

SNPs and Silencers: Dissecting PRE Function Through Transgenes and CRISPR in *Drosophila*

Elizabeth Bouchard, 2026

This summer, I had the opportunity to explore how genes are controlled during development using *Drosophila melanogaster*, more commonly known as the fruit fly. Precise control of genes is essential, since turning them on and off at the wrong time or place can lead to major developmental problems. My project focused on the *eyes absent* (*eya*) gene, which is crucial for proper eye formation, and a nearby regulatory sequence called a Polycomb Response Element (PRE). These elements act like “switches,” working together to ensure genes are expressed only where they are needed.

To study this, I worked with genetically modified fruit flies where the PRE was either present or removed. I used several research techniques, including CRISPR gene editing, fluorescent protein markers, and tissue staining, to examine developing eye, wing, and leg tissue in fly larvae. This hands-on work allowed me to observe how the PRE influenced gene activity.

My results show that when the PRE was intact and in the proper position, the *eya* gene was expressed mostly in the eye (Figure 1). However, when the PRE was removed, there was notable ectopic expression on the wing and leg discs (Figure 2). This is important because it shows us that regulation is strictly important in eye development, as well as suggesting that these mechanisms are more complicated than once believed.

This project has allowed me to gain invaluable research experience. I gained skills in fly husbandry, practice in dissection, and applied advanced techniques such as PCR, CRISPR, and confocal microscopy. Not only did I strengthen my scientific skillset, but I was also able to work on my public speaking and collaboration skills throughout the summer. More importantly, I further solidified my passion for lab research and the connection between science and patient-based care.

I am beyond grateful for the opportunity to contribute to research in the Bateman Laboratory and for the support that made it possible. This experience has strengthened my desire to pursue a career in science and reminded me of the importance of donor support in opening doors for students like me to learn and discover.

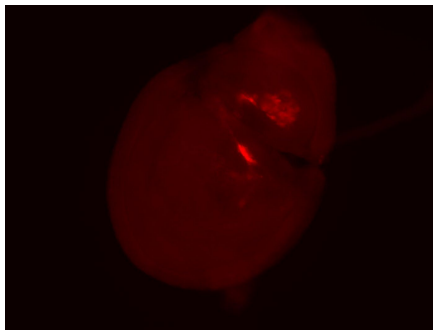


Figure 1. PRE intact, Leg Disc

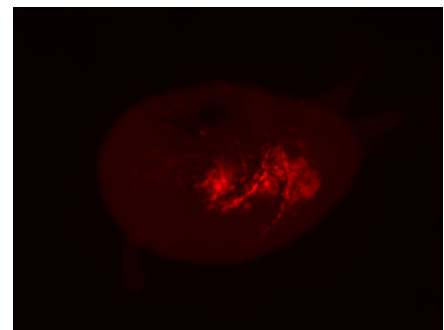


Figure 2. PRELESS, Leg Disc

Faculty Mentor: Jack Bateman

Funded by the Kibbe Fellowship