

Learning how to cope with the rotters and blighters in the Dundee *Phytophthora* lab

My summer internship introduced me to the oomycete, *Phytophthora*, a genus capable of causing colossal environmental damage and threats to food security. The potato pathogen *P. infestans* was responsible for the great Irish famine of 1845, whereas *P. ramorum* has recently devastated the woodlands of California USA, earning the name sudden oak death. Now with the emergence of a new species of *Phytophthora* in south-west England (*Phytophthora kernoviae*), the lab of Steve Whisson and Paul Birch aims to uncover the mysteries behind its infection cycle. It was in their lab that I had the opportunity to work with individuals who are at the forefront of the research on *Phytophthora*. Their passion and commitment to their research unknowingly inspired me, which took the form of me spending a great deal of time reading about *Phytophthora* and other pathogens such as *Magnaporthe oryzae* and *Rhizoctonia solani*. Over the course of the summer, I had the opportunity to develop many skills, such as i) Gateway cloning, using recombination reaction to put an effector gene into a Pk7RWGF2 vector, which contains a C-terminal mRFP tag to express in model plant *Nicotiana benthamiana* ii) Western blotting to check the stability of the C-terminal tagged fusion protein and iii) plasmid digestion and ligation cloning.

During my relatively brief stay in the Birch lab I have learnt far more than I did during my entire second semester of university, as I had the opportunity to practice and hone my lab techniques. I also discovered the importance of being a self-learner, as I was encouraged to seek out answers myself but would still have the support of Miss Shumei Wang (my day-to-day supervisor) who would always take the time clear up misconceptions I had. I'd never previously carried out a successful transformation protocol from start to finish by myself but, after bombarding Shumei with questions and understanding why she took each step, I'm very confident in being able to carry out a full transformation of any pathogen species unassisted.

Ultimately, I was encouraged to ask questions and from that developed the self-confidence to seek out my own answers. With an understanding of exactly what I was doing, I was encouraged to fully grasp the impact of what my work contributed towards. I felt a passion to learn more, greater than other previous experience I've had in science. For example, I never knew why we heat-shocked competent cells during a transformation until it was explained to me by a senior staff member; that bacteria have a survival mechanism in which the permeability of the cell membrane is increased in response to external stress which encourages the uptake of foreign DNA. I even learnt how to carry out electroporation and can explain why applying an electric field is more efficient at increasing the cell permeability compared to that of an ordinary heat shock.

I started learning about projects unrelated to my own; for example, a senior post-doctorate scientist by the name of Dr Hazel McLellan was working with Virus-induced gene silencing (VIGS) and co-immunoprecipitation to discover proteins important in PAMP-Triggered Immunity. Through both watching and helping her work, I not only learnt more about plant immunity but even learnt how to run a western blot from start to finish (a technique I'd never even seen done before). I learnt so many small tricks that would make running experiments in the future much easier, such as ticking off the components you've added when making a PCR master mix or not to pipette up and down when adding ligated DNA to competent cell (to avoid making bubbles, which can stop electroporation transformation succeed). Although these things might seem intuitive to some, they weren't to me and so greatly improved my efficiency in the lab.

Ultimately through the course of my internship, I've learnt to ask better questions which in turn brought me to find answers for myself, that not only benefitted my knowledge of the topic but also brought about a change in my mindset. I know this will prove to be invaluable in my later career. So I am extremely grateful for the opportunity that Professor Birch, Shumei, Hazel and everyone else in the Birch lab provided.

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