Inducing Osmotic Stress in C. elegans to Observe Mutation Bias in Gpdh-1

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The current paradigm in genetics states that mutation is random. However, recent studies with Arabidopsis thaliana have shown that the mutation rate and rate of expression of a gene are negatively correlated. This study aimed to determine if mutation could be decreased in a specific gene by increasing its expression over several generations. To answer this question, C. elegans were placed in a hypertonic environment to increase the expression of gpdh-1, a hypertonic response gene. The C. elegans were passed down through nine generations in their respective treatments (hypertonic and control). Gpdh-1 was isolated and amplified through a polymerase chain reaction and then sequenced. Sequences of the worms were compared to the known C. elegant gpdh-1 sequence to detect mutations. Results showed that worms placed in the hypertonic environment had fewer mutations in gpdh-1 than worms in the control environment. By showing that increased expression can result in fewer mutations, even silent ones, this study supports the claim that mutation bias can evolve in response to selective pressure. This study further examines the relationship between gene expression and mutations and further examines genetic machinery that has potential future applications in novel gene therapies.