in the classroom

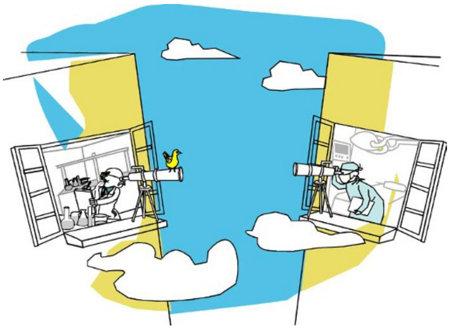
A tale of two disciplines

Hybrid training in clinical and basic sciences can promote patient-centred discoveries in nanomedicine, says Wen Jiang.

It is 5:30 a.m. The street is mostly empty, but my favourite coffee shop has just opened. I place my usual order, a tall Americano, and am quickly on my way to morning patient rounds, which start at 6:00 a.m. I was not always an early bird. In graduate school, I used to start my days close to lunchtime and work until the early hours of the morning. I was also not addicted to caffeine. Clearly, much has changed since 2003, when I was a PhD student in the University of Toronto's Biomedical Engineering graduate programme.

That fall, I joined Warren Chan's lab as his first graduate student to study how nanomaterials can be used to solve biomedical problems. This was a new challenge for me because my bachelor's degree was in electrical engineering with a focus on optoelectronics. The last time I studied living organisms was in a high-school biology class, attempting to stimulate deep tendon reflexes in dissected frogs. So the idea of a PhD revolving around biological experimentation sounded both foreign and a little frightening. However, as I explored how cancer cells interact with different nanomaterials, and figured out ways to use these materials to manipulate cellular functions, the fear of uncertainty was soon replaced by excitement and fascination. We identified new ways to tailor nanomaterials to induce programmed cell death in cancer cells. This was very exciting at the time: if we can use nanomaterials to alter cancer cell function, could we open new avenues to anticancer therapies that are not yet available?

Although I successfully completed my graduate studies and moved on to a postdoctoral fellowship at Harvard Medical School, I often felt uneasy, sensing a fundamental disconnect between my research and its clinical significance. I understood that better diagnostic and/or therapeutic tools were needed to fight cancer but I did not comprehend the specific problems being faced in clinical settings, such as the fact that different types of cancer have specific patterns of failure, or the kinds of clinical responses to standard systemic therapies that could be expected in particular patient populations. This made



me wonder whether any of my discoveries would actually be used one day by patients in the clinic.

After much contemplation, I made the biggest decision of my life: I would apply to medical school and become a physician-scientist. After all, what better way to understand real-world challenges facing cancer patients than by working on the front line? Having clinical experience would equip me with the practical knowledge and experience to develop clinically relevant nanomedicine platforms. The richly diverse curriculum at Stanford School of Medicine, and later my residency, helped me build a strong foundation in basic biology, physiology, and human diseases, and gave me the freedom to explore other scholarly activities including basic, clinical, and health-policy research. It was an eye-opening experience, leading me to constantly question: why did (or didn't we) do this with our nanomaterials?

As nanoscientists, we often take a bottom-up approach to nanomedicine development, where the goal is to develop the best technologies, optimize their performance, and then look for potential applications. As clinicians, the strategy is often the reverse, where clinical problems and patient needs are identified first and are used to specify the design requirements for the right solution. This difference in philosophy between nanoscientists and clinicians highlights their distinct approaches in tackling similar clinical scenarios: product-driven versus patient-centred. Being trained as a scientist and as a physician has helped me bridge this divide and see the 'big picture'.

However, becoming a physician-scientist requires significant sacrifice and a strong commitment. It takes 4 years to complete a doctor of medicine degree, and another 3 to 7 years (depending on the clinical specialty) for residency training. I certainly have the occasional pangs of envy when I see my former classmates becoming independent investigators running their own labs, but these feelings dissipate quickly. Given the choice to do it all over again, I would not choose differently. In hindsight, I could not have embarked on this journey without the unconditional support from my family, friends, and colleagues. They tolerated my routine last-minute dinner cancellations, learned to understand that I could not always come home for the holidays, and accepted the fact that I may be a 'trainee' for life. However, somewhere along the way, I also developed a deep sense of responsibility and dedication towards my patients. The personal gratification of being on the front line pushing the boundaries of medical sciences and to experience first hand how new discoveries can impact the lives of patients make all the sacrifices worthwhile.

As I pull into the hospital parking lot, it is 5:55 a.m., and I have plenty of time to get ready. The trip is short, but the journey to becoming a physician-scientist has been long. There are already many physician-scientists in the field of medical research with training in biological sciences. As nanomedicine research becomes increasingly patient-oriented and interdisciplinary, hopefully more researchers trained in the physical sciences can also join the ranks. Hybrid training in clinical and basic sciences offers a unique career path to young researchers who aspire to become translational scientists because it will equip them with the skill set to make clinically relevant discoveries that could one day impact the lives of patients. ❐

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