The Taproot Podcast

Season 5, Episode 4

Guest: Kevin Cox, Jr.

Hosted by Liz Haswell and Ivan Baxter

Transcribed by Jo Stormer

[Theme music]

Liz Haswell: Welcome back to The Taproot podcast, where we dig beneath the surface of a scientific publication to tell the stories behind the science. I'm Liz Haswell.

Ivan Baxter: And I'm Ivan Baxter. Communicating our work to nonscientists is a challenge for all scientists. How do you put your work into terms that they can understand, and what do you need to do to reach them where they are receptive to your message? And how do you do all that while managing this crazy world of pandemics and social stress?

Liz: Today's guest, Kevin Cox, is passionate about bridging the communications gap between the science community and his online and in-person spaces. We talked to him about his research and how he uses multiple platforms to spread scientific knowledge and understanding. One note before we begin, we recorded these episodes in October and then life intervened. So any references to recent or upcoming events may not match our current situation. With that, on to the episode.

[Theme music]

01:48 **Ivan:** All right, well, today's guest is Kevin Cox. Kevin is a St Louis native but did his PhD at Texas A&M University before returning to St Louis to do a postdoc with Blake Meyers here at the Danforth Center. Kevin has won numerous awards and grants and was recently awarded an HHMI

Hannah Gray fellowship. Welcome to The Taproot, Kevin.

Kevin Cox: Thanks for having me, Ivan and Liz.

02:13 **Liz:** Today's paper is titled, "TAL effector driven induction of a *SWEET* gene confers susceptibility to bacterial blight of cotton," by Cox at al in Nature Communications. So, Kevin, can you give us a very brief summary of the results in this paper?

02:31 **Kevin:** Basically has paper involved working on this bacterial disease on cotton called *bacterial blight on cotton*, and it's caused by a *Xanthomonas* species. Before then scientists didn't really know the molecular mechanisms of this disease. They just had some hypothesis of what might've caused her based on previous studies with rise and cassava and peppers, but there weren't really any direct evidence. What we were able to show was the molecular mechanisms of this disease which showed that this bacterium uses this effector protein called a TAL effector to activate this plant sugar transporter in cotton - which is called a SWEET gene. By activating the SWEET gene in cotton, it was able to promote this water soaking symptom in the plant and allow the bacteria to multiply, and possibly use that sugar as a carbon source to continue to spread and affect the rest of the plant.

03:38 **Liz:** One of the things that people who are not familiar with plant-pathogen interactions don't know is how much the bacteria is able to manipulate the plant and basically turn the plant to make a little house for it and give it a bunch of food. So that's kind of what these TAL effectors are doing, right?

03:59 **Kevin:** Yeah, that's exactly it. I like to call them *eukaryotic transcription factors in bacteria*, cuz that's what they are. They're basically going into the plant and just hijacking their gene regulation in order to use it for their advantage. Because at the end of the day the bacteria has to survive and it does what again.

04:18 **Liz:** What's the role that these SWEET genes play? Why does the bacteria want to turn the SWEET gene on?

04:25 **Kevin:** So these SWEET genes, they're sugar transporter genes. Normally in a plant, the plants use these sugar transporter genes for nutrition for themselves or for sugar transport throughout the plant, or for even pollen development. So the bacteria will wants to use that sugar because they like sugar and they use sugars to grow. The bacteria's thinking, "Well, if I can take the sugar transporter's gene and activate it at a very high level to where I can start feeding off that sugar in order to survive and multiply even more," that'll benefit the bacteria a lot.

05:01 **Ivan:** So, Kevin, in some respects it's a very simple paper because you have these TAL effectors. They're turning on a gene and you were able to show that: turn on the gene, it allows infection. You block that, it doesn't infect. But I noticed there's a lot of techniques actually used in the paper that were fairly new. This was a 2017 paper, so you're probably doing this in 2015, 2016, or before. You're doing full genome sequencing. You're designing TAL effectors, too, for altered sequences and all these kinds of things, so it's one of these works that is like enabled by technology just advancing so quickly in our field. Was that how you started the project?

05:45 **Kevin:** I think the biggest thing to know is some of the technologies, they really start to improve more when I was a graduate student working on this project. I know PET [paired-end tag] biosequencing, that was kind of discovered back in the early 2010s, but in the last few years (maybe 2013, 2014) that started to get really refined and started to really become a powerful sequencing technology. Adam's group (my collaborator) was using PET bio a lot to sequence a wide variety of *Xanthomonas* species. At the time we were thinking, "Well, we can do the same thing for these cotton pathogens, too." That was something that kind of evolved a little bit later in the paper.

06:36 **Ivan:** Cool. Kevin, I really liked this story. One of the things that always strikes me about these sorts of questions is when you're doing these sort of molecular studies in agricultural crops, you have this wealth of resources to deal with because the agronomists and the breeders all know the strains that are problems in their fields; they know the resistant cultivars, and you can sort of say, "I have this perfectly set up experiment – susceptible/resistant, pathogenic/non-pathogenic," and you can just kind of go in there and really dig in and use the molecular biology to tell the whole story and figure out what's going on. That was something that's really powerful and part of that's probably because you were at A&M, so you had connections and people who knew these things. Was that one of the things that sort of was attractive to you about going to work at Texas?

07:41 **Kevin:** There were kind of two big reasons. One reason was I was looking for plant pathology schools or a good agriculture schools to go to, and Texas A&M they were pretty much at the top of the list and they had a real good ag school; hey had a solid plant pathology department; and they also had a professor that I wanted to work, which was Libo [Shan] so she ended up becoming my mentor. I really loved the work that she was doing and I could easily see myself working with her for five or six years or whatever. That was the big reason.

The second one is mainly because A&M gave me the best offer. At the time I was a undergrad student. I already had my daughter at the time, so I wasn't really making that much money. I had a job, but it was like a minimum wage type of job. So I applied for three graduate schools. One ended up losing my applications materials; the other one they admitted me, but it was on probationary; and A&M gave me this offer that I couldn't have turned down. It was like a university fellowship packaged into it.

08:56 **Ivan:** That's a no brainer.

Let me step back. You were born and raised in St Louis city. You went to college in University of Missouri St Louis, just down the road from here. What made you want to go into ag? I mean, UMSL is not an ag school.

09:10 **Kevin:** It's a crazy story. I guess to give you my background, when I was growing up I always want to become a doctor because I felt that was the best way to help people. Specifically, I want to become a pediatrician because I liked working with kids at the time. So I went to also with the attention of being a pre-med student, but halfway through my sophomore year I took a microbiology class and I fell in love with the subject completely. I was just fascinated what these microbes can do - how they can harm people, how they can benefit us. It just completely blew my mind, so at that point I had decided that I didn't want to do anything else except research microbes. I didn't know what exactly yet, but I just knew it has to involve microbes.

10:01 A year later, I actually had got a part-time job at the Danforth Center as an undergrad lab tech and I had worked with Todd Mockler for about a year and a half, like 2012 to 2013. That was my very first exposure to plants. To be honest, before the Danforth Center I didn't really too much care about plants. I thought they were nice but nobody really motivated me; nobody really inspired me that showed, "These plants are actually cool." But when I got to the Danforth Center, I just fell love. I was just in awe the number of things plants can do for us; that just blew my mind. Then if you think about it, there's come a point (and Todd kind of told me this when he was mentoring me), he said, "There will come a point when we might not get sick as much but everybody's still got to eat and, plants, they provide that power for us." So I just took my passion with microbes and my new developed passion with plants (being at the Danforth Center) and just pursued plant pathology.

11:05 **Ivan:** That's awesome.

Liz: That is such a great story. I love the power of both a class and of hands-on research that just sort of came together to give you the bacteria plus the plants, and now you get to study both of them. That's really cool.

It sounds like that's that those are some experiences and some mentoring experiences that you want to give back, right? You're back home in your hometown, and so what are you doing now to give young people the information and inspiration of plants that you feel like you didn't get until later on?

11:44 **Kevin:** One thing that I'm trying to do is to spread that love of science or plants (or both altogether) that I had got to other students or other kids that are much younger than I am. I wasn't really inspired by plants and I didn't know you could become a scientist when you got older. If I can take that ability and pass that on to kids and let them know, "Hey, this is the stuff that you can do and it's actually really fun and you'll enjoy it," I believe that can help them. Right now, what would I like to do is go to other schools and give science lessons or talk to other students about career goals. I like to do a lot of science communication through my social media with Twitter or Facebook, or with my YouTube channel every once in a while. It's just anything that I can do to communicate science to the public and communicate my passions to the public.

12:43 **Ivan:** Going into schools is something that lots of plant scientists do and you have all these other channels. Which ones do you feel like are making the most impact?

12:54 **Kevin:** I don't really know, to be honest. I just try to do a variety of channels and hope something sticks with somebody. I would say with the YouTube, it's an advantage for me because I don't have to physically go out and meet people, especially -

13:10 **Ivan:** What could possibly stop you from going out to meet people right now, Kevin?

Kevin: [Laughs]

Liz: Tell us a little bit about this YouTube channel, and then how do you turn that into a way to promote science? Is that all you do on it? Or is there other content on there?

13:27 **Kevin:** My YouTube channel, it started out as a hobby of mine. I may upload travel vlogs or I may play gaming videos - just me playing a variety of games that I may enjoy playing. I want to share my joy to the rest of the public or to the rest of the world.

13:46 **Liz:** My daughter watches a lot of those.

Ivan: Mine too.

13:49 **Kevin:** It started with that, and then as I got more into my science career I just kind of realized the gap between science and the general public, and that there was this big gap between communicating that science to the public. Especially when COVID came around, there was a lot of misinformation going around; there's still a lot of misinformation going around. So I started these videos to kind of help close that gap a little bit, to give people a kind of reliable source to say, "Hey, this is actually what's happening. This is from a scientist that you know, that you grew up with, that you can trust. This is what's actually happening right now." I hope that it kind of closes that gap. Those videos, they kind of have been my more well-received videos. I haven't been making them that much lately because I've been busy with other stuff.

14:42 **Liz:** Give us an example of a more recent, maybe even pandemic-related video that you've put out there.

14:52 **Kevin:** So my more recent one was when the State of Missouri were finally

mandating the mask in some of the public places.

Liz: Right.

Kevin: A little late, but regardless.

Liz: [Laughing] It's too bad this is a podcast and people can't see your facial expression when you said that.

15:09 **Kevin:** [Laughs] I had to put out a video explaining why masks need to be mandated. It's just topics like that I try to touch – topics that may not be understand that well or not well-received.

15:25 **Liz:** Let me just make sure I understand. It's the same channel, you're like playing a video game. So every now and then you pop in and you just like, "By the way, PSA, masks are to protect other people from your breath." Do you get like feedback where people are like, "Yeah, that's not what I'm here for." I say they're like two different channels but, as I think about it, social media that I follow - nobody's staying in their own lane this year. What are your thoughts about mixing messages like that?

16:02 **Kevin:** That's a good question. That was a conflict that I had, whether I wanted to keep it all in one channel or try to separate it into two separate channels. But if I keep it all on one channel, it kinda helps me bring an audience in and while I had that audience in they can listen to any science news that I may relay to them. They're like, "Oh, okay, well this guy, he's a normal guy. He's not a weirdo or anything." If I can bring them in and relay to them that message, they're like, "Oh, okay. So maybe this is actually right."

16:35 **Liz:** Right. Your other stuff gives you credibility, actually.

16:38 **Kevin:** Exactly.

Ivan: It's your channel. You do what you want with it. I think that's a key

thing for anybody who's thinking about putting something out there - decide that it's yours and you're going to do what you want with it. I do think it is worth thinking about what that means for you, because if you are mixing the personal and the professional, that means that you're going to get exposure for both and you may get feedback from people who don't like that.

Kevin: My thing is that if you don't like my content, you can unsubscribe and it's not going to hurt my feelings.

17:15 **Liz:** You're welcome to it!

Kevin: Yeah, I've got a pretty thick skin or I developed a pretty thick skin, so it's just like, "I understand, but that's how I feel. And this is what you guys need to hear because what you guys are hearing right now, it's not true at all."

Ivan: Did you have the YouTube channel when you were a grad student, or is this just since you've been a post-doc?

Kevin: Uh, I had it since I was a grad student but I wasn't really putting anything on air. It's become a little bit more active since I became a post-doc.

17:42 **Liz:** I feel like I also see you more on Twitter since you became a post-doc, but maybe some of that has to with more visibility for me of Black scientists on Twitter. I've started to follow more; there was this beautiful Black Botanists week where I know you posted in that. Tell us what it's been like to be on Twitter, sort of over the summer and into the fall this year as a Black scientist.

18:06 **Kevin:** Yeah, I didn't really have a Twitter until my post-doc. Then I was hearing from other people, "I use Twitter for just science-related stuff. I only follow people that do science, and nothing else." So I kind of kept it with that; it's that outside of maybe a handful of people that I know

personally and I may follow, most of my following is with scientists.

And as a Black scientist on Twitter these last few months, it's definitely an eye opening what the power of Twitter can do as far as connecting you to people that you probably wouldn't have ever met or known of. I know before Twitter, I had trouble finding Black plant sciences, and now I have a ton of connections through that that I was able to find through the power of Twitter.

Ivan: That's awesome.

18:54 **Liz:** We had a great conversation with Tanisha Williams about the pleasures of really seeing this community form in real time over Twitter. I'm so glad for you guys that you were able to do that - that you're able to like use social media for this incredible experience that it sounds wasn't a flash in the pan either. It's a community that will be there and connecting you guys forever, which is super cool.

19:25 **Kevin:** I totally agree with that. Before that week, there was people that I hadn't heard of or know of before that week. I was seeing all these Black botanists and I was like, "Oh! He's or she sounds cool; I should follow them, and vice versa. They follow me and I end up following them, and we keep up with each other because we've just developed that community.

19:52 **Liz:** Kevin, we just talked a little bit about the beauty of social media to sort of help you get through the pandemic, but we're really interested in your *whole* experience there. I know in St Louis (as you said) in March the county, the city, and the state were a bit slow on the uptake, but then eventually I think almost all local elementary schools were closed. I know you have a young daughter, is that right?

Kevin: Yep.

Liz: Tell us how you worked that out as a post-doc during the pandemic.

20:26 **Kevin:** It was definitely . . . definitely tricky. When my daughter's school closed for a year, she was basically homeschooling from March till I think the end of May. Trying to homeschool her was definitely a challenge because my daughter's currently in a third grade and at age they not really big on homeschooling. They want to go and see their friends and interact with other people. So at that age, it was kind of tough for me and my wife to keep her motivated on her schoolwork or try to teach her subjects that she would get easily upset on. That was definitely a struggle.

21:08 **Liz:** How did you manage that? I mean, I was trying to be a fourth grade teacher (and teach my class and run my lab) and it's no different for you, although you weren't trying to teach but presumably I guess you were home from the lab - but I assume you had some stuff you were writing. How did you work that out? Or did you just kind of catch as catch can every day?

21:33 **Kevin:** I mean, I honestly just try to take days one day at a time. Some days I was able to get through with homeschool work with my daughter and then also do some work on my own and get a decent amount of work done. Other days, I was basically helping my daughter for maybe half of the day and then on Zoom calls the other half, and I just didn't get anything done. I just had to live with that.

21:59 **Liz:** How did that go with your advisor?

22:01 **Kevin:** Blake was absolutely really flexible; he was really open. He understood that I had a daughter in school and that some people in the lab also had kids that they had to attend to. They said, "Just do as much as you can, and if you can't get anything done that day and that's just the way it is." It definitely helped a lot that Blake was really understanding to that matter.

22:25 **Liz:** How's that all working for you this fall?

22:29 **Kevin:** My daughter's school district, they went back in-person in August which kind of surprised me at first, but I've actually been somewhat surprisingly pleased with how they've been handling it. Everybody wears masks, they're all doing their best to social distance. I can probably make an argument that the kids are doing a better job at it than some of the adults are in this world. She's back in school now and I just drive to the lab, do what I have to get done, and then get out. If I have to spend a whole day on Zoom calls or write, I just stay home just to make sure that the lab stays socially distanced and give other people a chance to get in and do their work.

23:13 **Ivan:** Kevin, obviously one of the things about plant path[ology] is that it is full of acronyms and is actually very hard to really get my head around all the terminology. Here I am in the most privileged position and I have trouble understanding scientific communication. One of the things that I think we don't do a good job of doing as a community is sort of expressing our science in ways that lots of people can understand. I think that's probably all even more true when we're dealing with communities that have historically been excluded from our society and have their own vernacular dialects. You obviously have a unique advantage in communicating to Black audiences cuz you look and sound and talk like them. Is this something you've been intentional about trying to put your science in your own words to try and bridge that gap? Or is that something that just naturally happens?

Kevin: It's something I take pretty personal to heart, to try to craft and make sure I really communicate the science to the public in a manner that they can easily understand it. Because I feel if they don't understand it, if the public's not understanding it we're not going to get anywhere with science. There's only a handful of scientists in the world and if we keep progressing through science without communicating stuff to the public, there's still going to be all these conspiracy theories that get brought up - all these rumors that are completely bogus. That's why I

feel that if I can communicate what's happening to the public right now and they can understand it and know what's going on without getting confused with all the jargon or the acronyms or the stuff that they really don't need to know unless they want to know more in detail, it's going to help us as a world - as a country - to progress even further in science and accept more stuff than science easily.

25:22 **Liz:** I think that's really true. We start to use language as a shorthand for insider status; that's what I think. I think we like to use acronyms not really because we're trying to save on word count in a Nature abstract (that might be part of it), but I also think part of it is like it's a signal to other scientists to say that you're an insider and you know this info so well that you don't even need to have it all written out. I think we do that in a lot of ways - not just with acronyms but with sort of phrases like *plants are sessile* . . . [laughs] just kidding. That was for Ivan.

We do this with like a lot of phrases. I think I see that as something that, scientists, we have bought into it so far that then crawling ourselves back out of that deep hole of insider language makes it really hard for us to communicate with the public. That's one of the things that I think is so admirable about what you're doing is that you don't feel compelled to signal, "I'm legit. I'm going to make sure I use all the acronyms possible. I'll just explain them to you." You're like, "I don't even need that. I can just use normal language to explain it." I think that's really a powerful . . . I think it's powerful, but I think it's hard. I mean, do you find yourself fighting against that, or no?

26:57 **Kevin:** Yeah, it's definitely hard. That's why I try to continue to craft my communications, because it's just natural when you work in a field for so long that you want to shout out these acronyms because that's how you know them. You don't know them as this long word or this long phrase; you know them as an acronym and you assume that everybody else knows it. It's definitely a challenge to break yourself out of that when you communicating that to the public.

Ivan: Well, I mean, to some extent they're there for a reason. It's very hard to have a very common language word for "something that a bacteria uses to evade the detection of the plant that's trying to look for the thing that the bacteria has put in there in the first place because the bacteria needs to steal something from it [gasps theatrically, as if out of breath]", you know? So you come up with an acronym that's like, "It's an effector."

[Laughter]

Kevin: Right, exactly.

Ivan: But I think it's a hard balance and a lot of it is probably just practice, right? You just have to keep doing it or you won't get there.

28:07 **Liz:** These types of the ways that we use language extends *so* far. My dad is an English professor and I remembered talking to him early on about how I had to wrap up this story and "blah, blah, blah" as a graduate student. He was like, "Wait, why are you saying story, it's like fiction? Are you saying that what you're doing is fiction?" I was like, "No! No, no. It's science." It just made me realize how much of the way we talk about our work in our inner circles uses words in different ways than they're used by like literally everybody else. I feel like the plant path[ology] field does that a lot.

28:53 **Kevin:** I think what kind of helped me realize that is, well, so in grad school, since I was in a department that was at base, Texas A&M, they're good. They have good molecular biology, but they also have good more applied science like plant breeding - those that work away from the bench. Sometimes if you want to be successful, you need both of those and you can't go up from a lab bench with lab language to somebody that's doing more applied work and they don't have that much molecular biology background. That kind of gave me a real realization like, "Yo, I need to break this stuff down or we're not going to get

anywhere." That's the way it is.

29:42 **Ivan:** Kevin, this was fantastic. We really appreciate you joining us for this episode. If people want to see all this great science communication that you're doing, where can they find you?

29:56 **Kevin:** They can find me on Twitter. You can search my name "Kevin Cox Jr", or I think my Twitter handle is like @K_Cox_Bioguy. My YouTube channel, which is the same - Biogoy. And they can also find me on Twitch where I stream games every once in a while and I like to hang out, also by the name of Bioguy.

30:17 **Ivan:** And Liz, where can people find you on the YouTube and the Twitch and all those kinds of things?

Liz: Well, normally I say you can find me on Twitter at @EHaswell, but we also have a Haswell Lab YouTube channel you can check out if you want with a couple of science- and lab-related videos. It's just "Haswell Lab YouTube Channel". What about you, Ivan?

Ivan: You cannot find me on Twitch or YouTube, but you can find me on Twitter @BaxterTwi. You can find the podcast at @TaprootPodcast, and we also have an email which is @taproot@plantae.org.

With that, Kevin thank you so much. This was great.

30:56 **Kevin:** Ivan, Liz, thank you so much. This was an honor to be here to talk with you two.

31:00 **Liz:** It was great to talk to you. I don't even know what Twitch is. What is that?

[Laughter]

[Theme music]

Ivan: The Taproot is produced by the hosts, in collaboration with the Plantae team of Katie Rogers and Mary Williams at the American Society of Plant Biologists. On this episode, we received editing help from Plantae fellow Shannon Barry. Jo Stormer provides our transcripts.

Thanks for listening. And we will return with another episode next week.