Detecting the Elusive Lyme Disease, Year Two: Creating a Novel Diagnostic Aid for the Detection of Borrelia burgdorferi in Ticks

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Lyme disease is a serious illness that affects approximately 300,000 people in the United States alone every year. It causes joint pain, arthritis, weakness, fatigue, and more seriously, cognitive, nerve, and cardiac damage. Diagnosis is difficult; and if treatment is not administered quickly, the symptoms can persist indefinitely. The typical methods of diagnosis include clinical examinations paired with laboratory analysis of patient samples. Both of these methods are unreliable in the early stages and laboratory testing is expensive and time-consuming. Given the serious nature Lyme disease, along with its implications, it is imperative that there be a multitude of diagnostic aids to eradicate the disease as soon as possible. This project created such a diagnostic aid; a device that allows someone who finds a tick biting them to test it immediately for the presence of Lyme disease. This project built upon the work of the previous year by utilizing Borrelia burgdorferi spirochetes with the presence of ticks in order to demonstrate the device's ability to accurately indicate the presence of Lyme disease. A limit of detection was established to be 100 spirochetes, far below the median level in an adult Ixodes scapularis (10,000 spirochetes) showing sufficient specificity, along with no reaction with negative samples. An early knowledge of its presence provided by this device will allow for efficient and effective treatments that will aid in the prevention of long-term symptoms and major damage.

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