I was almost completing my course in Masters of Engineering, National University of Singapore, NUS, when I was uncertain what the next step in life I should take. Like most graduating students, I spent nearly all the time doing my experiments and writing my thesis. Having experienced two years of bioengineering research in school, I felt that doing research was something meaningful. However, it requires lots of discipline, reading, writing and planning. It was also vital to be able to withstand constant failures. For the first time, I started considering research as a career seriously.

In June 2000, the Singapore government announced its National Biomedical Science Strategy. The government will pump an estimated S$2 billion (US$1.2 billion) over the next 5 years into new institutes, academic research, and training in the life sciences sector. It will also provide tax incentives for both multinational pharmaceutical companies and homegrown biotech start-ups. This was part of the "Industry 21" strategy to build knowledge-driven industries to sustain the country's economic growth. Being typically Singaporean, I was sceptical.

Nonetheless, I decided on research as a career option. Thankfully, I was granted a scholarship to pursue a Doctorate degree by the Agency for Science, Technology and Research (A*STAR). It was to do research on skin tissue engineering. My successful application for the scholarship certainly gave me the extra motivation and belief that I made the right decision. Being able to work on clinically relevant research was particularly meaningful and rewarding because I believe that my work could potentially be used to help improve lives.

One notable privilege of being an A*STAR scholar was getting international exposure on the research front. I get to attend international conferences, listen to distinguished visitors at seminars and meet up with renowned scientists up. This gave me the opportunities to interact and learn from researchers from all over the world. Not to mention the occasional holidays that I enjoy when I attend a conference overseas.

Nobody can predict how much Singapore can achieve as a biomedical hub, but I am optimistic that it will succeed. For that, I am glad I can play a small part.
Skin Tissue Engineering

Tissue engineering is a multidisciplinary field which aims at growing human body tissues in the laboratory and using them for transplantation to replace lost body parts. This is a highly clinically oriented field of research that has attracted much attention over the past two to three decades, because it could potentially be our answer to the longstanding problem of tissue and organ shortage for transplantation.

Skin tissue engineering was the first to reach clinical relevance, with a number of products already available on the market. However, the field continues to receive attention because none of the products has achieved widespread use, due to different types of shortcomings. As a collaborative effort between the Department of Surgery and the Division of Bioengineering at the National University of Singapore, we aim to find alternative approaches to tissue engineer an off-the-shelf skin equivalent that will function as well as autografts (skin from another part of the patient's own body) or allografts (skin from another person), which are often in short supply.

Our strategy is to use a bioresorbable polymeric knitted mesh made from poly(lactic-co-glycolic acid), as a matrix for skin cells to attach, proliferate and regenerate skin. Because of its flexibility and elastomeric nature, the mesh emulates the native mechanical behavior of skin, thereby providing a stable, 3-dimensional physical template for skin regeneration. We propose to culture a dense fibroblast (cells from the dermal layer of skin) sheet in combination with the knitted mesh to form an integrated dermal equivalent with extracellular matrix produced by the cells. Keratinocytes (cells from the epidermal layer of skin) are then cultured on top of this dermal construct to produce a bilayered skin equivalent. Our studies have shown that cells remained viable and metabolically active within these cultured constructs, and produced a number of extracellular matrix proteins and growth factors. When transplanted onto wounds created on the back of rats, these grafts supported complete healing with an extent of contraction comparable to autografts.

The future of tissue engineering is promising. In the context of skin tissue engineering, the future could bring exciting new technologies in which skin equivalents complete with appendages including hair follicles, sweat glands, blood vessels and even nerves can be produced, thereby raising tissue engineering to the level of organ engineering.

References