CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

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Project Number

34335

Project Title

Using D. melanogaster to Explore the Genetics of the Early Stage Development of the Human Hematopoietic System

Abstract

Objectives/Goals

Studies trace the cause of hematological malignancies to changes in gene sequences involved in hematopoietic system development. Such changes can potentially alter the proper expression of these genes, resulting in compromised development of the blood system. Drosophila melanogaster is an optimal model organism in the study of genetics given its sequenced genome, homology to humans, and minimal care. The objective of this project was to assess the effects of specific genes in D. melanogaster on hematopoietic system development, and deduce the function of those genes and their application to humans.

Methods/Materials

Hand Hemolectin Lineage Tracing (HHLT) stock was crossed with 13 RNA interference (RNAi) stocks, each containing a specific gene of interest. As a result, the progeny of each cross contained both HHLT and RNAi systems. HHLT marked the hematopoietic system with green fluorescent protein (GFP) markers, which allowed the progeny to be viewed under an ultraviolet fluorescence microscope. RNAi induced inhibition of gene expression by using RNA strands to cut specific mRNA strands. Each cross was examined for any defects in the blood system, using the HHLT x 5905 (wild type stock) cross as the basis of comparison.

Results

3 out of the 13 stocks exhibited significant defects in blood volume, lymph gland and dorsal vessel development.

Conclusions/Discussion

The phenotypical defects induced by the inhibited expression of genes unc-5 and reaper may attribute to their roles in apoptosis. netrin receptor UNC5C precursor, the human homologue of unc-5, has been shown to be involved in tumorigenicity. The defects associated with the gene Adenosine deaminase-related growth factor E may attribute to its role in growth regulation. Its human homologue Adenosine Deaminase CECR1 precursor has been shown to be involved in Cat-Eye Syndrome, the symptoms of which include heart defects. The results of this experiment provide insight into the relationship between D. melanogaster genes, their human homologues, and genetic disorders such as tumors and Cat-Eye Syndrome.

Summary Statement

This project explores how genes in D. melanogaster affect the development of their hematopoietic system and investigates the application of these findings to humans.

Help Received

Mentored by Dr. John Olson and Dr. Nikki Malhotra; Experiments were conducted in UCLA facilities under the supervision of Dr. John Olson. Parents provided transportation.