University Honors Program

Experiential Learning Reflective Essay - Research

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**Title of Project:** YARS2 research

**Thematic Area:** Research

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Summer research reflective essay

Part 1:

**Provide a brief description of your experience. What did the experience entail? What was most significant about this experience? How did the experience meet and/or differ from the expectations you described in your proposal?**

University honors program is really supportive and the advisors in this program always try to support us in many way. This experience of mine prove that the honors program is a program that one should consider if they want to strike for the best in their college. After finishing my SURF program with the children’s hospital, I decided to continue working with Dr.Huang on another genetics project. In this experiment I will do research on the gene YARS2 (mitochondrial tyrosyl-tRNA synthetase) with Dr.Wang, a post-doc in Dr.Huang’s lab. This enzyme catalyzes the esterification of a specific amino acid, Tyrosyl, or its precursor to one of all its compatible cognate [tRNAs](http://en.wikipedia.org/wiki/TRNA) to form an [aminoacyl-tRNA](http://en.wikipedia.org/wiki/Aminoacyl-tRNA). This form will then come to the ribosome to make polypeptide chain. In our case, one of our patients has mutation in YARS2. The interesting part here is that when turned on and off the mutation on this gene, two point mutations in the mitochondria were affected. The two point mutations here are 3635G-A and 11778G-A. These two point mutations are two typical point mutations in mitochondria disease. A most widely seen disease related to these two point mutations is Leber’s hereditary optic neuropathy (LHON). People with this disease usually lose their vision permanently when they become adult and it is mostly seen in male. I will be the one who mainly take care of the cells. I grew the cells, split them when needed and collect them for data analysis and further purposes. This is a really important role because the quality of the cells will determine the quality of the research. I also did some mitochondrial isolation for the next step of the experiment. The most significant things about this experiment were, of course, the new knowledge that I learned along the way and a fact that doing research is not always easy. This project was stopped after we have been doing almost all the culture work to collect mitochondria. The reason why it was stopped was because the cell quality is not good. During the process of growing cells, I found out that some of the cell did not grow well as we expected although our procedure was correct. So we had to stop after collecting mitochondria from 8 out of 12 cell lines. It was really frustrating at first when we found out that we have to stop the project but I guess this is also something important to keep in mind whenever you conduct research on anything. Not every project is a success, you just have to learn from your mistake and keep moving forward. Especially in a professional working environment like Children’s hospital, you always have to keep moving forward and work hard on every single project even if it turn out to be not successful. Everything I did in this project met my expectations and I learned a lot of things. I personally feel like this is also a test for me to see if I can handle the pressure and the frustration of a research career and I think I dealt with these difficulties really well and I still love doing research after my work of 3 months got canceled. I think that learning from my failure is a really important lesson and it helps you re-evaluate my choice in life.

**How have you have made progress towards meeting at least 2 of the research learning outcomes you identified in your proposal? Provide specific examples from your experience to illustrate your points.**

I definitely made great progress towards meeting 2 of the research learning outcomes that I mentioned in my proposal:

**I will possess a well-developed awareness of literature in the field**

This project surely has helped me to develop my awareness of literature in the field really well. I got the chance to culture new type of cell, lymphocyte, and learn about a new gene (YARS2). Before I started this project, I have no idea which group this gene belong to and what its function is until I dig into a lot of articles to learn about it. This gene control the activity of an enzyme that catalyze the esterification of a specific amino acid to t-RNA to from aminoacyl-t-RNA which then will be transferred by a ribosome to a growing polypeptide. We think that there is an interaction between nucleus genome (which is YARS2) and the mitochondrial genome. Our workflow was first, I will grow the cell (which will take approximately 2-3 months) then we will collect mitochondria from the cells. After that we will collect t-RNA and tRNA-AA do data analysis on them. We will perform Northern blot to get the aminoacyl-t-RNA and analyze their function. We have a really good workflow and we were on track with our cell culture. This project is a really exciting project because the idea about interaction between Nucleus genome and Mitochondrial genome has been around for a while but there was no actually evidence about it. Therefore this research was a really promising project. Some of the literatures that I read during the time I work on this project were:

**Confirmation of the mitochondrial ND1 gene mutation G3635A as a primary**

**LHON mutation**

Juhua Yang, Yihua Zhu, Yi Tong, Lu Chen, Lijuan Liu, Zhiqiang Zhang, Xiaoyan Wang ,

Dinggou Huang, Wentong Qiu, Shuliu Zhuang, Xu Mab,

**Complete mitochondrial DNA genome sequence variation of Chinese families with mutation m.3635G>A and Leber hereditary optic neuropathy**

Rui Bi, A-Mei Zhang, Xiaoyun Jia, Qingjiong Zhang, Yong-Gang Yao

# Histidyl-tRNA synthetase.

[Freist W](http://www.ncbi.nlm.nih.gov/pubmed?term=Freist%20W%5BAuthor%5D&cauthor=true&cauthor_uid=10430027)1, [Verhey JF](http://www.ncbi.nlm.nih.gov/pubmed?term=Verhey%20JF%5BAuthor%5D&cauthor=true&cauthor_uid=10430027), [Rühlmann A](http://www.ncbi.nlm.nih.gov/pubmed?term=R%C3%BChlmann%20A%5BAuthor%5D&cauthor=true&cauthor_uid=10430027), [Gauss DH](http://www.ncbi.nlm.nih.gov/pubmed?term=Gauss%20DH%5BAuthor%5D&cauthor=true&cauthor_uid=10430027), [Arnez JG](http://www.ncbi.nlm.nih.gov/pubmed?term=Arnez%20JG%5BAuthor%5D&cauthor=true&cauthor_uid=10430027).

# Toward the full set of human mitochondrial aminoacyl-tRNA synthetases: characterization of AspRS and TyrRS.

[Bonnefond L](http://www.ncbi.nlm.nih.gov/pubmed?term=Bonnefond%20L%5BAuthor%5D&cauthor=true&cauthor_uid=15779907)1, [Fender A](http://www.ncbi.nlm.nih.gov/pubmed?term=Fender%20A%5BAuthor%5D&cauthor=true&cauthor_uid=15779907), [Rudinger-Thirion J](http://www.ncbi.nlm.nih.gov/pubmed?term=Rudinger-Thirion%20J%5BAuthor%5D&cauthor=true&cauthor_uid=15779907), [Giegé R](http://www.ncbi.nlm.nih.gov/pubmed?term=Gieg%C3%A9%20R%5BAuthor%5D&cauthor=true&cauthor_uid=15779907), [Florentz C](http://www.ncbi.nlm.nih.gov/pubmed?term=Florentz%20C%5BAuthor%5D&cauthor=true&cauthor_uid=15779907), [Sissler M](http://www.ncbi.nlm.nih.gov/pubmed?term=Sissler%20M%5BAuthor%5D&cauthor=true&cauthor_uid=15779907).

I am developed my awareness about newest issues in the field by following this project. I learned things that will lead me to my goal in the future, to become a doctor in genetics field. This project is a great start for me in experiencing genetics subjects.

**I will have the ability to think beyond the just completed research and articulate how my world of view has been impacted by the experience.**

It was a great project to work on, especially when I have already worked on NARS2, which is also a gene of this group. I am especially interested in doing research with this group of gene to study more about the interaction between Nucleus genome and Mitochondrial genome. Having the chance to work in doctor Huang’s lab is a life changing experience because I had the chance to just focus on mitochondrial genome, a not to big but also not to small area to do research on for an undergraduate student. I think with the skills that I have right now, I can perform experiments on my own and conduct my own project for the next experience.   
Although my project was stopped unexpectedly, I did, however, learn from other scientists in the lab by helping them do their experiments so eventually I have developed the skills that I do not necessarily need for my project. By helping others, I have the chance to understand part of their project and surprisingly their projects are also connected well to my project. Although I mentioned this in my last reflection already, seeing how well things are connected in this lab amazed me of how doctor Huang is in organizing and operating the whole lab system. To be able to do this I think you have to plan everything in your head already and you know what you need to do to reach your final goal. I am really impressed with a real professional research physician like doctor Huang. This make me want to become a real research physician more and more. I know that there are still a lot to learn but I just fell so excited about what I can do if I can make my dream come true.

**Part 2: So What?**

* How did your experience impact your development (academic, professional, and/or personal goals)?
* **What academic theories, readings, courses, or concepts did you rely upon to inform to your experiential learning work? How did knowledge of this theory, reading, course, or concept contribute to your learning in this project?**

This project is project that I work on after doing the SURF program with Dr.Huang’s lab in the summer so I used everything I learned from the summer to execute works in this projects. Everything run more smoothly than in the summer. I have already known what I need to do so I was really confident about my works in the lab. I also knew people in the lab well so I had a really easy time working in the lab. In the summer I mainly culture fibroblast but in this Fall I cultured both fibroblast and lymphocyte so it was a little bit more complicated but I managed to make everything work. I just had to be more careful when I take care of them because you really do not want to contaminate your cell. With the fact that it will take approximately 2 to 3 month to culture the lymphocyte, contamination is something that you do not expect to happen during the culture process. I have to clean everything before I change the type of cell so that nothing can contaminate my culture work. The training from the summer really helped me big time during this time. With the high level of comfort when handling fibroblast, I was able to execute my work more quickly and more effective. In the summer it took me around half an hour to do the culture work for fibroblast but now it only take me 10-20 minutes to handle them without any contamination. I think the level of confidence also helped me a lot when I learn to culture lymphocyte too. I was not shy or nervous when I try the new experiment. Instead, I was really calm and I listened really well to the instructor before I started doing everything on my own. My culture work went really well until we noticed some strange things happen to our lymphocyte. Two third of our cells was good but a third of them have some problem. We tried to save them but it no use. Maybe because these cells carry mutation in them so their rate of growing is significantly slower than others. Our controls grew really well but our mutants grow really slow. This also is a thing that I need to keep in mind when I try to conduct an experiment next time. After seeing the slow grow rate of these cell, we decided to stop our project to save time and money.

**Part 3: Now What?**

* **How are you integrating what you learned from this experience into your life? What connections have you drawn between this experience and other experiences both within the classroom and beyond?**
* **How have you shared your learning with others and disseminated your work? Who was your audience and what did they learn? What did you gain from the experience of sharing your learning with others?**

I am right now still working with Dr.Huang and these skills are really valuable to me because right now I am able to handle work by myself without observation from my mentor. I know that I have contributed greatly to 3-4 projects and I hope all of them will be successful. Of course doing research is never simple, and this project show that it is true that sometime things will not work the way we want it to but in the end we have to try your best because we know that we are trying to learn things that are not proven yet. This experience is unique compare to others experience that I have had before. This is the first time I have faced difficulties and frustration in our lab. It is also my second medical science research because before that all I do was chemistry. It is really exciting to see the impact that we can make on the world by just spending time doing what we love in the lab. I really appreciate the way labs works because every time we publish something, everyone around the world will get the benefit from it even when we make mistake, it will also benefit somebody. This is something that I want to do with my life. Contribute my small life to this great thing that is being done by other scientists. After facing all these struggles, I still love what I do and I appreciate the chances and opportunities that the honors program has given me. I will continue to do research with doctor Huang and try my best to get into medical school.