Position effect variegation in the white gene as an assay for chromatin conformation in Drosophila hybrids

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This summer I sought to discover whether divergence in chromatin conformation between Drosophila fruit fly species contributes to gene expression problems in hybrids. Proper gene

. Our working hypothesis is that divergence in chromatin conformation between two parent species causes improper chromatin conformation in hybrids, and therefore improper gene expression.

Chromatin is DNA wrapped around special proteins called histones, while chromatin conformation refers to the structure and shape of chromatin. Chromatin conformation is important for gene regulation as this packaging of DNA controls much of gene expression. There are two main types of chromatin: euchromatin and heterochromatin. Euchromatin is more loosely packaged chromatin where the majority of genes are located. Because euchromatin is loosely packaged, the DNA is D F F H V V L E O H W R W U D Q V F U L S W L R Genes in heterochromatin is W F D Q tightly packaged, so transcription factors cannot access DNA or express genes in that region.

A phenomenon called position effect variegation (PEV) was central to our research. PEV is the reduced expression of a gene that is usually expressed due to its proximity to heterochromatin. When a gene in euchromatin is located near a border with heterochromatin, the heterochromatin can ³VSUHDG´ DQG KDYH DV LOHQFLQJ PEV has been shown to be UE\ JHQHV associated with chromatin conformation, and chromatin structure is hypothesized to cause PEV.

Throughout the summer we crossed two species of Drosophila (melanogaster and simulans) to create hybrid flies. The melanogaster flies had a hsp70-white transgene insertion that was passed down to the hybrids. This transgene allowed us to observe PEV in fly eyes, and to use PEV as an