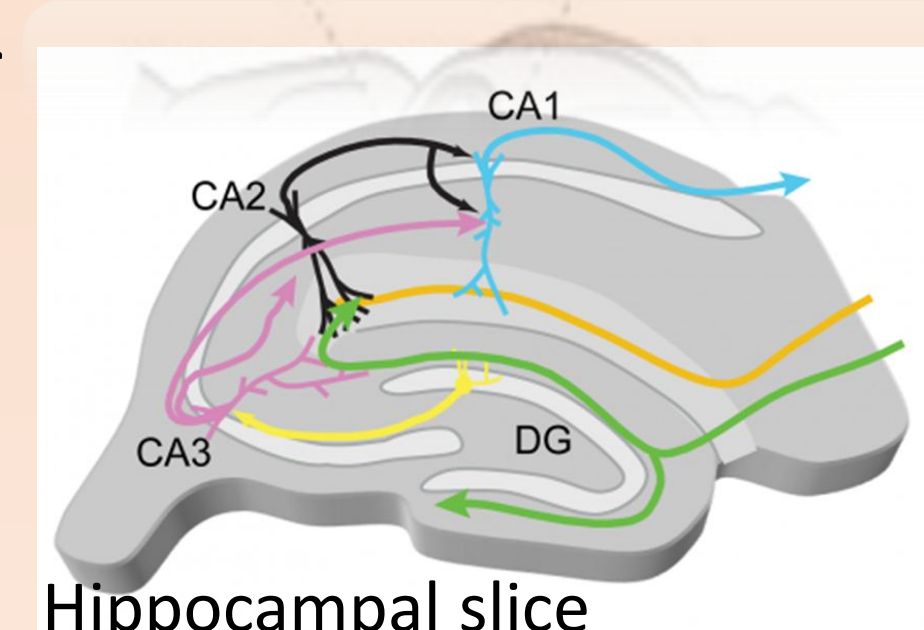
In the electrophysiology set up, the slices were perfused with 10  $\mu$ M of Gabazine, a GABA<sub>A</sub> receptor antagonist, to induce epilepsy. We placed a recording micropipette in the CA3 region of the hippocampus to record the epileptic-like events because it is where the most intense epileptic activity has been seen [5]. Then, the plant extract (Witch Hazel) was added in the presence of Gabazine, the neuronal epileptic activity was evaluated.



Mouse model



Hippocampus



Mouse brain



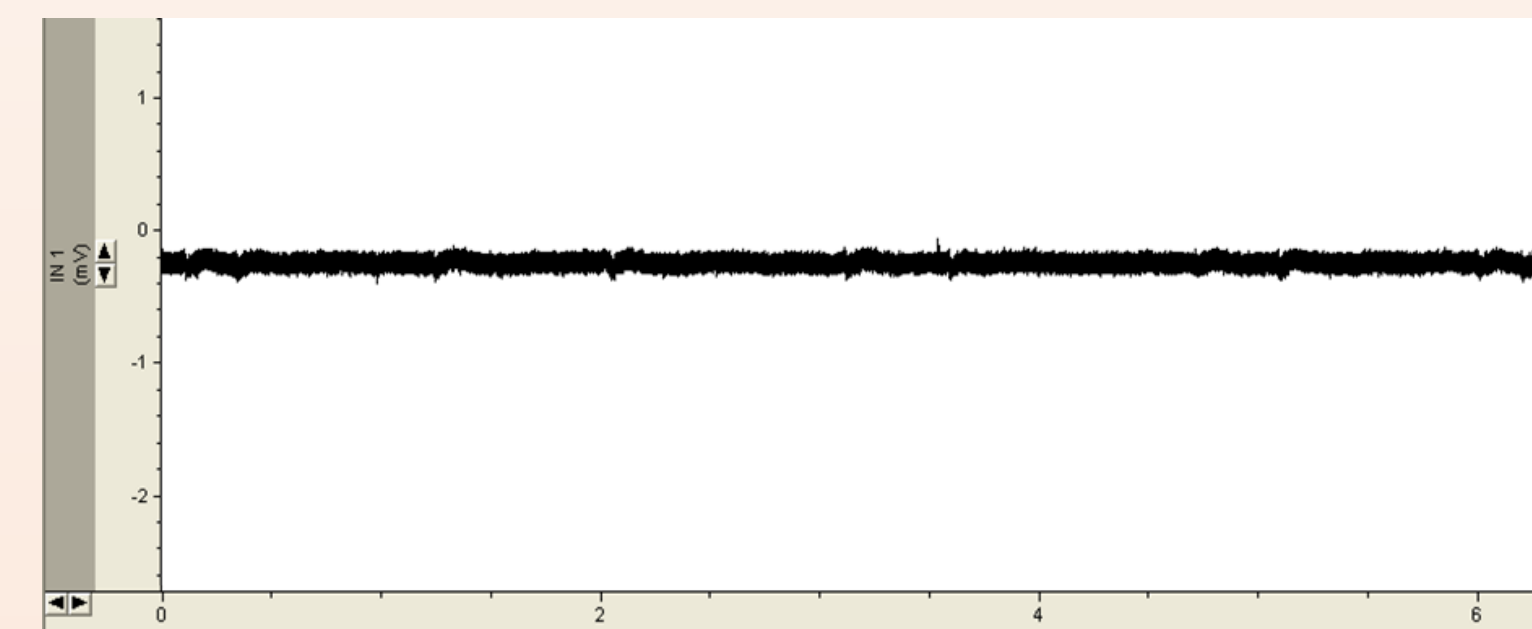
Hippocampal slice



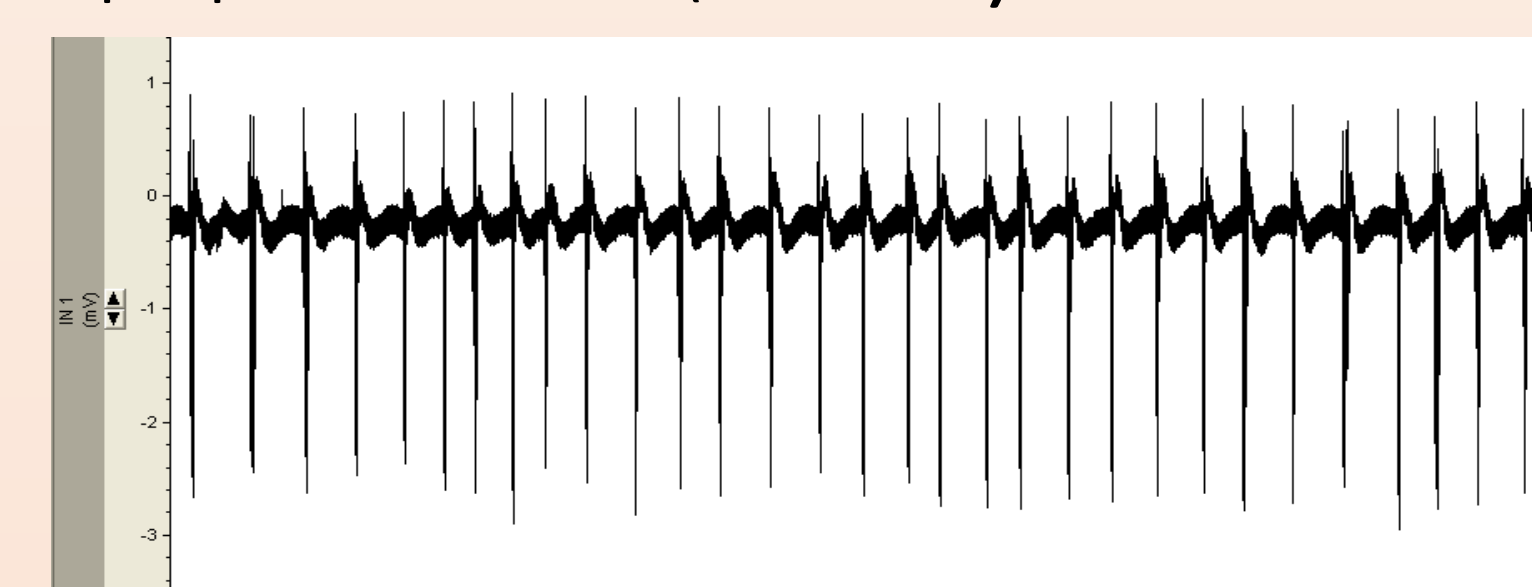
Recording Micropipette

## Results

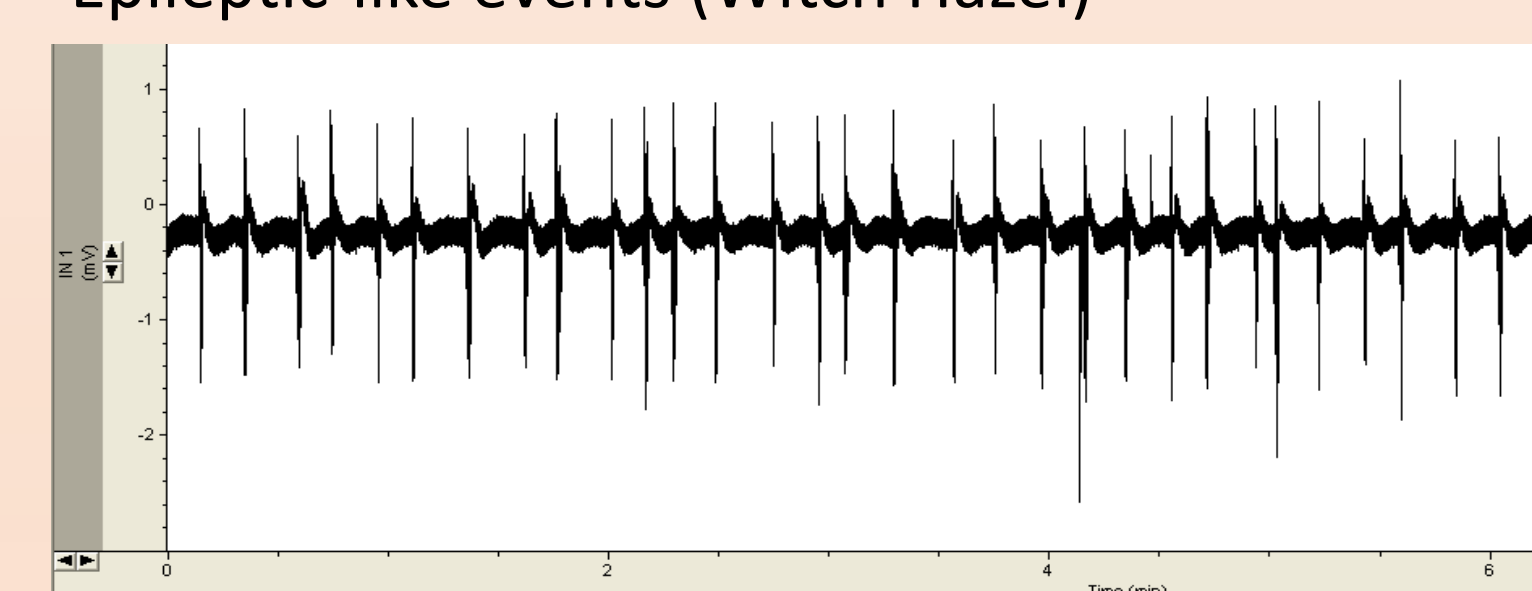
### Normal condition



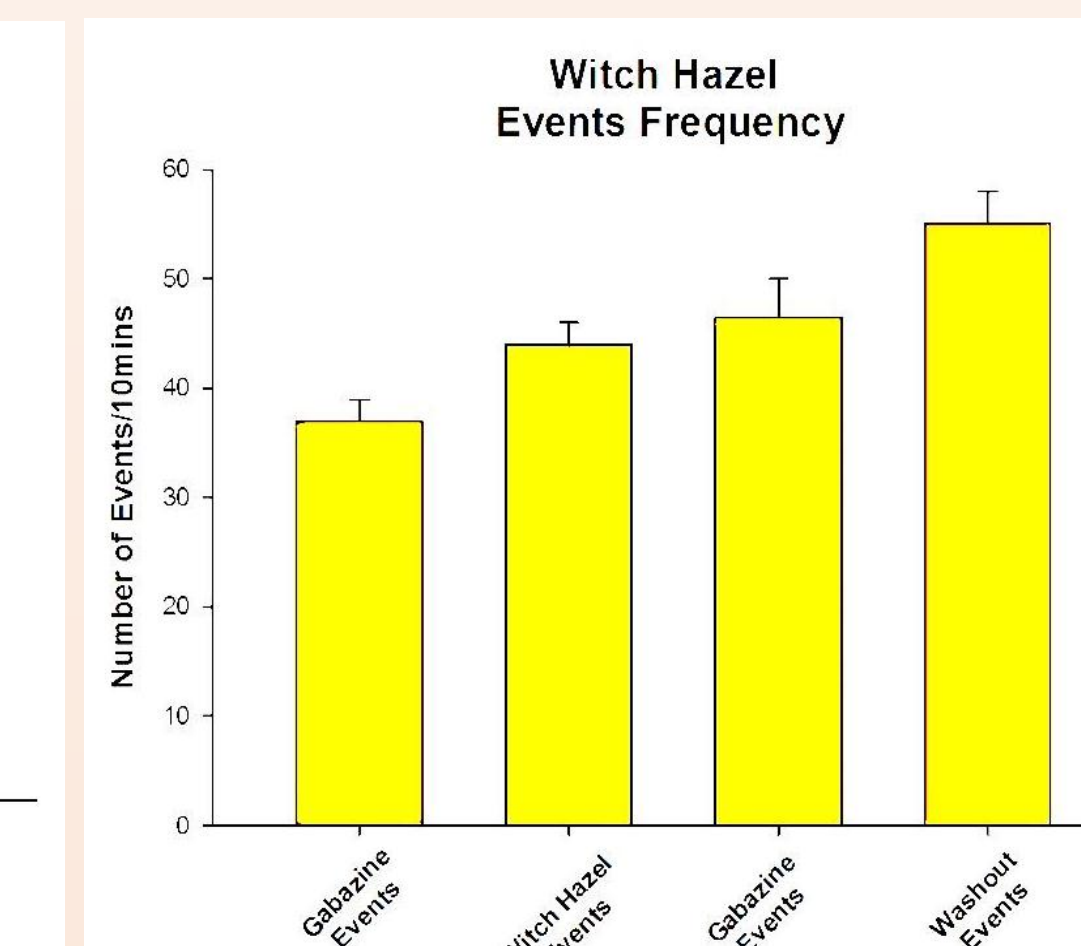
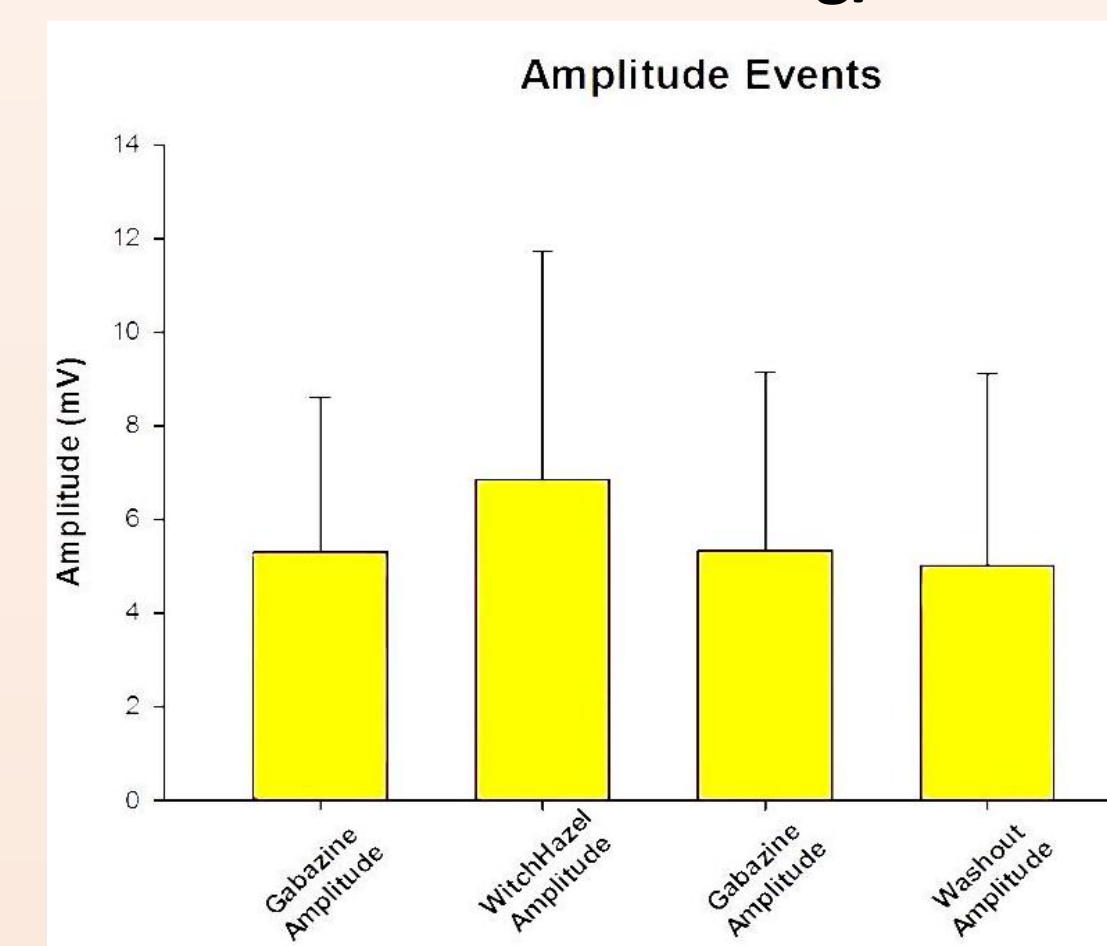
### Epileptic-like events (Gabazine)



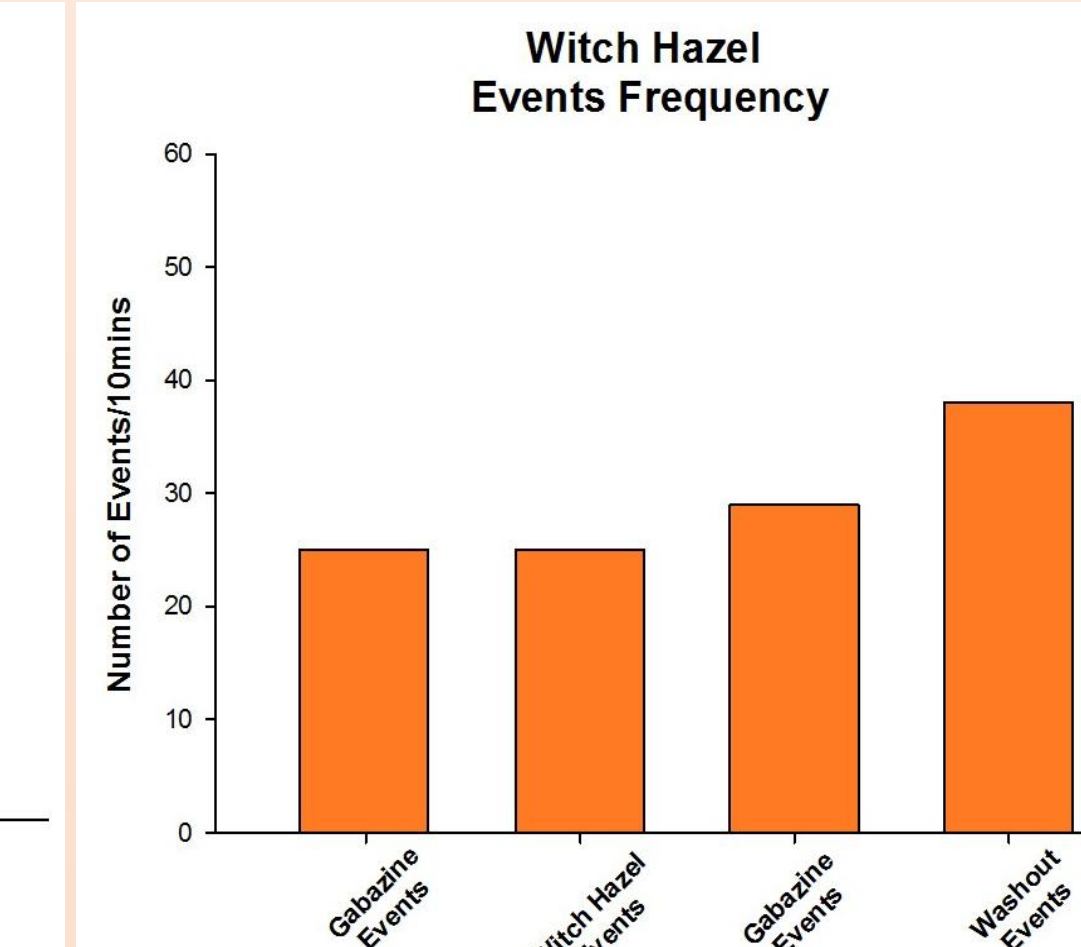
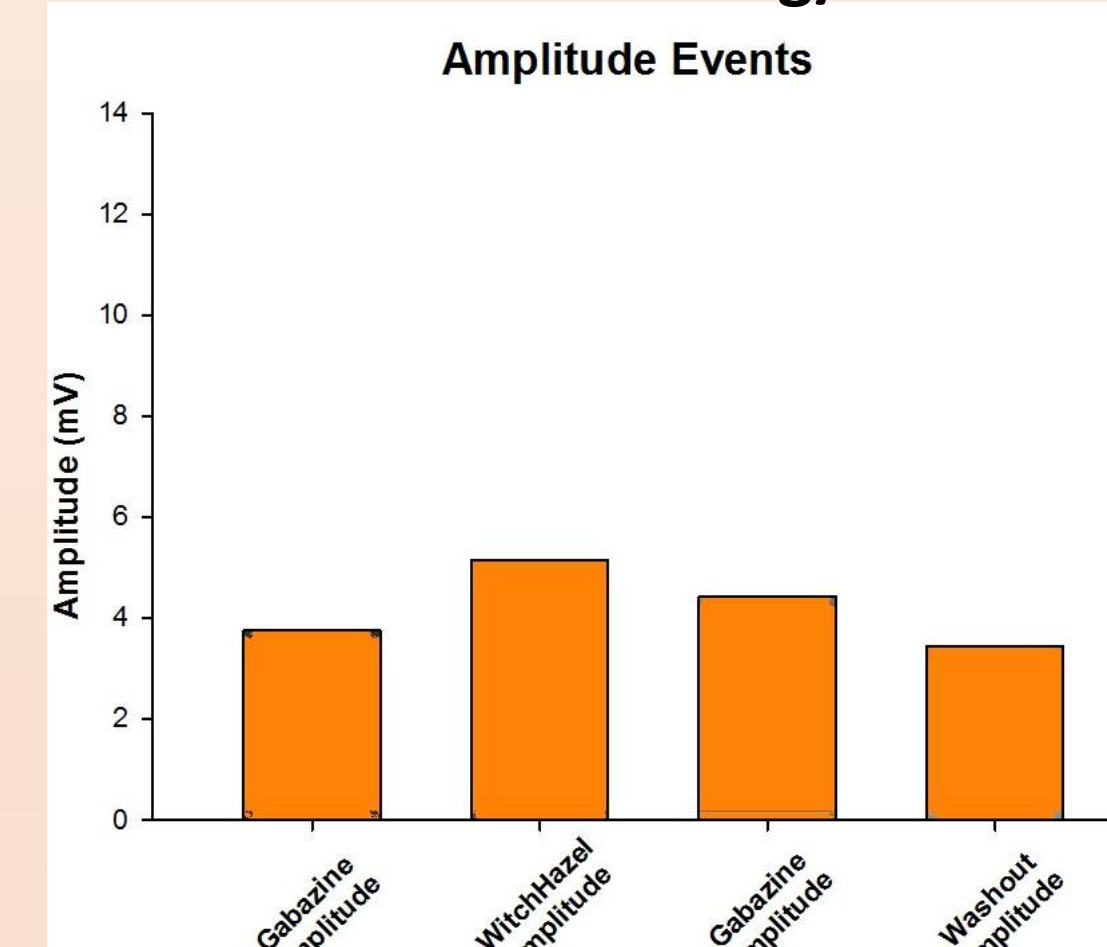
### Epileptic-like events (Witch Hazel)



### Concentration of 0.25 mg/ mL



### Concentration of 0.1 mg/ mL



## Summary/Conclusion

In this experiment we used an *in-vitro* model of epilepsy to produce epileptic-like events on hippocampal slices. These events were produced using Gabazine then we determined the effects of *Hamamelis Virginiana* on the amplitude and frequency on the stimulated slices.

Our data suggest that *Hamamelis Virginiana* (Witch Hazel) increased the effect of Gabazine on hippocampal slices. We conclude this because two out of three tests showed an increase in amplitude and frequency. We predict this is because of a high concentration lead to an over abundance of antioxidants causing the brain slices to reject or not use any of the antioxidants.

## Future Work

- Implement dosage curve
- Evaluate the effects of an antioxidant in combination with an anti-epileptic drug
- Assess the role of *Hamamelis Virginiana* *in-vivo* using a rodent model of epilepsy

## References

- [1] Holland, K. (2014, October 20). *Epilepsy by the Numbers: Facts, Statistics, and You*.
- [2] Kim, B. (2008, June 26). *Making Sense of Free Radicals and Antioxidants*.
- [3] *Witch Hazel: Uses, Side effects, Interactions and Warnings*. (N. d.).
- [4] *Study on the composition of the volatile fraction of Hamamelis Virginiana*. (1998, April 1).
- [5] *The CA3 region of the hippocampus: How is it? what is it for? how does it do it?* (2015, February 5)

## Acknowledgements

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