In Summer 2023, after my second year of studying Biochemistry at the University of Bristol, I was fortunate enough to be given the opportunity to undertake a six-week laboratory project in the Weavers Lab funded by the BSDB. The Weavers Lab is based in the School of Biochemistry at the University of Bristol. Being a highly interdisciplinary lab, it utilises a range of state-of-the-art techniques - from *in vivo* whole organism imaging and genetics in *Drosophila* through to human genetic epidemiology collaborating with clinicians, physicists, and mathematicians in order to explore the tissue resilience mechanisms that are involved in development and wound repair.

The title of my research project was: 'Exploring the cellular mechanisms driving tissue repair using *in vivo Drosophila* models.' The skin acts as a vital protective barrier against the environment and, in the majority of individuals, it heals efficiently following damage. Unfortunately, some patients (particularly those that are elderly or diabetic) suffer debilitating wound healing problems, such as excessive scarring or the inability to heal chronic wounds. In strong contrast to this, wound healing that occurs earlier in development (e.g., in embryonic tissue) is far more efficient, and leaves little to no scarring. It currently remains unclear as to why a significant proportion of chronic wounds fail to heal. Therefore, we felt that it was crucial that we gain a better understanding of the complex processes underlying efficient (e.g., in embryonic tissue) vs less efficient (e.g., in more mature tissue) wound repair. This information could then be used to design improved therapeutics which could encourage more efficient healing of pathological wounds.

To begin with, I was given two pre-existing 'omics datasets which had recently been generated by the Weavers lab: one RNAseq database with genes that had been differentially regulated following wounding in embryonic *Drosophila* tissue, and one proteomics database with genes that had been differentially regulated following wounding in pupal *Drosophila* tissue. After mining and comparing these datasets using bioinformatics tools, as well as reading around the literature on potential genes of interest, I had compiled a list of ten candidate genes to further investigate. We ordered RNAi knockout *Drosophila* stocks of each of these genes from Indiana University's Bloomington *Drosophila* Stock Centre.

Throughout my six weeks in the Weavers lab, I had gathered a range of skills and knowledge related to *Drosophila* husbandry and genetics. In the first few weeks, a typical day in the lab would begin by identifying and isolating any virgin female flies from *Drosophila* stocks carrying GFP labelled actin (see Figure 1a). I would repeat this process periodically throughout the day. Once the RNAi lines had arrived from Bloomington, I began to set up genetic crosses between the GFP labelled Actin females and the males from each RNAi line. These crosses were set up in 'laying pots' (see Figure 1b). Mated females laid developing embryos (that carried both GFP labelled Actin and the RNAi construct) onto apple juice plates in the laying pots; *Drosophila* embryos were then prepared for imaging and mounted onto a microscope slide. After setting up the confocal microscope, we introduced wounds to the embryos using an ablation laser.

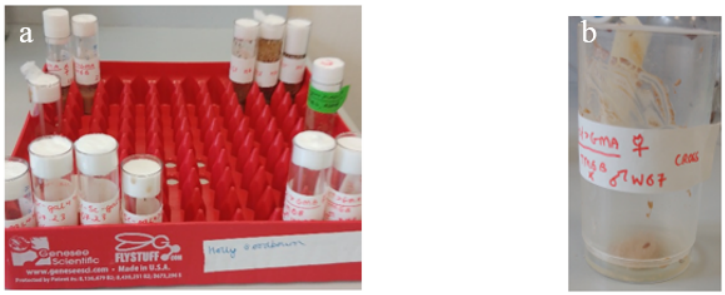

Figure 1a - Fly tray containing stocks of different Drosophila lines. Figure 1b – A laying pot of a genetic cross set up between GFP labelled Actin Drosophila virgins, and RNAi Drosophila males.

Since the GFP labelled Actin allowed us to identify cellular morphologies, we were able to monitor and track the migration and behaviour of cells at the wound site over time (see Figure 2). In this way, we were able to obtain wound healing data for a few of the genetic crosses that we had set up (RNAi knockout of AttB, Gr9a, vannin-like, and Yp3 genes). Using image analysis software, such as ImageJ, I measured the area and diameter of wound sizes over time in an attempt to characterise the roles of these genes in embryonic wound healing.

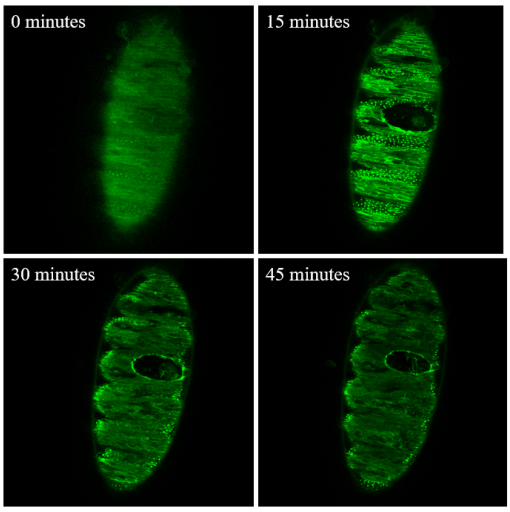

Figure 2 – Live imaging (confocal microscopy) taken following ablation laser wounding in GFP labelled actin Drosophila embryos. Images are taken at timepoints: 0 minutes, 15 minutes, 30 minutes, 45 minutes.

A few problems arose which meant that we were limited in the number of genetic crosses that we were able to set up. Firstly, it was difficult to obtain sufficient virgins to set up crosses for all of the RNAi lines. Secondly, embryos had to be selected at a specific stage of development for consistency across imaging experiments. Nevertheless, many of the wounds from RNAi embryos closed slower than controls suggesting this approach may have been fruitful at identifying important tissue repair genes. I am incredibly excited that some of the data I have obtained, in addition to the data mining that I have done, could potentially be used by the Weavers lab in the future.

Ultimately, completing a lab project in the Weavers lab has given me a clearer understanding of what my future career in scientific research would look like. I would encourage any student who is thinking of pursuing a career in biomedical research to undertake a summer research project. I am extremely grateful to Dr Helen Weavers and her lab group for giving me this invaluable opportunity, and allowing me to help out with their research.