**2018 PSBR High School Essay Contest**
***Finalist***

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Peripheral nerves send sensory information back to the brain and spinal cord, which then send signals to the muscles. Damage to these nerves, known as peripheral neuropathy, interrupts and distorts these messages. Cases vary from a number of different classifications, symptoms, causes, and severities. For example, symptoms vary depending on whether sensory, motor, or autonomic nerves are damaged. Every peripheral neuropathy patient can relate to numbness, tingling, prickling sensations, and muscle weakness in the hands and feet. Areas of the body become sensitive, leading to exaggeratedly intense or distorted experience of touch. Severe symptoms may also occur such as burning pain, muscle wasting, paralysis, or organ or gland dysfunction. Some cases of Peripheral Neuropathy in general are caused by damage to the axons (the long portion of the nerve cell), some are due to damage in the myelin sheath (the fatty protein that coats and insulates the axon), and others are produced by damage to the two combined.

Although it is rather easy and there are several tests to indicate whether or not there is simply nerve damage, it is not so easy to get to the bottom of what exactly causes that nerve damage. Looking from a genetic standpoint of Peripheral Neuropathy, advances in genetic testing within the last ten years have led to great strides in the ability to identify specific genetic causes for neuropathy. Treatments depend on the severity of one's neuropathy, but first a patient must address any possible contributing causes and go from there. The National Institute of Neurological Disorders and Stroke (NINDS) has a mission to seek fundamental knowledge about the brain and nervous system and then use that knowledge to reduce the burden of neurological disease, according to their website. NINDS research includes clinical studies of genetics and natural history of hereditary neuropathies, basic science investigations of the biological mechanisms responsible for chronic neuropathic pain, and understanding how immune system dysfunction contributes to peripheral nerve damage (Peripheral Neuropathy Fact Sheet). Such research on genetic defects has benefits such as better knowledge of genetic causes, which helps identify people at a high risk for developing Peripheral Neuropathy prior to experiencing any symptoms and may lead to the development of new therapeutic and preventive strategies for peripheral neuropathies. Scientists are using animal models to study how mutations in the autoimmune regulator gene (sometimes the cause of chronic inflammatory demyelinating polyneuropathy) result in inflammation along with nerve damage. Also tested on animals are electromyographies, a recording of electrical activity within the muscles after placing a small needle electrode into the muscle. Animals are placed under a general anesthesia and should not show electrical activity while asleep and not moving, however animals sometimes show spontaneous electrical activity, meaning they have

peripheral nerve or muscle disease (Hoke). Knowing what a positive outcome looks like from the animals' EMG helps doctors to spot nerve damage in their patients as well.

Not only do I have Peripheral Neuropathy, but my father and grandmother also have it and for the most part we all experience the same severity of the condition. Doctors along with myself would consider our neuropathies idiopathic, meaning no known cause. I have gone through a countless amount of testing such as blood tests, an electromyography, a full spinal MRI, physical examinations, DNA tests, and had my medical history perused over and over again. However still no answer on the cause and my specific case. Because my grandmother is my mother's mom not my father's, it is impossible that he inherited a genetic mutation from my grandmother. This does not fully rule out the possibility of being a genetic trait within my family as we are still currently waiting for the results back from the DNA tests, but also does not make much sense other than it being a coincidence that the three of us have neuropathy. My personal experiences with Peripheral Neuropathy have impacted my daily life and forced me to work around my neuropathy in simple, everyday tasks such as buttoning clothes and opening bottle caps. If I am walking in flip- flops, I won't notice if one falls off, my feet and fingertips are slow to react to temperatures, and it sometimes feels as if I am wearing a sock even when I am not. I am thankful for breakthroughs in biomedical research, as they have helped my family members and I get steps closer to finding out what exactly our condition is, and maybe even find a cure for Peripheral Neuropathy.

## Works Cited

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