CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)

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Project Number

38691

Project Title

Wnt6 in Progenitor Maintenance During Hematopoiesis: A Potential Biomarker for Acute Myeloid Leukemia (AML)

Abstract

Objectives/Goals

Hematopoiesis, or blood cell development, is a strictly regulated process and the maintenance of blood progenitors requires various pathways in cells. Deregulation of these processes will result in malignancies, such as leukemia. I used Drosophila melanogaster, where hematopoietic development and functions are similar to those in vertebrate systems, as a model system of hematopoiesis. In Drosophila, hematopoiesis occurs in the lymph gland, where blood progenitors undergo a differentiation process or become quiescent. The objective of this study was to characterize the role of Wnt6 in progenitor maintenance pathways during hematopoiesis.

Methods/Materials

The fly stock, UAS-Dcr2; Hml-DsRed, domemeso-GAL4-GFP, was crossed with three different RNA interference lines to observe the RNAi phenotype, with differentiated cells marked by Hemolectin DsRed and progenitor cells by domemeso>GFP in the progeny of the cross. A Wnt6 over-expression line was also used to determine the role of Wnt6 in the progenitor maintenance pathway. Z-stack images were taken of lymphs glands dissected during larval development. ImarIs software was used to create digital 3D reconstructions of each lymph gland and to count the different cell types based on fluorescence. The resulting quantitative data was analyzed for statistical significance using GraphPad Prism.

Results

RNA-interference mediated depletion of Wnt6 demonstrated a phenotype of over-differentiation and trends of decreased progenitor and intermediate progenitor populations. Overgrowth of secondary lobes and nodes of differentiated cells were also observed. Over-expression of Wnt6 resulted in a strong progenitor maintenance phenotype, indicating that Wnt6 is a crucial regulator of the progenitor maintenance pathway during hematopoiesis. This study revealed that Wnt6 signaling triggers progenitors into a G2 phase arrest and quiescence and was found to be involved in the beta-catenin mediated canonical pathway.

Conclusions/Discussion

The involvement of Wnt6 in both progenitor and intermediate progenitor differentiation processes through the G2 arrest and beta-catenin mediated canonical pathways suggests its potential as a biomarker for Acute Myeloid Leukemia, characterized by excess immature blood cells. These new developments can lead to a better understanding of the pathogenesis of relevant hematologic malignancies and can have therapeutic applications.

Summary Statement

RNA-interference mediated depletion and UAS over-expression of Wnt6 demonstrated the role of Wnt6 in the regulation of the progenitor maintenance pathways during hematopoiesis in Drosophila.

Help Received

Dr. Utpal Banerjee, my advisor, and Dr. Lauren Goins, my mentor, advised me throughout my research project and gave me access to laboratory facilities in the UCLA Department of Molecular, Cellular, and Developmental Biology.