

GDB Practicum Pods Transcription

Winter 2022

Episode 8: Valerie

[INTRO]

Indira D'Souza 0:09 Okay. Hello, everyone! Welcome to Episode 8 of the Global Disease Biology Practicum Pods. In this podcast series, we will be talking practicum projects with current and former GDB students. All students in the major are required to complete a practicum project before graduation. This project involves students finding a faculty mentor, conducting research under the mentor's guidance, and then turning their research experiences into a publishable scientific manuscript. Tune into Practicum Pods to learn more about research, mentors, and the GDB practicum experience.

[INTERVIEW]

Indira D'Souza 0:56 Welcome to the Pod! I'm your host, GDB Peer Advisor Indira. I use she/her pronouns. Today I am joined on the show by the lovely Valerie. Valerie is a current student, and a fourth-year, and their practicum title is...

Valerie Nyasimi 1:12 My project is the "Efficacy of the bacterial metabolite 2,4-diacetylphloroglucinol in controlling the Chickpea pathogenic fungus *Fusarium oxysporum*."

Indira D'Souza 1:26 Awesome! Okay, so hi, Valerie. How are you doing? Do you mind sharing your pronouns with us?

Valerie Nyasimi 1:33 Hi, Indira. I am doing well, and I use she/her pronouns.

Indira D'Souza 1:39 Awesome. It's great to have you on the Pod today. So, I'm wondering if you could tell us a little bit more about what topic your practicum project is on, and why this topic interests you.

Valerie Nyasimi 1:52 So first of all, thank you for having me here today, and happy New Year! So, my practicum project topic falls under endo-plant pathology, and it involves a three-way relationship between: a plant, specifically chickpea, a bacterium, by the name of *Pseudomonas*, and a fungus called *Fusarium oxysporum*. So, a little bit more about that relationship is that the fungus destroys chickpea plants and seeds. And this particular bacterium that I have, it has been shown to encode for genes that produce a

particular metabolite, which is the 2,4-diacetylphloroglucinol. And I know it's quite a handful of a name, a mouthful, so we can shorten it out to 2,4-DAPG.

So first of all, my bacteria was collected in southeastern Turkey, in the wild, in wild fields of chickpea. And this was done by the Cook lab and after genome analysis on these soils, they found that there were particular bacterial strains specifically called—in the *Pseudomonas fluorescens* genus and this bacteria had been shown to encode for this 2,4-DAPG molecule. So, what I'm doing in particular is testing if it does inhibit this fungus which affects chickpea and causes major losses in production.

And why this is of interest to me is because, like I said before, *Fusarium oxysporum* does create major losses in production of chickpea. And so, in order for farmers who are growing chickpea to kind of get a headstart on it, they have to treat their seeds with fungicides. And unfortunately, that can be very costly because this pathogen is very persistent.

So, if my research were to work, and it is in the pioneer phase, what it would do is that—basically shifting farmers from using fungicides, which does become more expensive in the long run, and have them use the bacteria instead. Which would be a little bit more of an affordable option for them and in the long run does help to keep the environment a lot safer because, I mean, fungicides are chemicals. And at the end of the day, like we're introducing chemicals to, you know, this big rhizosphere that we have in the soil with many bacterial species in there. So, if we could just keep this bacteria in there in the soil—and I mean, they do build symbiotic relationships with other bacteria and the chickpea—this would definitely be a better green alternative versus using fungicides.

Indira D'Souza 4:56

Okay, awesome. So, this would be cost-effective and safer. Okay, great. That's really cool! So my next question is: how did you find your practicum mentor? And were there any resources that helped you the most as you searched for faculty members to conduct research with?

Valerie Nyasimi 5:16

Yeah, that's actually a very interesting story for me. So, I found my practical mentor through my class, which was GDB 103, or specifically, it's the Microbiome of People, Plants and Animals. And I used to go to office hours a lot, and I would talk to my TA, or

teacher's assistant. And from there, I was able to learn that that particular lab had opportunities to hire students to assist the graduate students for their project. And it worked out because my TA at the moment was looking for someone. And so I applied for the position, and I was able—I got in.

Indira D'Souza 6:03

Awesome!

Valerie Nyasimi 6:05

From there on, I was able to attend lab meetings in the Cook lab, and just learning about what they do as a lab caught my interest. And so I decided to email my practicum mentor to ask if he would be okay with taking me on board, and it worked out.

Indira D'Souza 6:27

Okay, great. So in this case, it was actually a GDB course, like a major requirement course. And then you were able to connect with faculty and grad students by going to office hours. Okay, so awesome. I don't know if we've heard that, that method of finding a practicum mentor before on the Practicum Pod, so that's great. So, next question. So, we're going to ask more specifically: what type of research do you engage in? So, is it in-person? Is it virtual? Are you doing experiments? Are you making observations? Basically, what does a typical research shift look like for you when you sign in for the day?

Valerie Nyasimi 7:04

So, my research is in-person, and I do a lot of experimental and observational data for my particular practicum. And a typical research shift starts with planning on the weekend about the goals that I want to accomplish for the research week. And a good example is, like, my past week, my main goal was to accomplish exchange of—basically to successfully transform my bacterial strain using marker exchange mutagenesis. Which in short, is just to create a bacterial mutant. And with that in mind, so I have a goal, and then I do a little bit of digging, basically research on literature to come up with protocols that will help me to carry out the experiments and achieve this goal.

And then, when I get into lab on Monday morning, let's say, I usually check in. I pop into my mentor's office to see if he's available. And usually, for the most part, he is, and if not, I will send an email to just kind of check and verify if my protocol seems okay. And once I go ahead, for the most part, he'll add a little bit of edits. But once I get the go-ahead, I go ahead and carry out my experiment. And in the process, I do collect data and I write down everything. It's strongly encouraged to have a lab notebook in lab

when you're actually in person. And so everything goes into my lab notebook.

And some days, it could take a short time to carry out experiments, and some days, it takes hours. In between, I just do a lot of research on literature to problem-solve if I'm problem-solving, or just to prepare for the next day. And kind of what I finish at the end of the day sets the stage for what I will be accomplishing the next day and the week after, at the end of the day, depending on what I was able to accomplish.

Indira D'Souza 9:15

Got it, awesome. So I'm wondering if you could actually talk a little more about the mutagenesis and what that looked like last week, since you referenced that.

Valerie Nyasimi 9:25

So, it was stressful. Mutagenesis is honestly it can be very stressful. So, part of the things that I had to do was start by planning on, like, as far as like how much quantity I need for bacteria, and we have to also get the bacteria ready to be transformed. And in this situation, I was using electroporation, which is basically you pass a current quickly into the bacteria to make the membrane a little bit more permeable, so that it can accept our particular plasmid that you're introducing into the bacteria.

And so, typically it starts with growing your bacteria in liquid media, and then from then on, you have to clean the bacteria. Basically, get them ready to make for electroporation, because this is going to be, like, a traumatic experience for the bacteria. And so, you have to ensure that you get them ready by removing as much salt as possible, which is to make them electrocompetent. So you wash them with a particular solution. And then after that, like, you have to resuspend them in a certain amount of media. And then you electroporate, and it can be very tricky because what matters most is after, like, you zap them with it, with all this electricity, is this voltage is the recovery period. Because I mean, we are traumatizing bacteria. So it's like, you have to ensure that you are feeding them with, like, food, you're giving them all this food after to, like, to be like "hey, wake up! You're okay! Sorry!"

Indira D'Souza 11:25

"Sorry, I just zapped you!"

Valerie Nyasimi 11:28

"Here's all this food!" And so after that, it's just a process of waiting game. You plate your transformant at that point, and then you have

to wait to see. You could take up to two hours to wait, and in my case, I was waiting—I use different timeframes. So, there was immediate electroporation, and plating them, and putting them to grow. And you wait different times based on what anyone's particular protocol is. And then you just wait. But you have to—so we use market exchange because we try to insert a marker to tell us, like, if the bacteria was able to take a particular plasmid, and to kind of get rid of it. If we're trying to, like, exchange a gene, we will use a marker, and in most of the cases, it is antibiotic resistance gene.

And so you plate once you have electroporated, you plate your bacteria in media that contains that antibiotic. And you have to wait. Bacteria takes 48 hours to grow, specifically *Pseudomonas*. So, at 28 degrees. So, I waited for about two days, and you will start to see colonies that grow on your antibiotic plate, which contains media. So, if you did well, you will see colonies. If you didn't do great, you'll see nothing. And it's okay to not see anything. It takes a while to kind of figure it out. And that just sets the basis of "okay, so we got colonies. Now we need to go in and verify through PCR: did this plasmid actually get incorporated into the bacteria?" Because just because we see it does not necessarily mean that it's on there. You have to prove it genetically it's in there.

Indira D'Souza 13:30

Yeah, awesome. Well, thank you so much for going more into detail on that. That's really cool.

So next, I'm going to ask about your relationship with your mentor. So what is your meeting schedule? Do you meet regularly? Or do you work more closely with a graduate student? I know, you mentioned that you do try to check in with your mentor at the beginning of the week, and kind of go over your goals. So it sounds like they're pretty hands on, but I just wanted your official kind of reflection on how your relationship with your mentor works.

Valerie Nyasimi 14:03

Yeah, my mentor and I actually have a really great relationship. And we do meet at least two times in a week, other than me popping in to check in all the time. But yeah, we have a really great relationship. It's kind of hands-on based on like the materials that I need help with in the lab because there's definitely a lot of new equipment that I have never seen or learned about. So, I will pop in to ask help for that, and during our meetings, we also discuss what I would need.

And it's also hands off, I would say because he lets me try things out so that I can kind of get the feel of what it is to design, like designing your own experiment, because that's what I do. I research a protocol. We'll talk about something, research a protocol, and then he will verify and say "okay, this is fine" or "you might want to add an extra step here and there."

And as far as working closely with a graduate student, in the beginning I did, but lately I have just been on my own and one-on-one with my mentor. It's definitely very interesting, I would say, but you grow a lot from performing experiments by yourself. But the one thing I will say in the Cook lab, everybody is very supportive. So, in a situation where you needed help, like, you could definitely pop in and ask any of the graduate students to come in. So it is, I would say, a little bit more independent, but there's graduate student help needed, should you need help with something.

Indira D'Souza 15:52

Awesome. Yeah, I'm really glad that you have a supportive lab environment. That's great to hear.

So now moving on to our optional questions, I'm going to ask what skills did you acquire during your research experience that might be useful in your future? So, where are you headed after Global Disease Biology?

Valerie Nyasimi 16:14

You put me on the spot! But one thing, I will be honest, and everybody who does research can agree, I have learned to be patient. Patience has been the one thing I have, I am taking with me from now on. And also thinking outside the box is a thing I am also—it's a continuous process that, you know, I constantly have to, like, I'm learning it every time based on experiments I'm doing and to be prepared for the unexpected. Doing research requires a lot of critical thinking, and patience, and being able to look for alternatives when things don't go as planned. Because, I mean, experiments could go well one week, and the next week, the same experiments just for verification purposes don't work at all. And it can be very frustrating. So definitely, I can say that patience, and being able to think outside the box, and just be prepared for the unexpected. Because I mean, everything is unpredictable. And you could do the same thing, the same steps, and it just doesn't work one day, the other day it works.

So this is definitely important for my future because after GDB I do plan on going to graduate school, specifically PA school. And since I will be joining the healthcare field, I really think that these are great things and great tools to have in my box. Because, I mean, dealing with unexpected situations like in healthcare is something that, you know, it's normal to encounter. And it's just about being patient and being ready to, you know, face those challenges. So, I can say that, you know, research lays that foundation to be able to grow further and expand on certain skills as far as, like, you know, as a student and a professional in the future.

Indira D'Souza 18:29 Great, thank you so much for reflecting on that, and I hope that those skills that you've gained from your research really do impact your ability to be a fantastic PA!

[OUTRO]

Indira D'Souza 18:42 Thank you so much, Valerie for chatting with us about your GDB practicum experience. Our students are so excited to hear about these projects and learn about how to approach research in a large university setting.

You can visit gdb.ucdavis.edu to access the rest of the podcasts in this series or you can find us on Spotify. If you like listening to Practicum Pods and have suggestions for future topics for the pod, please let the GDB Advising staff know at gdb-advise@ucdavis.edu

Thank you everyone, and have a great week! Thanks, Valerie!

Valerie Nyasimi 19:17 Thank you!