

Working at a Cancer Research Laboratory as a Medical Student: Experience of an Indian Student Studying Medicine in Russia

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Abstract

Medical education is greatly supplemented by experiences in medical research. In Russia, many international students study Medicine, and some engage in research along with their educators and supervisors in different fields of medicine. Being one of such students, I present my experience working at a cancer research laboratory in a Russian university. Additionally, I discuss the opportunities and difficulties that an international medical student may face while studying medicine and doing research simultaneously.

Key Words: Medical Student; Russia; Biomedical Research (Source: MeSH-NLM).

The Experience

The Beginning of the Journey

Like most universities in Russia, Kazan State Medical University has a students' science society that offer medical students their first exposure to research.¹ Dry-lab work and clinical research are promoted through this system as it is cost-effective and accessible. Further, there are more opportunities for dry-lab research in clinical medicine as compared to preclinical work. Conversely, in the departments of biochemistry, microbiology, pharmacology, physiology, and pathology, the majority of research is wet-lab and requires additional resources. In my program, only a few exceptional students are invited to conduct wet-lab research depending on their performance in the students' science society. I was fortunate to be one of them.

My journey in cancer research started in November of 2018 at the Department of General Pathology with Professor Sergei Boichuk's lab. At the time, he was our teacher of pathophysiology and was investigating the mechanism of imatinib resistance in gastrointestinal stromal tumor (GIST) cells.² During the laboratory introductory session, the first question that I thought of was how the cancer becomes resistant to imatinib. It was a difficult question that inspired my involvement in research. Initially, my task was to shadow the senior research assistants so as to learn the lab protocols and techniques. The most important thing I learnt was how to culture and passage the cells in a sterile condition, and how to treat the cells with the drug of choice. Apart from that, I also had to learn the protocols of Western blot, flow cytometry, immunofluorescence, and the use of pipets and various other tools in the laboratory.

Difficulties to Overcome

Among many difficulties, the language barrier was the most arduous to overcome. I was the only international student working in the laboratory along with a few Russian students. The best way for me to interact with the rest of the team was to speak and understand the Russian language. It was difficult in the beginning, as the vocabulary that we use in day-to-day life in Russia or during clinical rotations in the hospital is vastly different from the vocabulary used in the laboratory. The knowledge of the nuances of the language is also key to establishing collaboration among colleagues. Thus, it took much longer for me to gain good working confidence and establish communication with other members of the team. Nevertheless, all of my senior researchers and colleagues helped me in every possible way to integrate into their work culture.

Another issue was balancing my studies with my laboratory work, which was certainly a challenging task. After attending all classes and lectures, I could spare only two to three hours every day for my laboratory work. On some occasions, I could assist a senior in their work, while on other occasions I would apprentice whoever was available. It was difficult to synchronize with the work schedule of the senior research assistants as their time was limited and so what should have taken a month to learn took much longer. Sometimes I had to make a choice, either to study for the next day's topic or to stay in the laboratory to learn the protocols. Often, I chose the latter. Consequently, this affected my class ranking. However, looking at the possible prospects, it was a price that I was willing to pay.

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Attending Conferences

Assisting others in their work was my only contribution during the first year. Although I had learned most of the laboratory protocols and knew how to use different equipment, I was still unoccupied. This was due to the pre-allocation of project assignments and the absence of any new tasks in the laboratory. Thus, I requested my supervisor to permit me to submit the research results to international conferences, for which I already had the necessary experience. After due diligence, we decided to submit the research result to the 12th Annual Meeting of the Korean Society of Medical Oncology (KSMO).³ The submission process was simple, and the research was accepted for a poster presentation. However, arranging to visit the conference proved to be a tedious task. Finally, with financial support from the University, I attended the conference in Seoul, Korea ([Figure 1](#)). The conference was held for two days, 7th and 8th November 2019, from dawn to dusk. Previously, I had never attended a conference of this magnitude, with many speakers and participants from all around the world. Among the speakers, the most prominent name was Dr. William G. Kaelin Jr., Nobel Prize Laureate in Physiology or Medicine 2019. His presentation on 'The VHL tumor suppressor gene: Insights into oxygen sensing and cancer' provided an in-depth understanding of the oxygen sensing mechanism of cells and its implication in renal cell carcinoma. It was indeed an overwhelming experience to meet so many great minds in just one place.

Soon after my return from Seoul, I decided to send our research data to another conference: the second United Kingdom (UK)-Russia Young Medics Conference in Cambridge, UK. It was much smaller in scale and was meant for medical students only. Therefore, I expected to network and make new acquaintances with like-minded students. The conference was held on 6th and 7th January 2020. This conference provided me with an insight into the work culture, lifestyle, and social values of those living in the UK. I presented our findings on the combined effect of BGJ398 and Doxorubicin on the Imatinib-resistant GIST.⁴ Although doctors and oncologists present there found the results interesting, they also criticized it as Doxorubicin is not normally used for treating GIST. From the discussion, I understood that results that are found to be useful preclinically may not always translate into clinical significance. This was a critical lesson for me.

The Pandemic

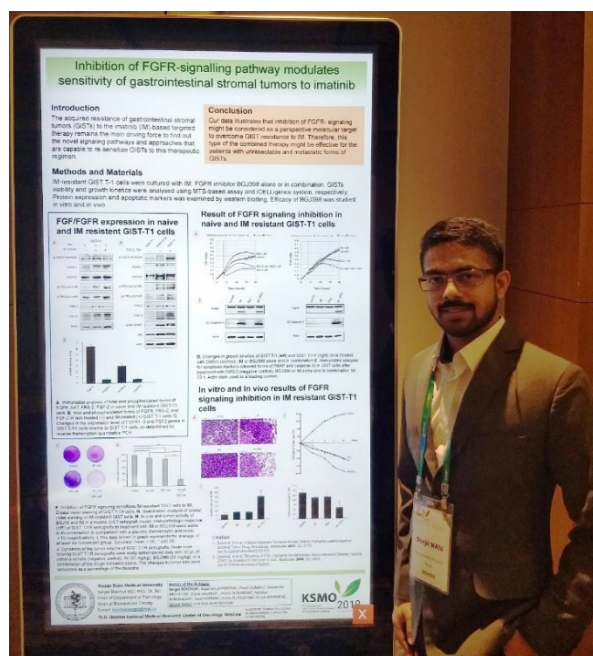
Upon my return, I reported to my supervisor and requested to join any current projects. At the same time, a new project was initiated to investigate the mechanism of resistance of GIST430 cells, which assigned to me. The initial results of the project were published at the 94th International Student Scientific and Practical Conference at the VII International Youth Scientific Medical Forum, "White flowers".⁵ Soon after, a lockdown was imposed all over Russia in response to the coronavirus disease (COVID-19) pandemic. Work in the laboratory was halted, including our project. Only a few necessary experiments were continued and just a few people at the laboratory were working

in shifts. Students were barred from visiting the University for safety reasons, thus preventing me from working in the laboratory. We could only attend our lectures and classes online and leave the hostel on weekends. Life had come to a standstill for six months. Meanwhile, I started working on a different project which was more statistical and could be done easily at home. This project focused on the correlation of spice intake with colorectal cancer. By using international databases, we found a significant correlation between these two variables. Thereafter, I prepare a paper/report on this project, which took about for months. Finally, it was published in the *International Journal of Medical Students*.⁶

Failure and Success

It was only in September 2020, once the lockdown had been lifted, that I was able to visit the laboratory to resume the project. Our lectures were still being conducted online, so I had more time to dedicate to my experiments. I had to culture the cells, treat them with proper chemical agents, lyse them, and conduct Western blotting to find the target proteins. We proposed a few hypotheses to describe the resistance mechanism of GIST430 cells. During the following five months, we tested these hypotheses in multiple attempts, using different experimental methods. Unfortunately, every single experiment produced negative results, even after ruling out confounders. This back-to-back failure was difficult to deal with; every time the experimental results came out negative, my self-esteem decreased to a point where I started doubting myself. The harsh truth and the lesson I learnt about research was that failure is more common than success. After getting only negative results for five months, the project was concluded.

Figure 1. Digital Poster Presentation at KSMO 2019 International Conference, Seoul, Korea.



Soon after, I joined another project with a colleague working on triple-negative breast cancer (TNBC) in the same laboratory. This was a new beginning for me. We were investigating the activity of a targeted drug, Infigratinib, on the TNBC cell line. During this project, time-management was a challenge. Along with the research and class work, I had to prepare for the Indian screening exam (FMGE), which would provide me with a license to practise Medicine in India. With such little time and a tight schedule, I had to leave my room at 8am only to return at 11pm after attending classes, lectures, and lab work. I then had to cook, eat, and study for the next day until 2am and repeat the same routine the next day. After almost seven months of rigorous investigation, we finally had fruitful results. We found that Infigratinib also targets p-glycoproteins in taxol-resistant triple-negative breast cancer cells and synergizes with Paclitaxel, increasing its lethality. Indeed, this finding was a moment of joy for us. Finally, the data from this project was published in March of 2022.⁷

Lessons to Learn

Without any doubt, the hardships that I experienced taught me lessons that I could not have learned any other way. The first

lesson was to be persevere any adversities that may come. Learning to accept failure is the key. Secondly, an aspirant must be ambitious, and with the help from an experienced supervisor, this ambition will bear fruit. Thus, having a good supervisor who would support you, even in difficult times, is crucial. Thirdly, exposure is necessary. Conferences not only allow us to learn about the current advancements in research, but also provide us with the necessary networking opportunities. Moreover, one must learn to ask for help when needed because research is a team effort and without help one cannot get too far. Lastly, the science and the experimental methods used in research are difficult and can be overwhelming to a novice. Thus, one must be resilient and take enough time to understand these concepts. Thereon, some tend to remain in the research field for the rest of their lives, while others find it difficult and quit. Research is for those who are madly enthused about it- it takes a lifetime to be a scientist; there is a beginning but no end.

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