A Novel Approach to Diagnosing Zika: The Use of Silk Fibroin and 2D Paper Networks to Create a Temperature-Independent, Affordable Paper Test Strip

Gallagher, Ashlynn (School: W.F. West High School)

The Zika virus (ZIKV) is an infectious disease from the virus family Flavivirdea which is spread from the Aedes mosquitoes. Zika was originally isolated in the Ziika Forest of Uganda where it was found in monkeys, and then later identified in humans in 1952. As of today, Zika has no cure nor a vaccine. Symptoms for Zika are commonly confused with Influenza or Dengue virus, leading to the potential spread of the virus. 10% of Zika infected pregnant women's unborn child have microcephaly, a disease that causes seizures, mid to severe learning disabilities, and joint deformities. Current diagnostics for detecting Zika are time consuming, costly, and samples must be sent to a larger lab. Due to expensive prices, many pregnant women are resorting to abortions if infected with Zika. The purpose of this research was to create a temperature independent, affordable, and portable paper test strip that could detect and differentiate between Zika NS1 (ZVNS1) proteins in human blood and urine samples in under 2 minutes. ZVNS1 antibodies were conjugated to an enzyme to cause an activation reaction with a chemical substrate when introduced with Zika NS1 proteins. The test strip can potentially diagnose a patient with a success rate of 99% well before current diagnostic methods in disaster areas and remote areas where resources, refrigeration, and time are limited.

Awards Won:

Fourth Award of $500

Fondazione Bruno Kessler: Award to participate in summer school "Web Valley" in Trento, Italy