

A*STAR Institute of Medical Biology Singapore, Singapore

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Work Environment

The [Agency for Science, Technology, and Research \(ASTAR\)](#) was established by Singapore's Ministry of Trade and Industry, to oversee and increase scientific research and technology development. The research institutes for biomedical sciences are clustered together in a complex aptly named [Biopolis](#). One of these research institutes is the [Institute of Medical Biology \(IMB\)](#), which focuses on research at the intersection of science and medicine.

What this means for you: You get to work in a place that is well-funded and well-equipped, and where everything is still pretty new (since 2000s).

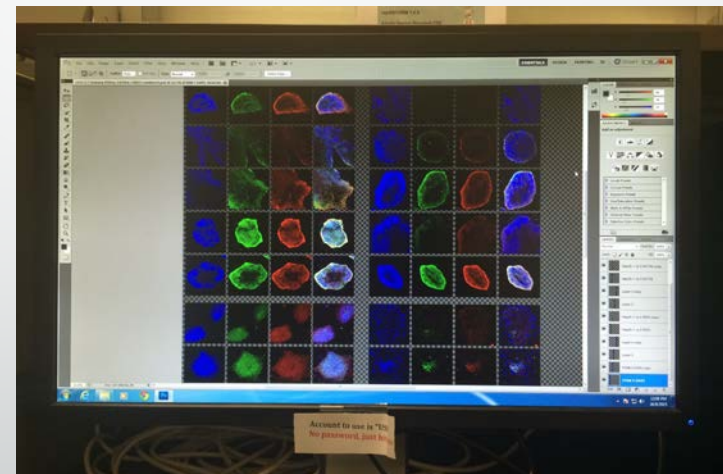
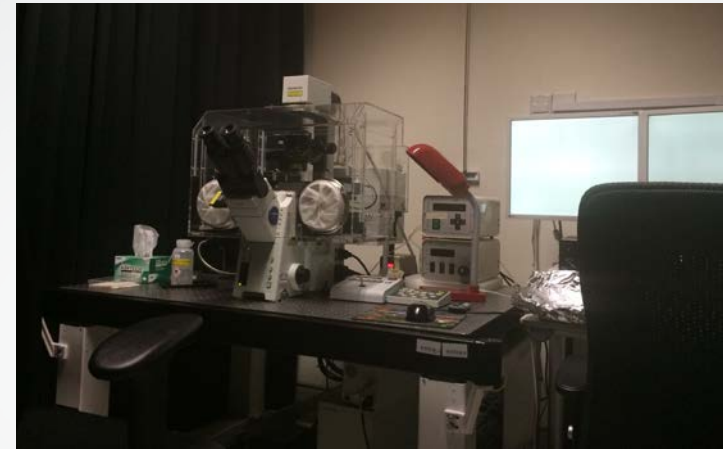


The office, the lab benches, the tissue culture room

My Project

Stem cell research for Type I Diabetes: The end goal of researchers in this field is to differentiate stem cells into glucose-responsive, insulin-producing pancreatic β cells. It is hoped that these cells will be able to replace pancreatic β cells that are destroyed in T1D, which would be the ideal therapeutic treatment for this condition.

Toward this end, my postdoc's current goal is to optimize co-culture conditions to maintain pancreatic progenitors derived from stem cells. As for me, I am mainly working on gene expression analyses, to determine which of these conditions are best maintaining the pancreatic progenitors as such.



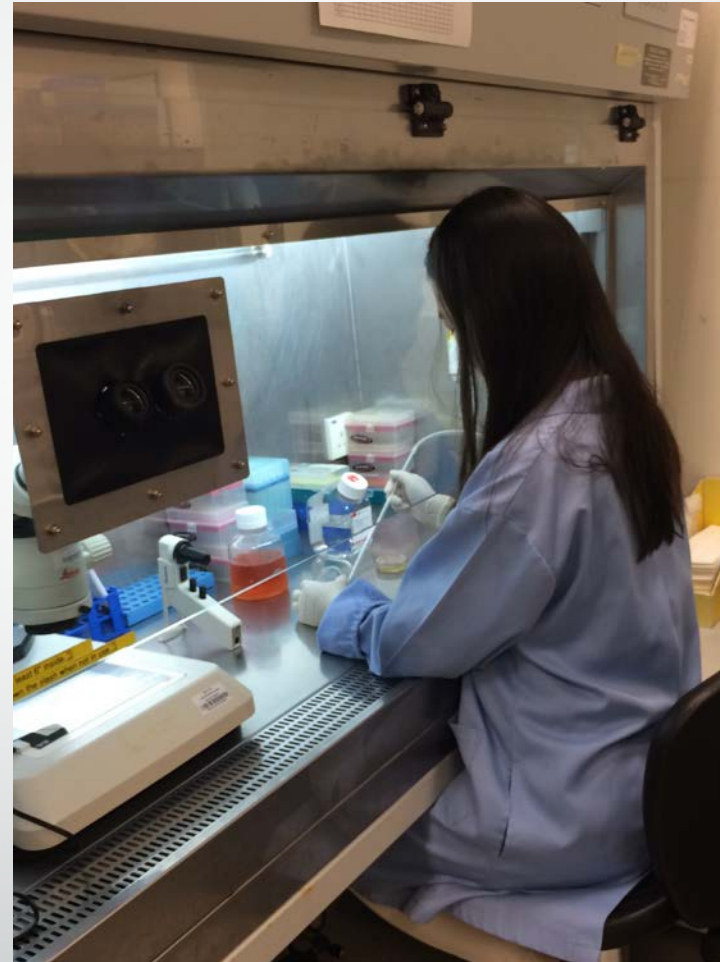
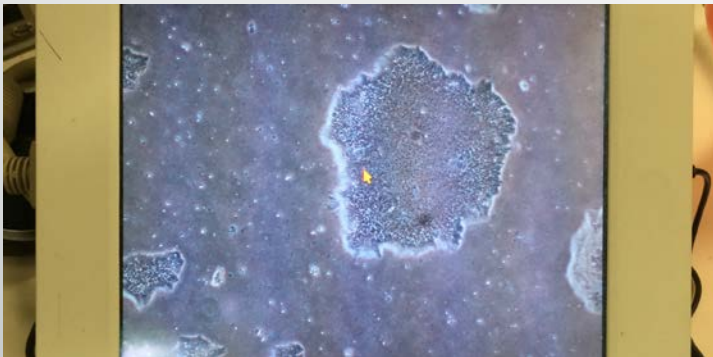
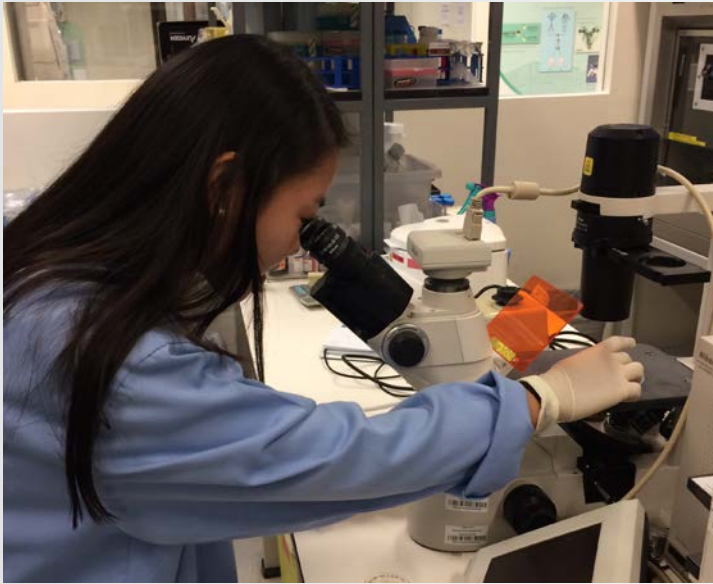
One of my qPCRs in progress;
The microscopy suite; processing images of colonies stained for different markers

Work Responsibilities

Main responsibilities:

- **Tissue culturing**: maintaining lines of human embryonic stem cells (hESCs) and induced pluripotent stem cells (iPSCs) by feeding them daily and passaging as needed
- **Gene expression analysis**: RT-qPCR, cell staining (ICC), tissue staining (IHC), fluorescence activated cell staining (FACS; flow cytometry)

Other things I've done: **in-situ hybridization** for mouse embryo and zebrafish



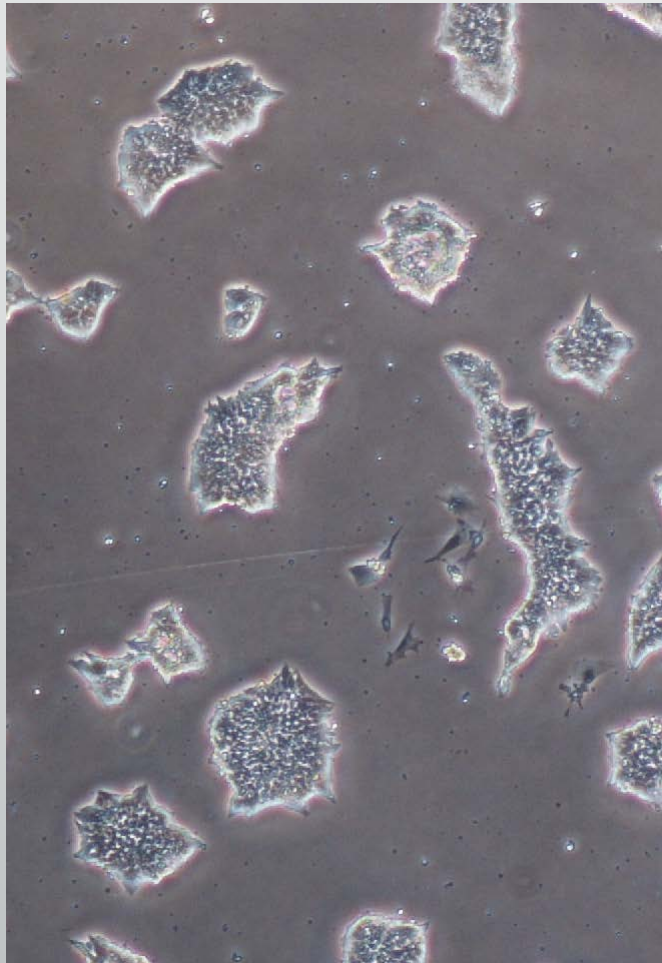
Examining and then feeding/passaging my cells;
One of my colonies of human embryonic stem cells (hESCs)

The Best Parts

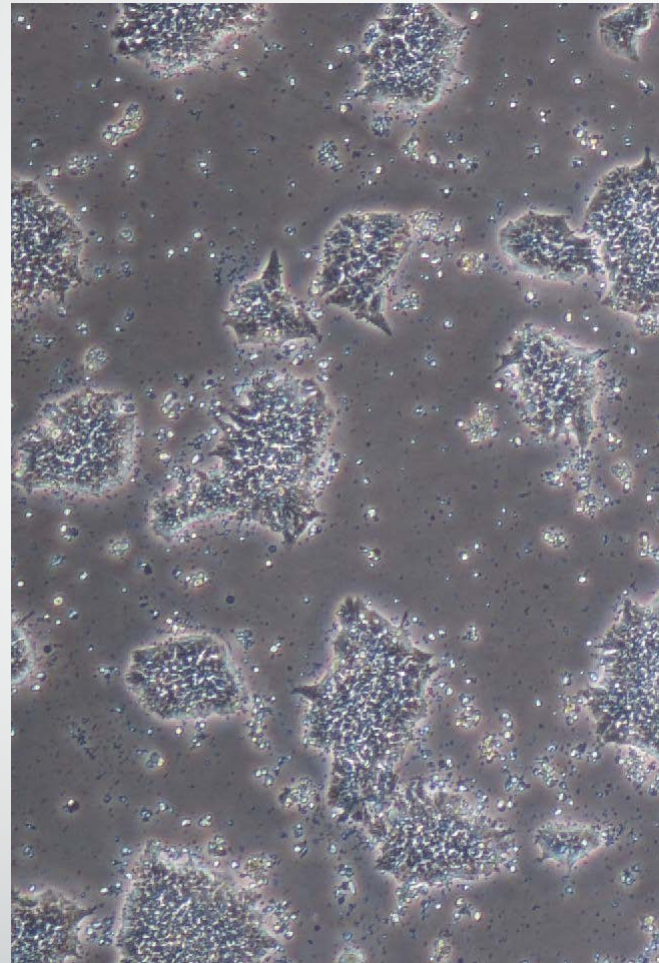
Stem cell research: Working with stem cells, watching them grow and then making them change by adding growth factors and signaling molecules

For T₁D: The idea that these stem cells may one day turn into something that can be used to treat T₁D is really exciting.

Applying concepts from class: In MOL 348, we learn about cell differentiation and key factors that are involved in turning a stem cell into a specialized cell – it was cool to actually use these factors in the attempt to differentiate pancreatic β cells. It was also cool to carry out techniques you learn in class.



Day 0



Day 1

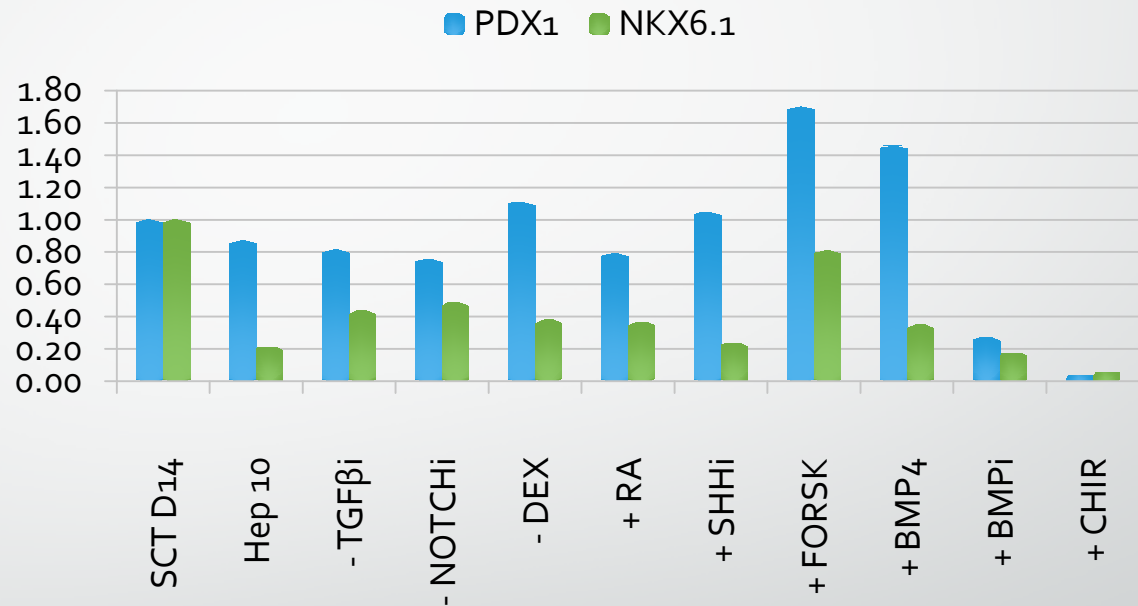
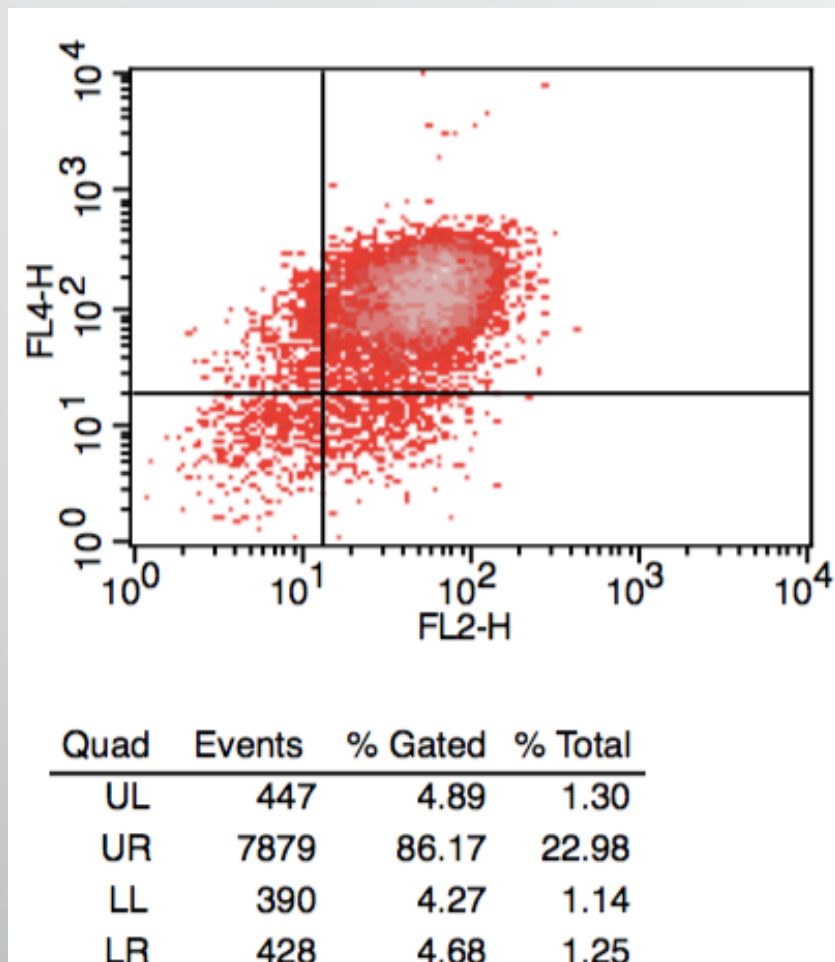


Day 2

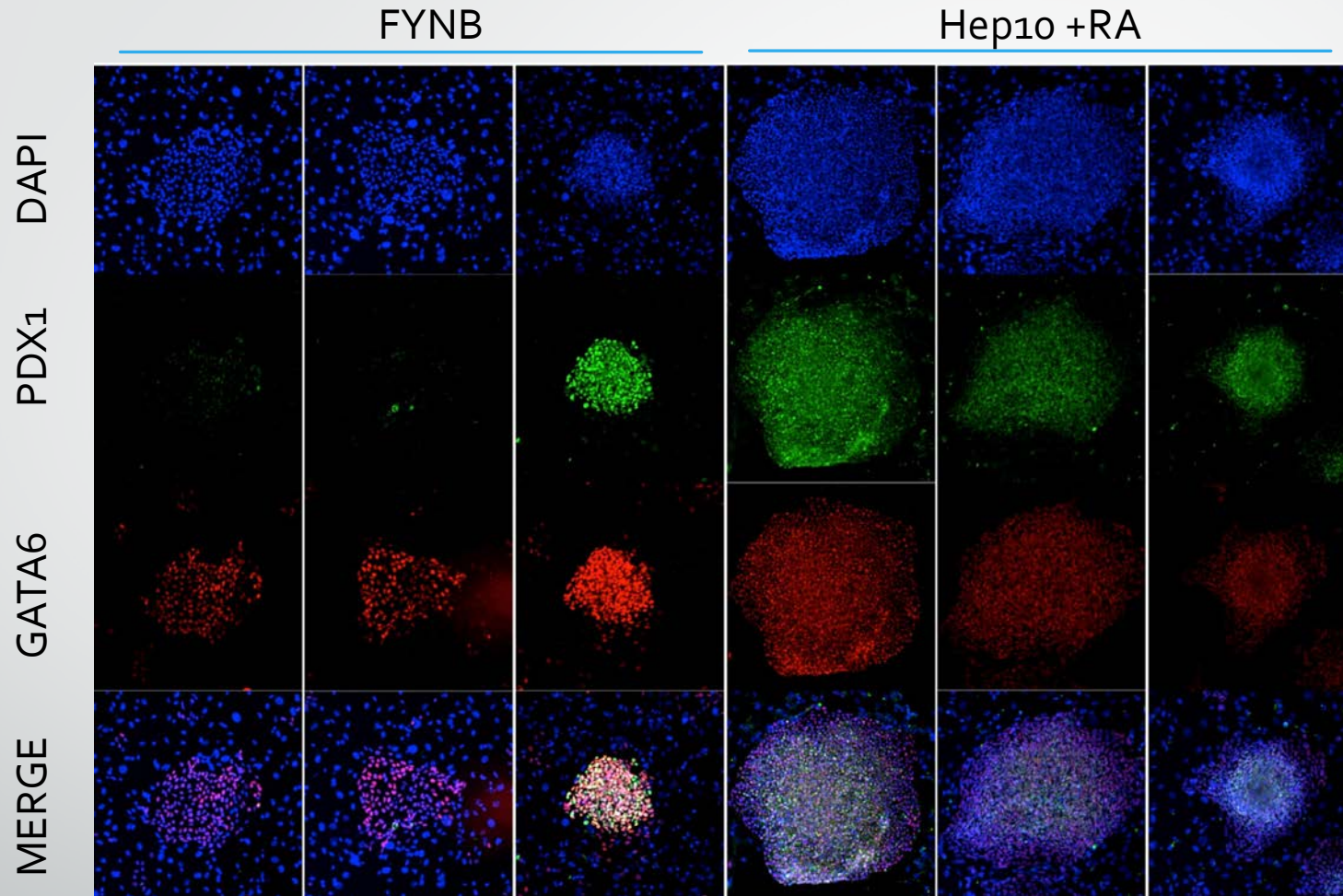
My attempt at differentiating human embryonic stem cells (hESCs) into pancreatic β -cells

My Contributions

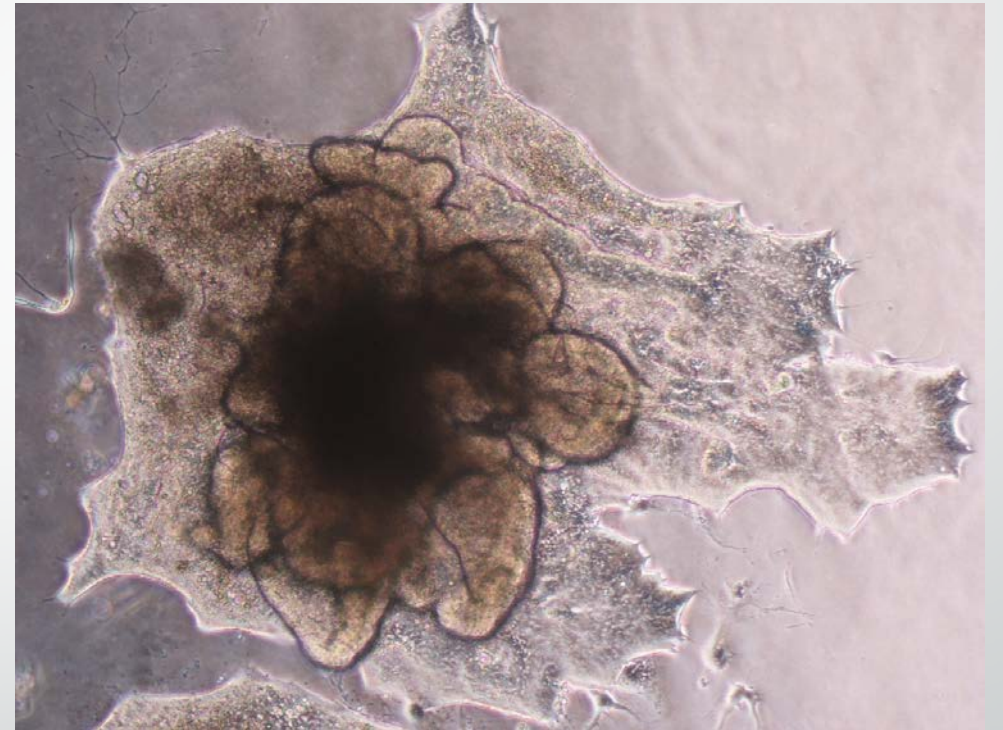
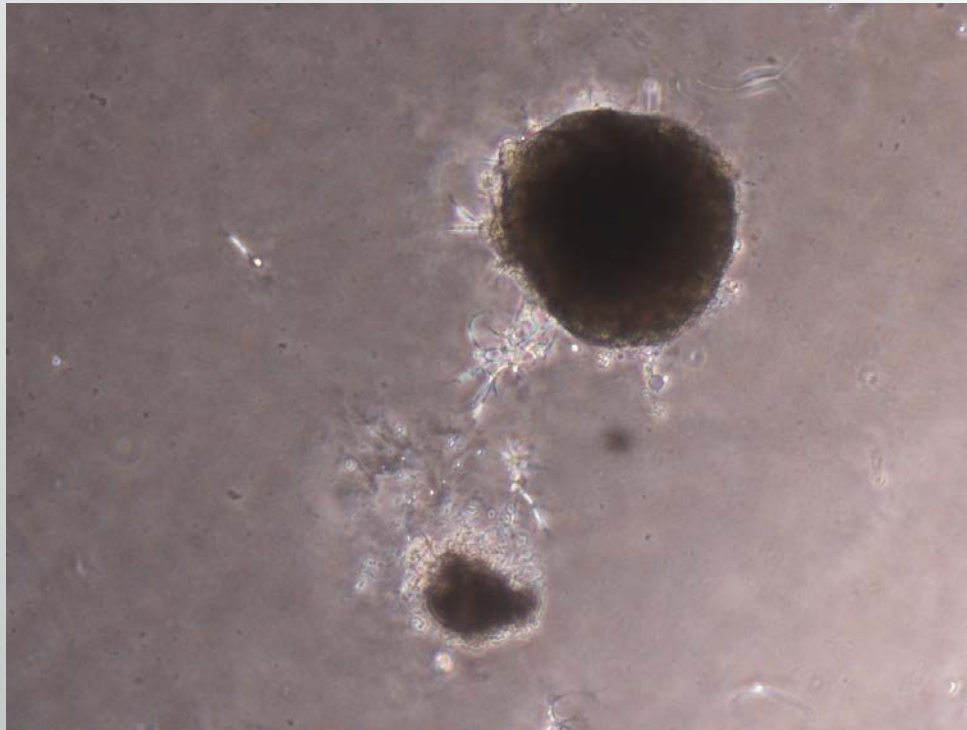
While my postdoc is doing the tissue culturing of the pancreatic progenitors for the coculture experiments (it's labor intensive and technically challenging), I'm doing the [gene expression analyses](#). Using samples from the cells grown in different conditions, I analyze them for expression of genes known to be key in producing pancreatic β cells. I do qPCRs to quantify expression levels of certain genes, staining to visualize the distribution of key markers among different colonies, and flow cytometry to measure the percentage of cells that express the markers. This helps my postdoc to decide which conditions to continue optimizing.



Results obtained using flow cytometry for PDX1⁺/NKX6.1⁺;
Results obtained from qPCRs of different co-culture conditions



ICC staining of pancreatic progenitor colonies grown in two different media



Attempts at growing pancreatic organoids (miniature organ)



Impact on Future Plans

On academic choices: I have realized that developmental biology as well as stem cell research are really fascinating to me, and I hope to incorporate either or both of these into my senior thesis. If not, at the very least I have learned experimental techniques that will be extremely useful in any lab I work in.

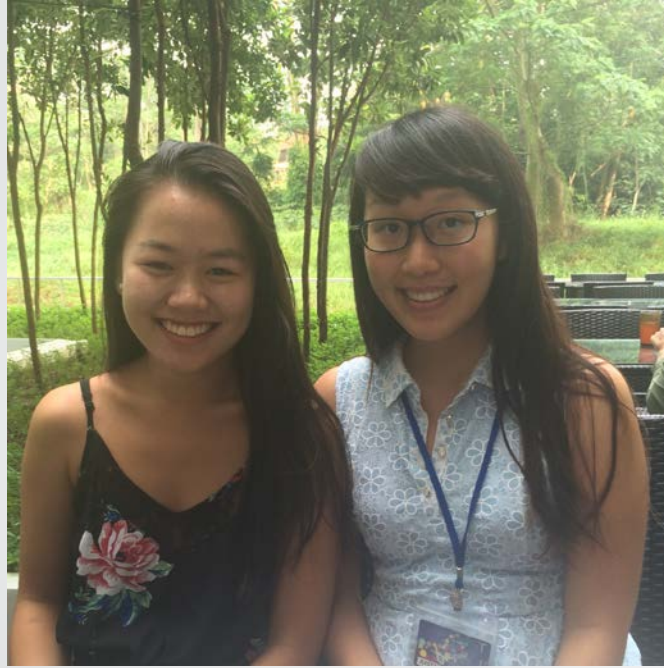
On career plans: Though I've previously been exposed to what it's like to work in scientific research, this was my first experience in a lab abroad, and it has made me consider whether I might want to work abroad in the future as well.

Closing Remarks

I really liked the idea of [my project](#). Though progress was often slow, I was motivated by the fact that when successful, the results would put us one step closer to producing stem cell-derived pancreatic β cells.

[A*STAR](#) is a unique place to engage in scientific research, as it is truly comprised of an extremely diverse group of scientists, with people from Israel, Austria, Ethiopia, just to name a few. It also has great facilities.

[Singapore](#) is an easy place to live in. It's convenient, clean, and safe, and, importantly, it has an abundance of awesome food. It also serves as a great launch pad from which you can explore Southeast Asia!



With a fellow intern and a PhD student in the lab
At the weekly ASTAR IMB Tea Party (i.e. free food and drinks!)



Questions?

Contact me: alliang@princeton.edu