The Effect of Protease- Activated Receptors (PAR- 4) on the Fertility and Progeny of C. elegans as a Potential Therapeutic Agent for Hereditary Chronic Inflammatory Diseases

Velayutham , Swetha (School: Plano East Senior High School)
Poruri, Vyshnavi (School: Plano East Senior High School)

60% of deaths worldwide are caused by various chronic inflammatory diseases that vary from arthritis to inflammatory bowel disease. Past studies have revealed that certain chronic inflammatory diseases, such as Cryopyrin-associated Periodic Syndrome (CAPS), have drastically decreased fertility rates in males and females by 63.62%. In addition, CAPS can also be passed on to the offspring of those suffering from the disease. Protease-Activated Receptors can be classified as a long-term anti-inflammatory agent due to their ability to send signals to the inflammatory response system and promote anti-inflammatory responses through intermediate proteins. Through the first-year study, the experimenters found that PAR-4 mediation can potentially serve as a new, long-term therapeutic agent for chronic inflammatory diseases. To further research the effects of PAR-4 on anti-inflammatory response, the activated PAR-4 receptor was tested for its effects on the fertility and progeny of Caenorhabditis elegans (C. elegans) genetically mutated to simulate CAPS syndrome. The experimenters tested N2 Wildtype C. elegans, PAR-4 activated C. elegans with CAPS, and C. elegans with CAPS for reproductive dysfunction through gamete count and quality, fertilization ratio, and the number of progeny. In addition, offspring health was measured through the lifespan, internal ketone levels, length at birth, and external inflammation. The researchers found that the inflammation levels of the unaltered N2 Wildtype C. elegans and PAR-4 activated C. elegans with CAPS were statistically equal. Highlighted results include Par-4 C. elegans had a ratio of fertilized to unfertilized eggs that were 68.4% greater and the development of PAR-4 C. elegan offspring was 69.3% greater than their inflamed counterparts.

Awards Won:

Fourth Award of $500