

2021 PSBR High School Essay Contest
Grand Essayist

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I have always had an interest in neurological disorders. My cousin Isabella was diagnosed with epilepsy at age 10. Epilepsy is a brain disorder that causes seizures in 50 million people worldwide. She has tried multiple medications and had surgeries to try to reduce the number of seizures that she has daily. Even with this medical technology she is unfortunately still not seizure free. Hopefully in the future gene therapy and stem cell research will help find a cure for people like my cousin.

While researching this topic I came across several journal articles that discussed advances in epilepsy research. In 2009 a study conducted by MJ Doring and V. Riban researched gene therapy in epilepsy by using animal models. Gamma-Aminobutyric acid (GABA) is a neurotransmitter that helps to inhibit neurons. It is thought to play a role in epilepsy. This study looked to see if genetic modifications of GABA would decrease the number of seizures. The studies done on rats and mice did find a temporary reduction in the number of seizures. Galanin, a neuropeptide released during epileptic seizures has also been used in gene therapy studies. Galanin has been found to reduce convulsions in animal studies with rats.

Another study published by Science Translational Medicine in November 2012 discussed a breakthrough in epilepsy treatment in rats. "Scientists have cured epilepsy in rats by inserting a special gene into neurons of the brain." This could be an alternative to surgery or medication for epileptics. Since only 7 out of every 10 epileptics benefit from medication this could be a valuable tool. The procedure adds a new gene to defective neurons so that it is harder for the neuron to disrupt normal brain activity. When this gene therapy was done on epileptic rats they were all cured, while the untreated rats still had seizures. This procedure may be able to be done on humans in the future.

Another study published by Grone and Baraban in March 2015 found that animal models used to treat epilepsy were safe. These studies were primarily done on mammals. The author states that tests done on other species aren't exact models for human problems, but that they are good guidelines. No animal can be used perfectly to represent epilepsy, but rodents with complex brain functions have been used most commonly. The advantages to using rats and mice include their small size, rapid reproduction rates, and their tameness. Epilepsy research started on animals in 1869 using dogs and electricity. Since then, scientists have found more safe and humane ways to test animals for neurological disorders. Epileptic mice have been identified due to advancements in gene-editing, but the gene responsible for epilepsy in animals is still unknown.

Recent stem cell research in birds and rodents has led to possible cures or treatments of epilepsy. Rodents were exposed to substances to see which may cause epilepsy to flare up.

Cobalt, tungstic acid, acetylcholine, strychnine or picrotoxin all caused problems. In zebrafish, the exchange of alleles and DNA sequences has been used to see the effects of gene therapy. Animal models have boosted the pace of research in epilepsy tremendously, and the authors believe that researchers should use a wide range of animals in future studies.

An article by Luke Dormehl from 2018 discusses how Texas A&M University researchers implanted stem cells into the brains of epileptic rats. When these stem cells were added to the rats brains, epileptic seizures dropped by about 70%. This method targets TLE (Temporal Lobe Epilepsy), which is the most common type. About 40% of people with TLE are resistant to treatments with medicine. This method takes some of a patient's blood and converts the fibroblasts into stem cells which are then transferred to the brain. Although not performed on humans yet, in the future it may be used for epileptics that do not respond to medication.

Epilepsy has had a big impact on my cousin's life. Although she is twenty four years old she has never been able to drive. She has a master's degree now but her learning skills are different from the average person. She has numerous small seizures throughout every day. Luckily, she has only had a few large seizures in her life but it is a constant concern for her to be alone in case one would occur. I hope that there will be more studies done in the future that look for a cure or treatment for epilepsy.

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