



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

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Project Title Determining Gene Dominance in Polygenic Traits	
Abstract Objectives/Goals Understanding Gene Dominance is critical for gene therapies like gene knockout or gene editing using CRISPR. Millions suffer from diseases like Diabetes, Hypertension and Coronary Heart Diseases which are polygenic diseases meaning more than one gene contributes to the disease. Further only a single allele of a sex-linked recessive trait is sufficient for the recessive trait to express itself. When multiple recessive genes affect a single trait, I hypothesize that the Hemizygous Recessive Gene (X-Linked) will be more dominant than the Autosomal Recessive Gene. In this project a novel method is proposed to determine the relative dominance of X-linked polygenic recessive traits. Methods/Materials For this project, Drosophila (fruit fly) is used to study dominance of Polygenic recessive genes. In this project, two independent polygenic traits - Eye Color and Wing Size - are used to draw conclusions on dominance between Hemizygous and Autosomal Recessive Genes. The proposed method relies upon breeding Drosophila with a percentage of population distribution that will be recessive for both traits. By observing the resulting phenotype we can draw conclusions on the dominant gene. Results For the eye color trait, a total of 356 males were examined of which 25.28% were Red Eyed as expected, 25% was Sepia Eyed and 48.31% was White Eyed implying that the hemizygous-recessive white eye color gene is more dominant than the autosomal-recessive Sepia Eye Color gene thereby supporting the Hypothesis. For the wing size trait, a total of 261 males were examined of which 35.58% is Long winged, 31.75% is Miniature winged and 39.18% is Apterous type implying the autosomal-recessive Apterous Wing gene is more dominant than the hemizygous-recessive Miniature wing gene thereby rejecting the Hypothesis. Conclusions/Discussion Based on the experiments conducted, I conclude that X-Linked genes are not automatically more dominant than their autosomal counterpart and that the theory of dominance should be based on gene interaction rather than its physical location in the Karyotype. This project establishes a successful methodology for determining dominance of polygenic recessive genes.	
Summary Statement A method is proposed to determine relative dominance between a Hemizygous recessive gene and an Autosomal recessive gene affecting a polygenic trait.	
Help Received I got initial guidance to use Drosophila from Mr. Teachworth. My science teacher Mr. Carmichael helped me procure lab materials from Carolina Biologicals. Mr. Daniel Zhang guided me on project presentation. My parents assisted with data collection & analysis. I am grateful to all of them for their support.	