Deuterium Oxide (D2O) on Maintaining Viability in Coliphage Bacteriophages under Low Temperatures to Model Live Attenuated Viral Vaccine Additives

Morgan, Annika (School: Joel Barlow High School)

Viral particles used in vaccines and viral therapies are often damaged due to the molecular movement of their storage solution and require storage at low temperatures to reduce the velocity of the water molecules. Deuterium oxide (D2O) is made with an isotope of hydrogen that increases the density of water to 1.11 g/mL; when viral particles are stored in D2O the increased weight reduces the molecular speed of the solution, reducing trauma to the particles, increasing the temperature in which samples can be stored. A T4 bacteriophage was used to test how a viral particle would react to its environment and deteriorate over time while stored in D2O and deionized water. A sample of Coliphage bacteriophages stored in D2O was compared to a sample stored in deionized water at 16? to determine the infectivity titer of the samples over time using plaque assays. The sample stored in D2O showed significantly less deterioration over time and slowed the rate of degradation to 6% that of deionized water. D2O proved to be a more advantageous solution than deionized water in supporting the health of the phages and is a promising storage additive for viral samples. This solution has application for use to increase the storage temperature of live attenuated viral vaccines, such as the Ebola vaccine, rVSV EBOV that often require storage at very low temperatures during transport and storage to remain effective and viable for administration to patients.

Awards Won:

Intel ISEF Best of Category Award of $5,000

First Award of $3,000