Using Zebrafish Embryos as a Model Organism for Cardiotoxicity Assessment

By Carolina Stamboulid

Having no experience working with zebrafish, the first two weeks of my research were exclusively focused on learning about zebrafish husbandry and handling of embryos. This involved distinguishing males from females based on their morphology, learning about the optimal settings for breeding such as water condition and temperature, dietary requirements and light-dark cycle. I also learned how to harvest eggs and handle embryos for optimal survival and development, including the use of methylene blue to inhibit growth of mould in the water and the importance of temperature on embryonic development.

Many hours were spent observing and handling the embryos under a dissecting microscope, learning to distinguish between the different embryonic stages, selecting viable embryos that presented normal development and removing the chorion using fine forceps, which required much attention and dexterity. During this initial stage, I also learned about the zebrafish heart anatomy and development by reading various articles around the topic, which has vastly improved not only my knowledge on this model organism but also my library research skills.

Once confident with the husbandry and embryo handling skills, I moved on to determining the concentrations of the chemicals to be used and assessing their effect on the embryos. This involved meticulous planning, calculations and preparation of solutions, which greatly differs from my experience to date as an undergraduate student, where the laboratory experiments were all set up and ready to be performed with a predictable outcome. I had to independently make most of the decisions involving this experiment and address every issue that arose along the way, such as a great variation in embryo mortality when initially trying to determine the LC_{50}. After ruling out issues with embryo handling or the solutions, I concluded the inconsistent results were likely caused by the viability of the embryos themselves, which I overcame by selecting and breeding only the pairs of fish that consistently spawn high quality eggs.

Additionally, I had to optimise my initial research proposal to accommodate the timeframe and resources available, such as the lack of specialised software; which did not allow the assessment of cardiac rhythm and thrombosis as initially planned. Conversely, I also incorporated into my observations other parameters indicative of cardiotoxicity that I was unaware of before starting my experiments, such as looping failure during cardiogenesis.

Furthermore, this research experience also boosted my data analysis skills by learning how to use GraphPad Prism and SPSS, as well as understanding more about different types of statistical tests and their applications for different sets of data. I also had the honour to present my project to an audience of well-established researchers, further improving my oral presentation skills.

As a result of this real research experience funded by the BTS and the extensive support, guidance and feedback of Dr. Kenneth Ritchie during this project, progressing onto a PhD once I graduate has become a tangible possibility and I am more inspired and driven than ever to pursue a research career in toxicology. This short experience as an independent researcher working with an *in vivo* model has immensely enriched my scientific knowledge and skills. I now have a much greater appreciation for the benefits, flaws and ethics of working with this model organism, as well as how challenging and yet rewarding it is to answer the questions that probe the unknown.