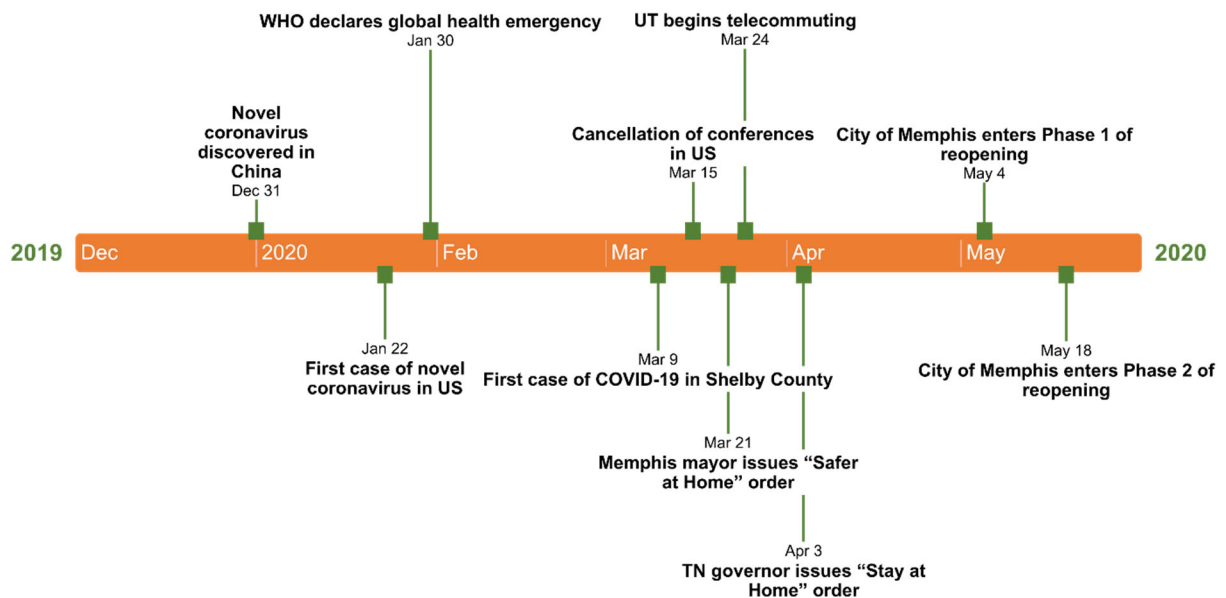


COVIDaptation: Career Survival During COVID-19 – Bench Scientists “Working from Home”

Having migrated to the U.S. in pursuit of a scientific education and a career after growing up in a country with civil unrest where curfew and school closures were a fact of life, I am not a foreigner to vagaries. Since migrating, I’ve worked numerous jobs during college to pay the steep foreign-student tuition fees during undergrad; went entire semesters on four hours of sleep a night during grad school; and worked 14-16 hour days straight during postdoc. My focused effort allowed me to complete my postdoctoral fellowship within two years and start my own laboratory in 2012 with funding support from my mentor. Little did I know that it would take me a year to renovate the laboratory, establish research protocols, train personnel, and organize my research focus/projects. I quickly learned that financial stability would be a moving target I will have to pursue throughout my independent research career which was launched in 2015. My laboratory, currently comprised of five members, is my life.



COVID-19 made its entry into society at the latter end of 2019 and our city in March. The changes that were imposed by the governing agencies are highlighted in the timeline above. The impact of “COVID-19- imposed shutdown” and other changes have a unique impact on individuals and therefore, the team. Each of our stories are different. Therefore, I asked each member of my team to share their stories so that others with similar job responsibilities as them may relate. The following is our story of “COVIDaptation” and an outline of protocols and procedures to collectively survive and overcome barriers in the horizon to stay scientifically productive and personally sane.

Amali Samarasinghe, PhD: Associate Professor of Pulmonology

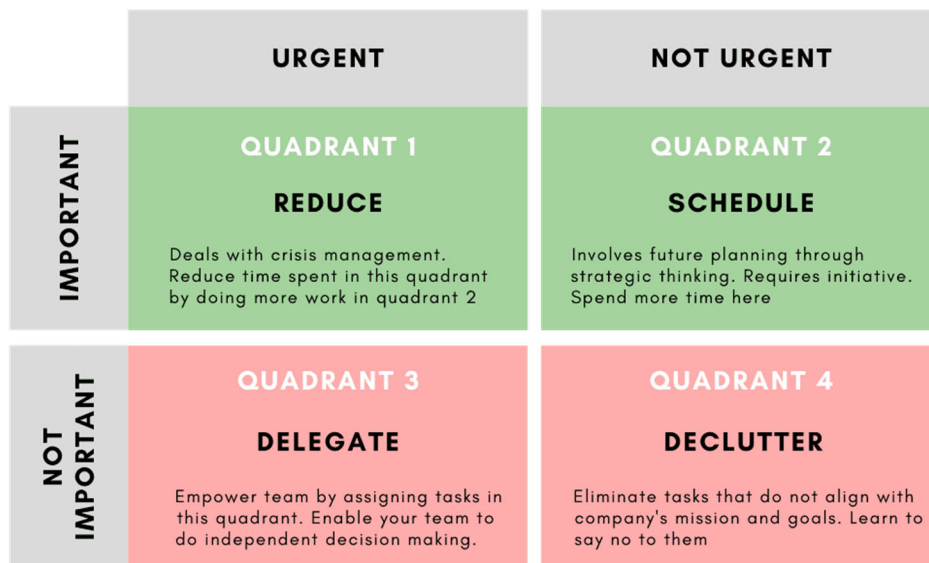
I am what one would call a Type A personality, or if you go by Thomas Erikson’s personality classification system, a ‘red’. I am stubbornly persistent, extremely organized, passionate about science, a perfectionist that expects no less from others, and critical. I am critical of myself, my team, our science and data. My logic is simple – if we can see our mistakes, we can correct them and leave little for others to critique (because of course, our colleagues are exceptional reviewers that catch



everything). My team and I work hard, and we work with clear-cut goals and timelines. We are productive as a unit where everyone plays a demarcated function in all tasks whether it is as simple as keeping the labs clean or as complicated as performing a multifaceted study involving 100 animals from which we collect multiple organs for a number of downstream experiments. Our laboratory is busy from the time doors are unlocked by me at 6:30 a.m. until they are locked at night by my postdoc at 7:30 p.m. I too had finally, after years of struggle, settled into what my work-life balanced routine: wake up at 5:15 a.m., be in lab from 6:30 a.m. until about 3:30 p.m. (plus an additional 30-60 minutes based on what how many questions my team has when I announce my departure for the day), spend time with family (husband, dogs, and birds), go to the gym (my fun place), have dinner and watch a movie, read/write grant applications or papers for three hours before bed. I had my long- and short-term goals that I was progressively working toward to achieve in terms of my work (funding, publications, mentoring, scientific citizenship) and my life (family, health, wellbeing). All was well, until March when COVID-19 came to our city of Memphis and lab shutdown – every PI’s nightmare – became a reality.

I am faced with two major challenges; 1) As a hands on leader, how do I navigate the work from home landscape to stay productive? and 2) How far do I deviate from my ongoing, long-term research projects to contribute to COVID-19 research and perhaps even align lab initiatives with long term COVID-19 research activities?

As a basic scientist being on site is essential to conducting the work necessary to make discoveries. While reading and writing are components of our work, wet lab work needs exactly that, a wet lab! My main focus was to establish protocols to protect the safety and well-being of my lab members while maintaining a scaled-down level of productivity. We operated under the safety net of institutional daily screening that takes place before being permitted on premise and implemented a software solution to track compliance. Furthermore, a dynamic schedule was imposed to minimize exposure to one another while in the lab or animal house. The scaled-down level of activity meant that we had to prioritize between partially completed research studies, pre-planned research studies nearing execution (grant milestones), and designing new experiments to stay abreast (prelim data for grants, data for papers) using the Eisenhower matrix (below, a true lifesaver!) to identify, prioritize and streamline activities.



Prior to the COVID-19 era, we religiously conducted our lab group meetings. The ability to conduct the weekly meeting virtually was “the” means to provide continuity and stay focused on important matters. This unprecedented time made me reflect on my leadership style as to motivate the team to stay positive and productive.

How far to deviate? Even prior to COVID-19, I was constantly challenged with information overload when staying current with knowledge strictly within my field of expertise. However, reading to stay current with evanescent clinical, biological, and socioeconomic articles related to COVID-19 has sent that facet of my life on a tail-spin. I have learned to ignore the rapid publications outside the rigorous reviews and now only read proper, peer-reviewed journal articles. Directly aligning my current work with a COVID-19-related research initiative. It is apparent that there are significant funds allocated to COVID-19 research projects in the near term and it seems imperative to align research activities to stay competitive in the grants arena. As an investigator that dealt with an overload of manuscript and grant reviews, I came to the conclusion that deviations or add-on science was not for me at this stage in my career with a small lab.

Although it took a few months for me to get accustomed to the new routine, I too have a new normal. I begin my day 8 a.m. and end it around 3 a.m. I spend similar amounts of time in meetings or calls and only go into the lab when my presence is required (therefore, I don't distract myself by walking into lab and tinkering with experiments because that is my happy place). I spend more time reading and writing than I did before, which I have learned to enjoy more. I make it a point to take a few hours during the day and in the evening to spend time with my family and take a walk and work off the extra calories. As I reiterate to my team, this too shall pass. We have to make sure that we recognize ourselves and our accomplishments at the end of it, as we will be stronger.

Kim LeMessurier, PhD: Research Associate and Lab Manager

I've been a research-associate-level lab manager since the inception of the Samarasinghe lab, which currently is comprised of a postdoctoral fellow, two technicians, an MD research faculty and an undergraduate student who has joined us remotely during her summer break. About two years ago, I almost completely transitioned out of the wet lab into a more management/admin/data analysis role, the vast majority of which I complete from home. The more intensive administrative work is addressed by our PI's administrative assistant, Angie. However, I did retain my main project and interest, which is investigating influenza and pneumococcal co-infection in individuals with allergic asthma.



Respiratory pathogens have been my focus since undergraduate, when I joined a *Streptococcus pneumoniae* lab in Adelaide, Australia. Infectious disease was perhaps one of the less cool areas to migrate to when HIV, stem cell research and cancer got the lion's share of funding and media attention. It was this under-recognition of a pathogen that caused over a million children's deaths each year in developing countries, but barely registered in the mind of the first world, that attracted me to the area to begin with. Almost two decades later, SARS, Swine flu, and now SARS-CoV-2 pandemics have increased recognition of respiratory pathogens as agents that are relevant worldwide.

After completing my post-doctoral fellowship in Memphis, Dr. Samarasinghe's group was a perfect fit for me, because she was interested in the how a common airway disease such as asthma would affect disease pathogenesis and outcome caused by Influenza A Virus (IAV). IAV and *S. pneumoniae* have a

special relationship, with a recent previous infection with IAV predisposing a person to a more severe infection with the usually commensal *S. pneumoniae*. There have been no reports yet that *S. pneumoniae* shares a similar relationship with SARS-CoV-2. However, with the predicted co-occurrence of a second wave of SARS-CoV-2 infections and seasonal influenza in the Northern Hemisphere, it seems a real possibility that both medical systems and people's immune systems may be overwhelmed by the double viral threat, leaving the body vulnerable to disease caused by common bacterial agents such as *S. pneumoniae*.

As my role in the lab had already changed to one which was conducive to telecommuting before the COVID-19 pandemic, I was sheltered from some of the changes that our university implemented. My husband was also fortunate to be able to work remotely. However, the amalgamation of telecommuting and daycare closures has been the most difficult work-related challenge for me during the COVID-19 pandemic. When physical labs were shutting down across the United States, there was some ambitious notion that working from home as researchers would be a rare opportunity for us to focus on re-analyzing data and writing papers. As many families quickly discovered, having young children and two parents working out of the home is much better on paper than in reality. It was immediately apparent to me that looking after a two year old (well entrenched in the 'terrible twos') and a baby, and getting productive work accomplished, were mutually exclusive events. My husband and I were surprised that breaking up the day so one parent looked after the children in the morning and the other in the afternoon did not work as well as expected. Numerous video meetings and set times where work duties needed to be performed were preclusive to having the block-shift working hours. The strategy that we eventually employed was to attend meetings during the day while shuttling the children to the parent with lower workload that hour, and addressing other work in the evening after the children were in bed. While this worked in terms of productivity, subsisting on a few hours of sleep a night is not sustainable in the long term. And it helped that my lab group stoically persisted with meetings, even when my head was covered with a blanket or a toddler was catapulting off the sofa behind me.

The concept and reality of analyzing data and writing papers remotely are also vastly different beasts. While people who telecommute all the time have systems set up for receiving and processing data at home, for researchers who were thrust into the work-at-home lifestyle seemingly overnight there were practical considerations that slowed down the publication pipeline. You begin to write up a paper and find the data for a side experiment you now wish to include is back in the lab. After going to retrieve the data (or, in my case, asking Sofia our technician to scan and email tens of pages of notes), you remember that your home computer lacks the software to perform the analyses. Writing methods is difficult when all of your lab notebooks are housed in the laboratory (where they are required to remain). Or in a colleague's lab book, who is also working from home and discovering the same limitations of doing so as you. Maybe this is a strong argument for computer-based lab notebooks backed up onto a cloud system, but for us and many labs who are currently married to the analog variant, the lack of easy access to our research is a hinderance.

Many aspects of lab management are also more time consuming. Monique, our new research technician had the dubious honor of joining during the time our lab was shut down which was challenging for her, our administrative assistant Angie and myself, who were discovering alternative protocols for initiating new personnel into the group and university without an on-site presence. An overreaching issue of working remotely has been the lack of face time. There are no number of reports and emails and Zoom meetings that can replace physical presence in the lab. Small reminders that usually would have been addressed casually in conversation require emails; in many instances, multiple emails. Not only is it harder for lab members to remember to do something "tomorrow" or "whenever

you're rotated in lab next", as opposed to being able to address the issue immediately, but as soon as the email is sent the issue or reminder has been put in writing. This was amplified during the COVID-19 pandemic, as responses to emails both internally and externally were delayed because many recipients were working outside of normal business hours. Helping staff with experiments or analyses needed to be done using Zoom, requiring us to scan and upload documents and data in advance and contend with poor internet speeds. Not all staff had a laboratory software equipped computer at home, which was also something that needed to be rectified.

COVID-19 brought with it many additional requirements needed to accommodate the new work situation for the lab. For our research group, working partly from home was a new experience; we had no idea of what was a reasonable output to expect with this format. This meant I had additional tasks of creating work goals for the lab, assessing lab member productivity and how many hours they were in the lab vs at their homes. As certain group members still attended the lab on occasion, there were rigorous cleaning schedules and checklists to prepare, COVID-19 work guidelines that needed to be generated and approved by the university in order to keep everyone safe and in compliance with institutional requirements, employee compliance to monitor, increasingly scarce PPE to source from vendors much of which is still indefinitely backordered to this day. Some of these are ongoing considerations that will likely remain even after workers are fully phased back into our workplace.

Perhaps what I miss the most is the lack of professional interaction. There are benefits of not being physically present at work (turning up to work in pajamas comes to mind), but it's incredibly mentally draining to have such limited personal contact with colleagues. The beautiful thing about working as a basic research scientist is that ideas and solutions arise from spontaneous conversations in the lab or within the department: being able to bounce around ideas on the fly, having someone answer you when you're thinking out loud about a problem. If your assay runs weirdly, there's someone who's had that same problem or can help with the troubleshooting. While I appreciate the work flexibility of telecommuting, I'm also more appreciative of the advantages of being physically present to manage and perform research in a science lab.

Sofia Kim: Senior Research Assistant

After finishing graduate school, I started in the Samarasinghe lab as a research assistant. I was six months into my position as a research assistant when lab had to abruptly shut down due to COVID-19. On March 23 during our weekly lab meeting, Dr. Samarasinghe instructed us to prepare our lab for a potential shut down by end of the day. As a large part of my responsibilities in the lab involve helping maintain the laboratory, this meant that I had to freeze all the ongoing cell lines for long term storage. In order to enforce the shutdown, all lab notebooks and freezer keys were relocated to lab office where they could be safely locked away. Fortunately, our lab was allowed to remain operational during the shutdown but at a limited capacity. My training on cell culture and colony management came to a halt due to inconsistent hours spent in the lab during the shutdown and observing my supervisor while adhering to social distancing guidelines was not feasible.



We had to make many changes to our day-to-day lab operation. For starters, weekly lab meeting had to be organized virtually through Zoom. This was a new platform for us, and we had some teething problems. Poor internet connection meant that at least one lab member always appeared pixelated, and people were regularly frozen or disconnected. We often had to repeat ourselves because audio issues made our voice sound muffled, or someone had to remind people they had forgotten to

unmute themselves before talking. Although some things could be done virtually, bench work and animal experiments are fundamental parts of laboratory science that still need to be completed in person. In many of our studies, mice are rendered allergic over a period of several weeks and are infected with respiratory pathogens for up to two more weeks. When the university reduced operations, we were in middle of two large animal studies and in process of expanding our mice colony for future studies. We were fortunate that our animal facility stayed open so we were able to continue our experiments. However, the animal staff worked reduced hours, and we were in constant communication with them regarding our colony management and new cage requests. When animal facility staffs worked full time, we were able to make our request for spare cages within 48 hours. But because staffs were coming in only few days a week, we had to carefully schedule when we make request to align with facility staffs' work schedule.

Typically, when animal tissue harvest is scheduled, we begin to prepare two to three days before the harvest date. When harvest involves lot of animals, I would spread tube labeling throughout several days. But with inconsistent hours spent in lab during shutdown, Kim and I had to schedule a day to come in just to label tubes. Normally, large animal harvests require several of us to participate, with each person being designated specific roles in the process. We have a small procedure room within the animal facility. Because of social distancing, we needed to rethink our bench arrangement, which previously had been set up in a production line format. Meenakshi harvest tissue from mice in BSC that was installed in animal housing area. I weighed and took picture of harvested tissues from a bench in opposite corner of the room from Meenakshi. Due to the square footage of the room, Kim was required to process the harvested tissue in a connected but separate procedure room. New set up took some time to get used to, but it turned out to be quite effective and may become a standard bench set up for future experiments

Routine tasks like recording received orders had to be done differently. Before the shutdown, I would gather all packing slips on Friday and hand them to Angie, our administrative staff. However, since Angie was telecommunicating, packing slips had to be scanned and emailed to her. Shutdown even changed how we received packages. Our lab is physically situated in Le Bonheur Hospital so the receiving dock remained open as normal, even after the University of Tennessee was closed. However, since our lab was mostly unstaffed, packages had to be delivered to building's floor manager's office who then notified us of the delivery or brought us the packages personally.

The University of Tennessee officially reopened on June 1. Reopening of lab required additional steps to abide by new guidelines put in place by the university. We had to maintain six feet distance between us. In order to maintain proper social distancing, I had to move out of our office space and relocate to bench in other room. We had to sit in separate corners of conference room during lab meeting to maintain six feet distance from each other. Additionally, we had to sign-in to daily health check before leaving for work in the morning. Personal area and benches had to be wiped down before work and at the end of the day. Benches and common areas in the lab had to be disinfected with cleaning solution every three hours. Each member of the lab had to sign cleaning logs after their cleaning duties. COVID-19 crisis has brought many changes to lab operation. Additional steps were put in place to ensure safety. Although it was difficult at first, but we were able to adjust accordingly to abide by new safety guidelines

put in place. It is uncertain if lab operation can go back to pre-COVID-19 but I am sure we will find a way to make it work.

Monique Payton: Senior Research Specialist

In July of 2019 after 11 long beautiful years of employment at a renowned cancer hospital as a Senior Research Technologist, a transition was required of me, not because of COVID-19, but because my PI decided to shut down her lab and enjoy retirement. My job search began as COVID-19 was beginning to make its mark in the US, and my transition was during the peak of the pandemic. I knew landing a new job would be challenging amid the coronavirus pandemic but I still applied for positions. With luck a new email read “I saw your application for a Senior Research Specialist position, I would like to interview you.” I realized how fortunate this opportunity was for me, because the number of people looking for work or newly unemployed is at historically high levels.

My interview was a success and I got the job! I am now a member of Department of Pediatrics Asthma Research Program at UTHSC in the lab of Dr. Amali Samarasinghe where the labs focus is immune responses during co-morbidities, and interactions between the allergic host and respiratory pathogens. Understand the impact of the work of our lab and many research laboratories are conducting around the world living in an era of pandemics {1} is more important than ever.



Due to COVID-19 UTHSC had already restricted all but essential jobs when I started employment, and Dr. Sam’s physical lab had shut down with the lab members mostly using computer-based communication and interactions. My first couple of weeks of work were conducted from home, which was now the new “laboratory” for myself and many researchers. For new employees in a research lab there are physical training and expectations, in addition to many mandatory courses and organizational challenges to adapt to. Human resources, Angie and Kim got me registered for online laboratory and safety training, institutional and new employee orientation training. This was all online, which was highly unusual as typically these courses were taken in person. UTHSC had not only restricted its campus attendance, but had enacted a hiring freeze, so this was new territory for everyone involved and needed a plethora of email back and forth: I do not know how a ball did not get dropped but we made it work. Online training was a success.

Nonetheless working from home has become “Battle of the Wills.” It’s a challenge working from home if you have never worked remotely before. I am not technologically challenged, but there were many imperfections of telecommuting from home that I was not expecting. First my horrible Wi-Fi speed that kept buffering during all of my online meetings. Our household’s one computer belonging to my daughter had a virus, and my printer ink was no longer in stock meaning I needed to buy a new printer. Instead of jumping into the new work situation, I spent the better part of my first week correcting all these unforeseen circumstances. I now have even more time to clash heads with my teenager, who is winning by the way, and even complete household chores usually reserved for the weekends. Although working from home is a big challenge mentally because of the work I do, I realized following a schedule and sticking to it and moving my office out my bedroom will be a great upgrade in productivity.

Currently, even though UTHSC has starting to open up in phases and people are working in our lab again, my wet lab training as a basic research scientist and the physical demands and personal interaction of working in the laboratory are still slowed down compared to normal. Even though, for laboratory training I have most of these skills set, training and documentation is still a very important

part of onboarding of a new employee to a lab. Physical training on experimental assays and preclinical work that is unique to the lab has been difficult due to the university's social distancing requirements. This has impacted the lab's routine and my progress by halting my training, potential start of initial experiments, day-to-day practical task, and developing personal relationships with my coworkers. For now, I'm performing experiments and tasks that only require one person until restrictions are eased and normal work of yesteryear is restored.

COVID-19 has required us all to change our behaviors, challenge relationships and halt goals and ambitions. The anxiety, stress and fear of starting a new job during the COVID-19 pandemic, while also worrying about the health and safety of my family and friends, have all been a reality of my transition to this new stage of my career. I am fortunate to still be part of the working population, whether it is working from home or in a research laboratory. The patience and communication of my employer and co-workers has overcome much of the emotions of uncertainty of my future employment. I know when all this passes, I can master this new change heads-on and apply myself to my new lab.

Angie Cooper: Administrative Specialist

I provide administrative support to a group of dynamic PI's and their staff, in two different divisions of Pediatric Research. My contributions entail scheduling meetings, travel approvals, releasing lab supply orders, processing invoices and reimbursements, balancing ledgers, facilitating contracts, maintaining inventory, and assisting with associate hires and onboarding. In addition to these duties are departmental expectations which must be met. It requires a great amount of flexibility, organization, and teamwork to be successful. The COVID-19 pandemic has tested those qualities and transformed our campuses around the state with unprecedented changes, relaxing some policies while initiating new ones never seen before.



The university responded by implementing an indefinite work from home policy, which posed its own set of challenges. Creating a functional workspace comparable to my office space has taken time and assistance from our university's IT Help Desk. Internet connectivity can be slower, and trips to the office were made to reset desktop VPN connection problems. I also tend to work more while at home. Since I don't commute, I will start early and work later. If I have a heavy workload, I may work on the weekend because of the convenience. Communication can also be an issue as some people may not have laptops, desktops, or reliable internet connection. The Pediatrics Department has purchased laptops for administrative assistants who need one, in order for them to remain productive. Working remotely has affected email response times. I've noticed that my lab groups are more responsive than my administrative peers.

The pandemic also created changes in some university policies. Mandatory travel bans to protect faculty, students and staff were instituted, conferences and symposiums were either cancelled or transitioned to online platforms such as Zoom due to ever-changing information and restrictions. This caused an immense backlog as all pending flights, hotels, and registrations had to be cancelled. Depending on the carrier, some flights were credited, having to be used within a year of cancellation. While some universities were unable to reimburse faculty or staff for expenses, our university offered to reimburse all out-of-pocket expenses. Another policy that has been affected is one requiring wet signatures on forms. The university has been trying to initiate digital signatures for some time, but the pandemic has been a catalyst in implementing that change sooner than expected. Return To Work guidelines have been put in place as faculty, students and staff prepare to return to campus. Online

testing of those policies and guidelines is required before returning to work. Masks must always be worn. They can be cloth or disposable, but N95 masks are preferred if available. Desk space must be sanitized upon arrival, throughout the day as needed, and at the end of the day. Hand washing with soap or hand sanitizer is also required after touching any surface.

As we navigate through this new normal until a vaccine is discovered, we still don't know what the future holds, or challenges that await us. All we can do is stay vigilant and prepared. But I do feel it has made us more patient with each other, more innovative in problem solving, and more productive as a team.

Meenakshi Tiwary PhD, MSc: Postdoctoral Fellow

July 29, 2017 was one of the most exciting yet intimidating days of my life. I moved to the U.S. with no family or friends not only in the U.S., but without knowing even a single soul in the entire Western Hemisphere. The journey from India to join the Samarasinghe lab as a postdoctoral fellow at the University of Tennessee Health Science Center was filled with trepidation. Luckily, Dr. Samarasinghe and her lab welcomed me with open arms and have been wonderful to work with and learn from. The team that she has assembled is a delightful group of women coming from rich and diverse backgrounds. I immediately felt at home.



My PhD training was not in allergy or the immunological response of infective respiratory disease as is Dr. Samarasinghe's lab focus. Through Dr. Samarasinghe's mentorship, I learned the techniques needed to be successful in the field of immunology. However, as a post-doctoral fellow, I have a finite amount of time to publish papers and develop skills important for a successful career, such as communication, networking, leadership, and career planning. As an international postdoctoral fellow on a J1 visa, extending my stay for a few months is complicated and expensive. Therefore, time is a significant commodity for someone such as me.

As a senior postdoctoral fellow, my next career move is to successfully secure an industry or academic job. As this transition requires months to years, I aim to begin my job search in 2021. This year, Dr. Samarasinghe received funding support for me to attend the American Association of Immunologists conference in May. However, the conference was cancelled due to COVID-19, thereby shattering my plans to network and talk to potential employers. Following the cancellation of these conferences with no indication of when in-person conferences will resume, I am concerned about missing important career opportunities. In the United States, the biological science job market in either academia or industry has always been highly competitive. As of April 2020, there has been an increase in unemployment by 14.7 percent (20.5 million people). This will have consequences for postdoctoral fellows seeking jobs in academia or industry. Many universities have frozen their hiring processes until 2021, while industries have dismissed many of their employees. I am entering a highly competitive job market due to an excessive number of qualified applicants for a declining number of open positions, and worry about the negative ramifications for foreign postdoctoral fellows like myself.

My research focuses on antiviral responses of eosinophils during influenza virus infection, involving many *in-vitro* and *in-vivo* techniques. I also contribute in many ways as a team member during bigger lab experiments such as fungal asthma modeling and our co-morbidity mouse modeling. After the Tennessee governor issued a "stay at home" order in March, our university responded by shutting down all but critical activities. For us, that meant that our laboratory remained partially operational, but at a

vastly reduced capacity. Our PI requested that we only come to work if absolutely required. Working from home had a rippling effect for me. I had to freeze my active cell lines and postpone *in vitro* assays, which were considered non-essential experiments. As I'm about to enter the fourth year of my post-doctoral fellowship, it is essential that I invest most of my working hours performing experiments, generating data, and preparing manuscripts. However, due to COVID-19, I was left with no alternative but to transition from long hours of bench work to mostly working from home. I was mostly limited to manuscript writing and flow cytometry data analysis. Meanwhile I performed some of my experiments and contribute to crucial team projects. When I did physically go into the lab, commuting was a challenge as I am dependent on public transport and was hesitant to use the bus system or Uber during the COVID-19 pandemic due to safety concerns.

Our lab is mostly focused on animal research. We heavily utilize a mouse model of fungal asthma and influenza using a variety of mouse strains relevant to our research that we breed in-house. Our colonies are taken care by Sofia, who is training to take a larger role in the breeding schedules. COVID-19 lockdown has slowed this hand-over process: therefore, I still needed to participate in some of the breeding decisions and colony management. We were fortunate that our animal facility continued to run during the lockdown, but it was not at full capacity. We were able to maintain our mouse colonies, but there were some necessary changes in workflow.

Even when my laboratory reopened, we were not at a normal pace. The delay in shipment and delivery of items has impacted my research. For example, we had designed and planned experiments requiring live imaging to explore mechanisms of bacterial uptake by immune cells. To do this we had specifically purchased an automated microscope and expected to generate data for the manuscript using the microscope. Our administrative staff tried to get the microscope company to install it, but their technicians could not come due to COVID-19 transportation issues. We had to install the microscope with the help of technical specialists through Zoom. They gave us training over video chat, but it is not as effective as having a hands-on demonstration.

There are lots of negative aspects of COVID-19, but all hopes for progress are still not lost. I was able to stay productive during lockdown by performing few crucial experiments, synthesizing new research ideas, literature review, critically analyzing data, and writing manuscripts. Our lab continued to organize frequent meetings during lockdown. I also regularly attended the professional society meetings to enhance my knowledge base. I whole-heartedly believe in the research that we are conducting. A pandemic like the one we are currently experiencing demonstrates the utmost importance of the field of virology. Despite the struggles COVID-19 has presented, I have grown through this experience but hope to never experience it again.

Nick Morin, MD, PhD: Assistant Professor of Critical Care Medicine

I started my first academic position in pediatric intensive care roughly 18 months before the COVID-19 pandemic made its way to our part of the United States. As an MD/PhD, my career goals include developing an independently funded research program and my clinical and scientific interests converge on the physiology and immunobiology of infectious lung injury. I was able to join my current lab whose members have expertise in lung physiology, immunology and respiratory infections including influenza. Being junior faculty with research aspirations provides ample pressure to acquire funding and produce publications. I have been lucky to be in a supportive environment with mentorship and some financial means to begin to work toward my goal. I was able to apply and be awarded a one-year institutional research grant to help jumpstart my research.



Getting started in a new lab is challenging but I was able to rely on my labmates for help from simply finding supplies to learning new techniques and equipment. However, because my clinical responsibilities caused only a sporadic presence I had not yet fully connected with all members of the lab nor was I part of day to day lab life. Work from home restrictions and social distancing have further prevented me from being fully integrated into the lab. My research efforts had just begun to pick up steam when the multiple email announcements came in succession from the university restricting international travel, followed by all travel, in-person meetings and ultimately closing campus except for essential services. The lab had to be shut down effectively halting significant progress for what has turned into months. I have felt definite anxiety about the delay and I remain unsure what this means for my current funding timeline and expectations for productivity at the administration level.

While my research came to a near standstill, my clinical responsibilities continued and came with new challenges. Much has been written about the difficulty faced by medical workers in various parts of the world with overwhelming patient numbers and supply shortages. As a pediatrician I have seen far less significant illness from COVID-19 than my adult medicine colleagues. Much of the effort in our children's hospital has been in preventing spread to and among staff and protecting the parents and caregivers of our patients. Early on we did not know what to expect in the pediatric intensive care unit. To date we have not seen much critical respiratory illness from active SARS-CoV-2 infection. However, I still feel a strong sense of responsibility to keep up to date with the evolving literature surrounding COVID-19 with new symptomatology and associated disorders such as the emerging multisystem inflammatory syndrome in children (MIS-C). This syndrome is being increasingly seen in our hospital and does lead to significant critical illness. Because MIS-C develops weeks after acute infection I am worried that we are just at the beginning of this evolving disease process without any knowledge of how common it may become nor what the lasting implications it will have on children's health.

Work-life balance has always been a huge effort for me, with my wife and our three children. My wife is a pediatric radiologist and we met during the first years of medical school. Our children currently span the ages of four to twelve. Arranging childcare has always been a major and sometimes difficult endeavor for us. Prior to COVID-19 our children all went to the same school and had before and after school programs that allowed us to adhere to both our work schedules without significant issues. We received notice on March 13 that the school and all programs would be closed for one week at a time which soon became the rest of the school year. With both of us being essential hospital staff, it has been difficult for one of us to be home all the time and there has been significant juggling of our schedules that has only been possible thanks to our colleagues' willingness to trade and cross-cover when needed. For our children, the transition to remote learning has been interesting and sometimes demanding. On occasion all five members of our household have been in an online class or meeting at the same time. While the initial increased family time was welcomed, there is no substitute for the social aspect of going to school and all our children regularly express a desire for peer companionship. Each of our children has had unique reactions and stresses as a result of staying home and we have had to adapt by making changes such as allowing increased online social time so they can interact with others to outfitting our backyard to encourage exercise. We do not know what school will look like in the coming year and whether there could be long term social and emotional consequences of childhood social distancing.

As places and institutions begin to open up with a new normal, I've started wondering more about what will happen to our careers and how this time will be viewed from afar. I worry that the expectations for academic advancement may not fully account for the dramatic changes COVID-19 has caused to all hospitals and universities. Will grant applications and renewals be delayed or require less for successful

funding? Or could the process become more rigorous with more people who may have delayed applications during current cycles or developed new ideas while away from the bench? I also worry about the state of trainees in research and medicine in the coming years. Medical students were removed from clinical rotations for a significant time but will be graduating on schedule. It is likely that all interviews for all graduate programs, medical school and residencies will be virtual for the foreseeable future. This could lead to less movement of trainees around the country and be potentially detrimental to places that rely on bringing in professional students from outside their area. We have been rightfully focused on containment of COVID-19 and now appear to maybe be able to take a breath. However, it remains imperative to identify and plan for the long term effects we will encounter for years to come.

This time has been truly unprecedented in my life. The far-reaching effects of the SARS-CoV-2 virus continue to be discovered. It has been a period of stress, anxiety, and learning for everyone I know. It has led me to reflect on my place in society and as a physician and scientist and I am encouraged both by the dedication and endurance of all medical staff and researchers fighting this new health threat.

Sanjana Kosuri: Undergraduate Intern

Changes caused by the COVID-19 pandemic have immensely derailed plans that I had mapped out for my undergraduate career. These changes may have lasting impacts on my future as a scientist, but I remain optimistic as I reimagine what my next few years as a student will look like amidst this global crisis.



I am currently a Neuroscience major on the pre-med track with the goal of attending medical school after undergraduate school. As a sophomore in college, I value gaining a wide breadth of experiences to explore various career paths that are available. Beyond my coursework, I have spent time shadowing doctors, volunteering at hospitals, teaching science lessons at elementary schools, and planning sustainable development projects for villages in India. This summer, I was looking forward to exploring my interests by acquiring experience in other avenues related to science and medicine. Although I had extended exposure to clinical settings, I had never spent dedicated time working in a research lab. Having learned techniques including gel electrophoresis and ELISA in my introductory biology course, I was eager to apply and build upon these skills in the real-world research arena. When searching for a lab, I spoke with others who had completed summer programs, and many students felt disappointed with their experience because they were not given independent projects and most of their summer was spent simply adapting to the lab. After hearing from classmates with a range of experiences, I wanted to ensure that my own experience was a positive one. I was initially interested in Dr. Samarasinghe's lab because of its applications to pediatric asthma, and after my interview, I was certain that I would be given ample responsibility even as an intern and that this would be a very rewarding experience. I was initially going to be a full-time summer intern for the lab, but due to the circumstances, I am now working as a remote summer intern focusing on learning more about the lab's research through reading scientific papers and working to bolster the lab's online presence.

During the first week of March, my school year abruptly came to a halt due to COVID-19. A group of students had gone to Spain for spring break and, disregarding university policies to quarantine at home for two weeks after visiting WHO-identified high-risk countries, returned directly to campus. The day that classes resumed, several of these students tested positive for SARS-CoV-2. As a result, the university suspended all in-person activities to protect students from the excessive spread of the virus, and along with the rest of my classmates, I had to return home and finish my courses remotely. Anxieties surrounding remote learning include concerns regarding the stability of the internet

connection that will permit an uninterrupted zoom lecture and worries about laptop malfunctions during an exam. I live at home with my parents, grandmother, and nine-year-old brother. Luckily, both of my parents are able to work from home; however, we all have to thoroughly coordinate meeting times, ensure that my grandmother is cared for, and also homeschool my brother. These distractions have detracted from my learning experience, leaving me less prepared for future courses that build upon the foundational material I was meant to master. My courses have now ended, but I'm left having to relearn material that I know I will need to have a better grasp of for classes in the fall semester.

My summer plans have also changed tremendously. I was excited to start working in the lab the first week of May through July, and I had received a scholarship to be able to volunteer abroad for three weeks in August. Unlike most students, my plans have not been completely derailed. My scholarship has been postponed until next summer at which time I hope it will be safe to travel. Although in a limited capacity, I have still been able to do some work in the lab, and hopefully my role will grow over the coming weeks. It is unfortunate that I am unable to immerse myself completely in the lab by conducting experiments and learning directly from lab members. If I was able to join in person, I would have learned valuable lab skills including various lab techniques, effective data collection, analysis and presentation, and many other skills that can only be acquired in a research laboratory setting. It is simply not possible to simulate this experience in a remote setting; however, via Zoom I have been able to attend weekly journal club and lab meetings, learning more about the lab's work and gaining skills in reading and understanding research papers, staying updated through email communication throughout the week. I have also taken on the role of the lab's social media influencer to help expand the lab's online and social media presence, which may not have a part of my role if I was working in person on experiments. Through virtual meetings, I have been able to connect with lab members much more than I had expected without physically being present, as we all can connect over coping with the same situation. I was initially skeptical of whether I would be able to gain any substantial experience through virtual participation, but I was quickly proven wrong. One of the first papers that I read for journal club, was one regarding experiments conducted by the senior member in the lab, and upon first glance, it felt as though the advanced science in this paper was well beyond my reach. However, by listening to explanations from lab members and by critically thinking about the answers to questions asked to me, I quickly realized that there is much to learn even from my desk at home. Although I am not gaining the skills I would have in a traditional lab setting, I have been able to expand my communication skills, observe how the lab functions, and think critically about scientific papers.

The accumulation of changes has left significant anxiety over the future. Now, like many students, I am considering taking an extra year after college to spend time gaining experience in other scientific fields to explore the future opportunities that most interest me. As colleges decide on plans for the fall, the next school year will definitely be far from normal, with limited opportunities to continue participation in student organizations and other activities like shadowing in the hospital, leaving students in a state of uncertainty. However, I feel a responsibility to my hardworking immigrant parents to always put my best foot forward and follow my passions, and I have been inspired by the diverse group of lab members, most of whom are women, whose dedication to science never fails to motivate me. Sometimes, I feel as though everything I do now is a stepping-stone for the career that I will pursue for the rest of my life, so I must ensure that every day is productive. Other times, it feels like these four years in college will be the most flexible time that I will ever have, and that I must enjoy every moment, taking advantage of social activities and spending time with friends. This pandemic has left little room to grow on both fronts, but I am looking forward to finding new ways to explore my interests despite the current circumstances.

From our lab to yours, we wish you a happy COVIDaptation.