

Sponsored by:



2022 PSBR High School Essay Contest

Finalist

Kyle L.

Schuylkill Haven Area High School

Schuylkill Haven, PA

Every year hundreds of thousands of people contract Lyme disease. Most of these people live in Pennsylvania, followed by New York, New Jersey, and the rest of the northeastern United States, as well as Minnesota, Wisconsin, Virginia, West Virginia, Delaware, and Maryland. My mom, who at the time lived in New Jersey, was one of those people. My mother is a veteran of the United States Army Reserves. She enlisted to be a combat medic while in college to get hands-on experience in the medical field. One thing members of the Army Reserves are obligated to do is to spend one weekend a month training to keep their military skills sharp. On one of these weekend retreats, my mom contracted Lyme disease from a tick.

The bacterium behind Lyme disease, *Borrelia burgdorferi*, is transferred to humans and other mammals by infected blacklegged ticks. In the eastern United States, the blacklegged tick *Ixodes scapularis* (also known as the deer tick) is responsible for the spread of Lyme disease while in the western United States, the blacklegged tick *Ixodes pacificus* is responsible. Most people contract Lyme disease from nymphs, immature ticks. This is because immature ticks are much smaller and therefore less detectable. Blacklegged nymphs could be less than two millimeters long. Adult ticks could also infect people, but they are much bigger and more detectable. Ticks can attach to and feed on any part of the body, but they are usually in hard-to-see areas like the groin, the armpits, and the scalp. My mom is aware of this, and she always insists on combing through my brother's and my hair to make sure no ticks have taken root there. It is important to check for ticks after being outside for a while because a tick typically needs at least 36 to 48 hours to pass the bacterium to its host.

Between three and thirty days after a tick transmits the bacterium, most people develop a rash known as the Erythema migrans rash. Over a period of time this rather warm-feeling rash could reach twelve inches across. Sometimes the rash takes the shape of a recognizable bulls-eye, but this does not always happen. Months after a tick bites a person, they may experience facial palsy, severe arthritis and swelling in large joints, heart palpitations, episodes of dizziness and shortness of breath, shooting pains, numbness, or tingling in the hands and feet, and severe headaches and migraines. Migraines in particular plagued my mother for years after contracting Lyme disease even though it is common for symptoms to cease after treatment.

Research on Lyme disease is still a relatively new concept. It was only in 1981 that *Borrelia burgdorferi* was officially classified. Still, animal research is taking studies of Lyme disease to unprecedented levels. Animals are being used as models that demonstrate how the bacteria behaves, and how the host's immune system responds to it. Because of the complex symptoms of Lyme in humans, it is difficult to find adequate models that replicate this. Rodents, rabbits, dogs, and rhesus monkeys are commonly used as models for this reason.

Results from the rabbits, rodents, and dogs have been used to determine the transmission time between the tick and its host, and dogs in particular have been used to develop whole-cell dog vaccines.

However, not even these animals can replicate all of the symptoms that humans get from the bacterium. Rabbits will develop the typical Lyme disease rash, but a chronic infection would not establish. Small immunocompromised rodents would develop Lyme arthritis, but not the neurological lesions. For this reason mice were used to track the pathogenesis of arthritis and chronic infection. The best animal model by far is the rhesus monkey because of the marked similarities in human and rhesus monkey symptoms. This model allowed scientists to observe that the joint damage is caused by infection persistence, something that could not be observed in the rabbits due to their ability to rid themselves of infection in twelve weeks.

Lyme disease was a very debilitating disease for my mom, and it is a very real threat to me too. I spend a lot of time outside in the wilderness, and I have had many ticks on my body in the past. I also know many people around me that have gone through the effects of Lyme disease. Even though research on Lyme disease is young, it has made leaps and bounds since my mom was infected by it and I hope it continues to do so.

Works Cited

"Lyme Disease Home | CDC". Centers For Disease Control And Prevention, 19 January 2022, <https://www.cdc.gov/lyme/>. Accessed 10 March 2022

"History of lyme disease". Bay Area Lyme Foundation, 05 April 2020, <https://www.bayarealyme.org/about-lyme/history-lyme-disease/>. Accessed 10 March 2022

Herrmann, Jean Louis. "Animal models and Lyme disease". *Clinical Microbiology And Infection* (Elsevier Inc.), 01 December 1995, [https://www.clinicalmicrobiologyandinfection.com/article/S1198-743X\(14\)65120-X/fulltext](https://www.clinicalmicrobiologyandinfection.com/article/S1198-743X(14)65120-X/fulltext). Accessed 11 March 2022