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SPEAKERS

Amy, Stump The Chump, Guest, Jamie

Jamie 00:10
Welcome to Two Bees in a Podcast brought to you by the Honey Bee Research Extension Laboratory at the University of Florida's Institute of Food and Agricultural Sciences. It is our goal to advance the understanding of honey bees and beekeeping, grow the beekeeping community and improve the health of honey bees everywhere. In this podcast, you'll hear research updates, beekeeping management practices discussed and advice on beekeeping from our resident experts, beekeepers, scientists and other program guests. Join us for today's program. And thank you for listening to Two Bees in a Podcast. Hello everyone, and welcome to another segment of Two Bees in a Podcast. Today, we are joined by Dr. Kirk Anderson, who is the Lead Scientist, a molecular microbial ecologist and research microbiologist at the Carl Hayden Bee Research Center for the USDA Agricultural Research Service. This is based in Tucson, Arizona. Kirk, thank you so much for joining us on this episode of Two Bees in a Podcast.

Guest 01:11
Oh, thank you for having me, Jamie. I appreciate it.

Jamie 01:14
So Kirk, let me tell you how we typically do this. Our team here at UF, we read manuscripts all the time, and every Tuesday, we get together and discuss, at lunchtime, one of the manuscripts. And you co-authored a manuscript that had a very catchy and appropriate title for us, and that manuscript was "A longitudinal field study of commercial honey bees shows that non-native probiotics do not rescue antibiotic treatment, and are generally not beneficial." We are also doing some probiotic work. So this one jumped out at us. We had a great time discussing it, and we knew at that moment, Kirk, we had to have you on the program. So thank you for joining us to talk with us about that.

Guest 01:54
Oh, you're welcome. That title's about as long as my accolades.

Jamie 02:00
Well deserved, though, Kirk, well deserved. So since this is your first time on the podcast, we always ask this very generic question. We've got a lot of listeners from all around the world who just want to meet you before we talk about your work. So could you tell us a little bit about yourself, how you ended up where you are studying honey bees?

Guest 02:18
Oh, sure. I got interested in social insects in my undergrad. We went out and did some ecological studies on ants, Pogonomyrmex. This is up in Boise, Idaho, and so, I couldn't get into a PhD program up there. So I did a master's degree up there studying Pogonomyrmex, looking at hybridization as a creative evolutionary force and multiply mating ant species, which was a lot of fun. To do my PhD, I got let into the lab at ASU, the lab of Jennifer Fewell where I worked with Jon Harrison, Bob Johnson, Berthold Hölldobler, and a lot of these other ant people. Jennifer also worked on honey bees, and so did Jon Harrison. That was really my introduction to study in honey bees, although my PhD work was still all on Pogonomyrmex and hybridization, really. My job, so they got a grant, Jon and Jennifer got a grant to study Africanization, because it was during the African invasion and range expansion of the Africanized bee. And so I was tasked basically with keeping colonies from becoming Africanized. That was my sole job. So I learned what we referred to as the knock rev assay, where you go up and you knock on the colony, and if it revs up like an engine, it's probably Africanized. But we would also run molecular assays for this place, Carl Hayden Bee Research Center. So we'd run allozymes and mitochondrial DNA restriction digest to determine African maternity and so on. So I learned how to take care of bees during my PhD, but really, in no way would I call myself a beekeeper. And I'm sure there's lots of beekeepers out there, including people who work for me who would agree that I'm probably not a beekeeper. So then I did a postdoc with Diana Wheeler. I think a lot of people in the bee world know her. She worked on storage proteins with Norman Buck, and so I spent a lot of time with Norm Buck and her, and I continued to study ants, though. That's where I got introduced to the microbiome of turtle ants. I was really enamored with the microbiome, and it was a cool and brand new subject. I didn't know anything about it. And boy, had I become tired of working on ants and hybridization. So that was my new passion, I guess. And so, in 2009 Gloria Hoffman here told me about a job they were making to investigate the microbiomes of honey bees. Since then, it's just been a great adventure, and I've really enjoyed studying the microbiome honey bees.

Amy 04:55
That's so fun. So you got bored of ants and decided to go with stinging insects instead.

Guest 05:00
Yeah. Well, not really bored of ants, but what I was doing, it kind of run its course, and I was looking for a new project. I guess scientists are always looking for a new project.

Amy 05:09
Definitely. Well, we're glad to have you on, and as Jamie mentioned, in January of this year, 2024, you published a study. I'm not going to read the entire title again, but I think that something that's important and that we may break down in the podcast today is looking at this study was looking at non-native probiotics, they do not rescue antibiotic treatment. So I kind of want to focus on that a little bit. But let's kind of take a step back. Let's start from the beginning, and let's talk about the use of antibiotic treatments that are used in apiculture.

Guest 05:44
Right. So, yeah, antibiotics applied, I guess, for a number of reasons out there in the bee world. So, prophylactically is the word that comes to mind. So that's really as an insurance policy against anything that might happen. I think many just treat in anticipation of disease. So if they have disease that always springs up during forage dearth, they'll treat to suppress any pathogens that may spring up during forage dearth. Others, I think, just think that somehow they'll get some type of improved performance out of their colony. And when you should really treat, which is another thing we're working on, is when you have visible sides of brood disease, you have actual symptomology that corresponds with a bacterial brood disease, either EFB or AFB. But often, now, we see viral disease producing these globular larva and people still treat with antibiotics, although they have no effect on these viral manifestations. But, yeah, generally, I think that covers it.

Amy 06:45
Yeah, definitely. And I just wanted to mention it because I do receive this question often. When beekeepers call me, they get confused about mite treatments versus the antibiotic treatments. So just to kind of emphasize what you mentioned, the antibiotic treatments are normally for bacterial diseases like our foulbroods.

Guest 07:03
Oh, absolutely, yes. They're not going to do anything for fungus or virus. You're going to have zero effect. But there was a paper just published that suggested there was an effect of a probiotic on mite abundance. I'm not sure. That probably needs to be done again because I can't see the logical connection with probiotics and mite abundance, but you never know, and it may be something probiotics are doing in the Varroa mite that we don't know about. So that was an interesting study.

Jamie 07:32
So, Kirk, I'm glad you brought up probiotics, because that has become a relatively recent interest in our own lab. I get a lot of questions about it. I answer questions for beekeepers multiple ways, through this podcast, through American Bee Journal, and other ways. But I get a lot of questions on probiotics. I hear a lot of commercial beekeepers here in Florida, elsewhere, feed probiotics. And so, to me, there's a lot of use of it, but not a whole lot of data. And so when your paper came up, we were quick to jump on it as a team and read it and think it through and see what you said. So I just kind of want to start from the top. You specifically were looking at non-native probiotics and their ability to rescue bees from antibiotic treatment. So I'm just curious, could you talk a little bit, what are probiotics? What are non-

native probiotics, and why did you think they would have a link to antibiotic treatment in the first place, ultimately leading to your study?

Guest 08:28
I think it's what's done out there in the field and that this comes from, I think, human studies, where every time you get some antibiotics from the doctor, they send you away and tell you, "Well, if you have diarrhea, you should eat probiotics." This has just become a thing in the medical industry. And I don't want to disparage human probiotics too much because there are some that work, and I know that from an experiential point of view that I've had some work for me, and there's been studies on human probiotics where this can work. I got the Norovirus and I ate probiotics after and I cleared it up pretty fast, because I've had it a few times. But I'm an n of one, of course, so it's hard to tell. But the studies support a number of different probiotics. Probably 5% of the probiotics that are out there, or maybe less, but most of the probiotics that are out there don't do anything, human or otherwise, and there's no good data that they do, because they're not regulated. And so you can say anything you want to on the package, and you can use any type of advertising that you please. Antibiotics selectively kill bacteria, including your beneficial gut flora. And then, of course, the probiotics are these introduced microbes of whatever type that are expected to enhance the microbiota, provide some kind of benefit, and reestablish your gut flora. So they are expected to establish in the gut, and that's where they have their influence. So, beekeepers, they just treat following antibiotic treatment, just like we do.

Amy 10:04
So let's talk about the gut microbiome in honey bees. Can you tell us why the gut microbiome in the honey bee is so important?

Guest 10:11
Yeah, primarily, early on, we were looking for -- everybody likes to have these nutritional symbioses. So because they're really interesting, coming from some of the work that Nancy Moran and others working on different species have found. But generally, it's turned out that the worker just gets protection from pathogen, and that seems to be -- you get the structure of bacteria. We call it an interrotype, or just the microbiome, and it's the group of bacteria that establish in the gut, and then nothing else can establish there or set up shop. And so really it's protection. The queen, mostly unknown, but I would suggest that's likely also protection from pathogens. And the larva has a microbiome as well, although it's not very large, which has also been demonstrated to inhibit pathogens. That's also likely protection from pathogens.

Jamie 11:05
So, putting it all together, your project, then, was focused on essentially answering the question, after beekeepers treat bees with antibiotics, we would expect a microbiota change in the bees. Do commercially available probiotics rescue bees from that antibiotic impact? So is that a right characterization of your project? And if so, could you talk a little bit about how you guys conducted the research?

Guest 11:33
Yes, sir, that's exactly right. So that was experiment two. We did two experiments in this paper. The first one was simply we treated with probiotics for five months to see if they had any effect whatsoever on colony growth, colony size, microbiome membership and structure, and then whether or not they affected any of the known pathogens that were in the system. We had six pathogens that we looked at, and we did this for both of the experiments. So one of the experiments was just, do probiotics work, do anything by themselves, and then do probiotics do anything after you treat with antibiotics? So those are two separate experiments, but they were concurrently done on the same colonies. I think we started this with 78 colonies, and Randy Oliver did the field work, and actually was the individual who came up with this idea, and then recruited me to do it. And I said, sure, I'll do that. And they provided money. So the money for this came from beekeepers that had donated to Randy Oliver's website. There's a lot of faith in him. I like to say that Randy is one of these people, he doesn't know how to be dishonest. He's just honest to a fault. I love him for it. So you can rely on what he's doing. And he's always trying to get to the essence of whatever is going on. I mean, that's just his nature. He makes a fantastic scientist. Always been very impressed with him. He did a fantastic job with the field work. I can't believe that we got 78 colonies. So he did two yards, one in a sunny yard and one in a shady yard, and it was a double -- he blinded the whole study, right? So we didn't know what samples we were getting, and he didn't even know what samples he was looking at, right? For the first experiment, the probiotics, I said, were introduced every five months, and then we would weigh colonies, estimate colony size, and then collect workers with the fly off assay, where the older bees with experience flying will fly off, and then they just take the, what are presumably, the younger nurse bees. Then we examined the gut microbiome and the disease markers. So I can't remember. I think it was chronic bee paralysis virus, black queen cell virus, deformed wing virus A and B, and Nosema and Melissococcus plutonius, which is an agent of EFB. And so we looked at all of those for the first experiment, and we found really no effect at all of the probiotics. And then we did the antibiotic study. The first five months of Randy's experiment was as dearth begins to enter his colonies up there, entering into the winter time, going through autumn and into the winter, and then the antibiotics were applied to the same colonies that we used for the first probiotic study as we entered December. And yes, the antibiotics had an incredible effect on the gut microbiome. They virtually destroyed the gut microbiome. It did not recover, and it did not recover that well in the control so we looked at it three to four weeks out, and it was still highly dysbiotic in the controls and in the probiotic treatments.

Jamie 14:51
I do think one of the things that's key, though, is in the title of your paper, you use that phrase, non-native probiotics. I think when we hear the word probiotics, we think about things that are just naturally in us. So if bees are given an antibiotic, it wipes out their gut microflora. We give them a probiotic to restore their gut microflora. But maybe it's not that intuitive, because what do you mean, then, by non-native probiotics? What is this stuff that's available to feed bees?

Guest 15:21
Right. That's a very good question. So these are simply, and I think we put an article a few months ago in Bee Culture about just this. The microbes that are being fed to the bees are the same microbes that

are fed to chickens, hogs, cattle across the board. So there are these microbes that have been stamped as generally regarded as safe, and then they're available for sale, or, I guess you have to license the use of them. And so the companies, so we tested two different companies here, both of them are using the same microbe because they have been okayed for use in probiotics. They were isolated from a variety of different sources. None of them came from the gut of the honey bee.

Amy 16:13
That's really interesting. So Kirk, I think that's great. I really appreciate the collaboration on this project and the fact that beekeepers have also been able to help fund this project as well. I'm interested to know, what are you telling beekeepers about the use of probiotics?

Guest 16:27
Yeah, thanks for that question. I would point beekeepers to Randy Oliver's website. He has a summary of all of this work. Beyond that, I would suggest that nobody wants to waste their resources, and the way that you do that avoid wasting resources is you have to find out what's going to work. You have to perform your own controlled experiments, and you have to pay close attention to the results. And Randy also has a really good information for doing that on his website. How do you make a decision about what you're doing?

Jamie 17:04
So Kirk, a thousand questions are going through my head, but I think you've really given us some good information. So just to summarize to make sure I understand, study one was, do these available probiotics do anything at all? At least, what you guys found in your study, there was no impact on the parameters you measured. Number two, experiment number two, if we challenge bees with antibiotics, we would expect to see their gut microbiome change. Does feeding them probiotics fix this in your study? The answer was no. So I'm thinking, then, there must be a million research questions that need to be asked and answered next. What is future research that needs to happen on this big question associated with probiotics?

Guest 17:46
That's a good question. First off, you need something that can survive in the colony. So one of the strongest findings in our data is backed up by a study done in the Raymann Lab by Damico et al, and it's a 2023 study where they sequenced also the gut microbiomes of honey bees that were treated with antibiotics and then attempted to be rescued with probiotics. And they found out of 7 million reads, they could not detect the probiotic in the gut they sampled directly after they fed the probiotic with sugar. The bees are going to go in there, they lap that stuff up, it went right into their honey stomachs, and they could not detect any of the strains. 7 million reads. And so we had 14 million reads in our study, and we detected maybe 200 sequences that might have been from the probiotic. And we did not run the actual probiotic as a control, which I have to give Damico credit for doing, but that was very good idea. She sequenced what was in the actual product. We also ran some cultures of what was in the actual probiotic product that is sold to beekeepers, and we found that, yes, much less bacteria is present than is stated on the package, according to our culture results. So we had least a magnitude to two

magnitudes less. This is an optimal growth environment, right? That's what culturing is. You're trying to provide an optimal growth environment for these bacteria. I'll tell you, probably one of the least optimal growth environments that exists is the honey bee colony. This is just a killer of all other bacteria. They've been exposed to, bacteria for millennia, all types of bacteria from all over the place, primarily from the pollination environment and water sources, but there's only a handful of bacteria that even live in there and that live in the social hive environment, right, which is dominated also by three or four types of bacteria that are native to the honey bee. So not only did the honey bee not allow these things into its hive, even its hive is a killer of everything else.

Jamie 20:08
So Kirk, again, you guys specifically mentioned that the probiotics that are available commercially include non-native probiotics, in other words, things that aren't isolated or even occurring necessarily, potentially, at least the honey bee gut. So are there labs out there looking at developing probiotics that are specifically formulated to match what occurs naturally in honey bees?

Guest 20:31
Yes, that's a good question. So in the Moran lab, there's been a few labs doing this, but I think Moran is clearly the leader. Eric Motta has produced a really good perspective on probiotics and their future and their development. I'm quite convinced that only native strains are going to work. I think that what's most important in the microbiome is that you have strains that work well with each other and with the host, and we already know the microbiome works very well with the host. But you can get very different enterotypes at the strain level that compose your microbiome. So this is different types of species A coming together with different types of species B, and those two may be very synergistic, or they may be slightly less synergistic, right? And they may influence some type of host metabolism or not. That's, I think, where the science is sitting now. Eric Motta's certainly done some, he's doing some very creative work, and I'm sure that there's, as Randy says, a very bright future for honey bee probiotics. I'd also like to add that, as we all know, the honey bee is a budding species. So going back through time, the honey bee cluster of workers that you're looking at has had intimate contact with all of those clusters back through the ages. You're actually holding a cluster that has touched a cluster that is millennia old, right? So the ability for these microbes to be transmitted from cluster to cluster is overwhelming, and this is how I think the microbiome developed in the first place. But there can be lots of strain variability in a cluster, in between clusters, and within an apiary and so on. I think this is where it's at now, is looking at this strained variability and how well those things work together as an enterotype, as a complete gut microbiome that's going to aid the host.

Jamie 22:35
Well, Kirk, that was great. We thank you so much for joining us. This really sheds light on one of those topics Amy and I just hear about all the time. So I appreciate you joining us on Two Bees in a Podcast.

Guest 22:45
Oh, awesome. Thank you for having me, Jamie and Amy. Thank you very much.

Amy 23:03
Well, Jamie, it was really fun speaking with Kirk and talking to him about some of his research. I mentioned this in the podcast, but it kind of took a little bit of time to wrap my mind around what antibiotics have to do with probiotics, and why beekeepers are using probiotics, and what this all kind of means. I kind of want to just take it back just a step, just take it back from the beginning. We're talking about using antibiotics for bacterial diseases like the foulbroods, right? I'm basically just thinking out loud here. But the antibiotics, they kill the bacteria, they kill all the bacteria. So that could be good bacteria, that could be bad bacteria. And so then, there's essentially, not really anything in the gut. And then the idea is that we are supplementing probiotics, so we're feeding the bees probiotics, because people will eat probiotics, and it kind of replenishes the bacteria in the gut. Did I say that right? I don't know.

Jamie 23:57
Yes, so I will do my best to kind of clarify for sure what he was talking about. Now, essentially, there's a couple things happening here. Number one, there are probiotics available for sale that you can purchase and feed to bees. These probiotics come with a number of different claims: stronger colonies, healthier colonies, lower disease incidence, X, Y and Z. You and I are very careful not to talk about trade names and what's out there, but a lot of beekeepers use these things just for the advertised benefit. So you've got this whole contingency of beekeepers who are feeding bees probiotics just to make them stronger, healthier, have lower disease and pest loads. Now, Kirk and his team looked at that question by itself in the first study. If we feed probiotics to bees, can we see an improvement in these various things that we're measuring? Secondly, they made the leap to the same logic that we use for ourselves. We take antibiotics, it potentially messes up with our own gut microbiota, which we need, so, a lot of times, we, as humans, will follow an antibiotic with a probiotic to seemingly restore our gut biota. I was interested in hearing him say that maybe less than 5% of the available human probiotics don't actually do what they're advertised to do, so 95% of the time we're just potentially taking something that's of no value to us at all. But again, we're not medical doctors, so we'll focus directly on bees. But it's the same logic applied to bees. As beekeepers, we will treat with antibiotics to kill things like American foulbrood or European foulbrood, etc. But not only does it kill the bad stuff, but it can kill the good stuff. So we might then say, oh, well, we can feed probiotics after an antibiotic treatment, because we want to restore the good bacteria that bees should have in the gut. And so that was their second study. If we treat with antibiotics, can we restore the good bacteria in the bee's gut that got knocked out by the antibiotics by feeding bees probiotics? In this particular study's case, the science just didn't find support for that. So in the first study, feeding probiotics didn't impact any of their measure parameter. In the second study, feeding probiotics did not rescue bees from the effects of antibiotics on the good microbiota in the bees gut. So you and I both know a lot of beekeepers who are feeding bees probiotics, and so I think this is an important first study to push us in the direction of what are these things really doing for bees, and can we do better in the probiotic realm?

Stump The Chump 26:42
It's everybody's favorite game show, Stump the Chump.

Amy 26:51
Welcome back to the question and answer segment. Jamie, the questions that we have today, so we had our 2024 Summer Bee College in the Panhandle in Panama City, Florida. And on our survey, we always ask our participants to ask one question to the podcast. So the questions that are on the podcast today are from Bee College, and I'm ready to ask them. Are you ready to be asked questions?

Jamie 27:15
I am ready to be asked, Amy.

Amy 27:17
Great. Okay, so the first question we have, are we looking to selectively breed new types of bees that exhibit behaviors that reduce Vespa veluntina's effects on colony populations? And for those who were not at Bee College, our keynote was on Vespa velutina, which, if you're interested in knowing more about Vespa veluntina, we do have a previous podcast about that, but emphasis was really placed on Vespa velutina, Jamie. So can you answer that question?

Jamie 27:43
Yeah, so there's a good reason this question came up at our Bee College this year. So Vespa velutina is a hornet that is native to Southeast Asia. It goes by quite a few common names. You'll see it a lot, especially in Europe, called the Asian hornet. Here in the US, it goes by the yellow legged hornet as its common name. One thing about common names, they vary tremendously all around the world, which is why scientists like to use Latin names. So in this case, Vespa velutina. But here in the US again, it goes by yellow legged hornet. Why is this important? Well, it's been important in Europe for over a decade. It has been found in Europe. It causes problems for colonies there and here in the US and other areas around the world. We've kind of looked at Europe from afar, watching what this hornet does. Well, in August of 2023, it was found in the southeastern US, in Georgia, specifically. And so we're about a year after this thing has been found in Georgia. We've watched what's happening. We've had to do a lot more research into what the Europeans are doing to handle this particular hornet. We've heard all the horror stories. We see what's going on here in the States. That is what prompted, Amy, you to invite a keynote address specifically for Vespa velutina at our Bee College. And of course, our beekeepers aren't used to it, aren't experienced with it, don't know what to expect. So they asked a lot of questions related to it. I like this question. Are there any efforts, not just here in the US, but globally, where scientists are trying to breed new types of bees that exhibit a different behavior that might help against Vespa velutina? Well, the short answer is, I'm not aware of any efforts to do that. And so let me just expand on that just a little bit. This hornet is native to Southeast Asia. In Southeast Asia, it hawks or flies in front of honey bee hives and captures bees flying into the hive or out of the hive. And bees in Southeast Asia might have a suite of behaviors that they use to avoid it, but honestly, with this particular hornet, they do a lot of what our bees do, which is they don't fly a lot if there are enough of these hornets hawking in the apiary. So kind of fast forward over here to the US. Same thing we see happening here, as well as in Europe, where these hornets will hawk, h-a-w-k, fly around at the entrance of the hive capturing these bees coming and going. There's really no colony level trait that just springs into mind that you would select for to address that behavior. The hornets aren't landing on the

nest entrance and grabbing bees and flying away. They're capturing them kind of mid-flight, and as a response, bees that are in apiaries where any number of hornets are hawking, they will stop foraging, and you get what we call kind of colony paralysis, where you get this carpet of bees on the nest entrance that are unwilling to fly because they're being preyed upon by these flying hornets. So the question is, is anyone trying to breed bees that exhibit any behaviors that reduce hornet populations? No, and it's likely because we can't think of things that would help bees, given this kind of way that the hornets take advantage of bees, and so most of the efforts to address Vespa velutina go with finding and eradicating the nest.

Amy 31:00
So Jamie, from my understanding, there's this video that's out there, and there's a Vespa velutina who's hawking at the entrance and goes to the entrance, and then there are these bees that basically just ball Vespa velutina, right? And so they ball to this insanely hot temperature that kills Vespa velutina. Of course, that's just one hornet, but that is the species Apis cerana. Is this the same hornet?

Jamie 31:25
It's a good question, Amy. That's primarily a response to Vespa mandarinia, because Vespa mandarinia lands on the nest entrance, collects bees, and will go into the nest and collect bees and brood. And so Apis cerana, this other species of honey bee that you reference, does have a trait where, when a hornet lands on its nest entrance and tries to go into the nest, they can ball it exactly like what you mentioned, and the hornet dies at a temperature two degrees below that of the temperature at which the bees die. So they will heat that ball, kill the hornet, and then release the bee cluster around that hornet before bees stop dying. And while that is effective for Apis cerana, it's primarily effective against hornets that will land on the nest entrance. So Vespa velutina can do this occasionally, but most of what it does is capture bees in mid-flight, which kind of reduces or eliminates the impact that this balling behavior would have. So in Europe, as well as here in the US, most of the damage is done by these hawking hornets. And if they were ever to land on the nest entrance, then our bees wouldn't have that behavior where they ball it for the heat purposes. Now, they might ball it and try to sting it to death, but it's also really good at evading that. But you're correct, there is a natural behavior amongst Asian species of Apis, specifically, in this case, Apis cerana, that they can use this kind of temperature or this heat gain to kill the hornet. But that's something that doesn't work well against velutina specifically.

Amy 32:58
Alright. So for our second question, I think I have a couple of questions here. So the question is, is bee venom collecting really a thing? So I guess the question that I have is why would someone want to collect bee venom? How do you collect bee venom? And what's up with that?

Jamie 33:15
So, it is a thing. Now, I want to be very clear before I get too far into my answer. I'm going to be talking about human health-related pieces of information coming up here. I am not a medical doctor. I'm a PhD. I work with honey bees. I don't work with humans. So I am going to just say out loud some of the

things that beekeepers say. I'm not here to say there's evidence for or against any of these health claims, and I would certainly caution everybody listening against doing anything related to this without checking with their medical practitioner. But with that kind of disclaimer out of the way, there are people who, quote, take bee venom for lots of different therapies. They might rub it on their wrist. They might put a little dab on their tongue, things like that. This can be very dangerous. People can be very allergic to bee venom. It can be a problem. I've heard of people allowing themselves to be stung for arthritis in their knee or their shoulders. I've even heard people with multiple sclerosis even taking bee venom therapy. In fact, I know of people who provide bee venom therapy for people. Again, this is not something I can endorse. All I can say is that it's done. A lot of people physically get stung. There are other people who might want to use it for other purposes outside of physically getting stung so they would like access to bee venom directly. All of that stuff is out of my field. It's out of my expertise. I would caution everybody against trying it. Nevertheless, there are methods that one can use to collect bee venom. In fact, we have a bee venom collector that we have used here in our lab, and in order to collect venom, you basically have to get bees to sting something, deposit that venom that you can then go harvest. And one way that I have seen this done is that someone has wrapped a sheet of glass in saran wrap, that same kind of plastic thing that you could put over plates or dishes, etc. They'd wrap that sheet of glass in saran wrap, and then they would layer over that these wires that can be pulsed with electricity, a mild pulse with electricity. And when this device is put into the hive and these wires pulse with electricity, it causes the bees that are walking on those wires to sting, it elicits a defensive response, so they will sting that sheet of glass that's surrounded by saran wrap, and therefore deposit venom between the saran wrap and the glass. And you can do this any number of times. This thing can be in a hive and cause this stinging behavior. And once this is done, we have even done it here, you can bring that apparatus back into the lab, you can remove the saran wrap, and what you'll have crusted on that sheet of glass is dried bee venom. We've used razor blades in the past to scrape up that bee venom in its crystalline form, and store it for research purposes. So a lot of collection devices are built on that agitate bees, cause a sting, get them to deposit venom somewhere, and then you go back later and scrape it up. And so there are venom collectors for that purpose. So it is really a thing, but honestly, I can't think of any reason someone should be doing it on their own without proper supervision by people who are kind of knowledge generators behind the claims that people have for this bee venom. We could use it a lot for research purposes, but for human health purposes, this is just not something I can talk about with authority. So that's kind of where we are.

Amy 33:15
That's fair. I don't think I ever realized that bee venom crystallized.

Jamie 36:56
Yeah, it is a liquid, right? And so when they deposit it on this glass, if you give it just a little bit of time, it'll very quickly, quote, dry out, right? And then you get this kind of film on it that we've used these sharp knives, they're actually razor blades, these kind of rectangular razor blades that you can scrape the glass, and you get something that almost looks like salt or sugar kind of scraped up, and we've put it in containers that we've frozen for research purposes later. But I will tell you, Amy, this is potentially very dangerous, because when you scrape it, when you touch it, you are getting dosed with bee

venom, and it could represent a lot of stings. I mean, if 100 bees sting it, and you dose it up, and it looks like just this little crystal that, with your finger, you rake into a vial, imagine being exposed to 100 bee stings directly through the sting. And so it's just not something I think people should be dabbling with without safety measures in place. I just can't really think of a lot of reasons that beekeepers would do this.

Amy 38:03
Yeah, does it kill the bees? I have so many questions now.

Jamie 38:06
It does not kill the bees. No, it does agitate the willies out of them, but it does not kill them. And so when I've seen it applied, you put it in a colony, I don't know, for one or two minutes, and then you take it out, and then you can collect the venom that way. But like I said, it can be very dangerous. And when you start scraping the venom, you can create fine particulate venom, particles that will go into the air, and you could be breathing that stuff in, and that could be a problem. So that probably needs to be done in a fume hood, etc. So I want to make clear, again, all I was doing was answering the question. It is a thing. I'm definitely not saying that anybody should do it. There's safety measures that need to be in place before you dabble with it. And then you have to ask yourself, why am I doing this in the first place? And so I do not recommend that people do this.

Amy 38:50
Interesting. All right, so for the third question that we have, this one's probably the easiest question of all three questions, and that is, what is the future of honey bees, the population, and their survival?

Jamie 39:02
I love this question because I cannot be wrong because this is not a fact question, right? The truth is I don't know what the future of honey bee population and survival is, so all I can do is speculate. So let me just speculate. First of all, it's 2024 when I'm answering this question. Colony Collapse Disorder started in November of 2006. The reason I know that is because I was in Florida. I got hired by the University of Florida in August of 2006 and CCD started in Florida in 2006. So that happened a few months after I got hired here, and that was the Bee-mageddon, the Bee-pocalypse. All the bees are going to die, we're all going to starve to death shortly thereafter. None of that happened. We have more colonies now than we did in 2006, or at least as many. And that, by the way, Amy, is in a place where honey bees aren't even native. So in the US alone, we have over two and a half million colonies. Again, that's managed colonies in an area where they're not native. If we were able to do feral honey bee colony inventories, I'm sure there's thousands upon thousands of feral colonies in the US. I mean, in South Florida, there's thousands, I'm sure, of feral honey bee colonies. So why am I saying this all about the US? Well, I did my PhD in South Africa. I have a graduate student who's doing her work in South Africa. She's finding truly wild honey bees all over the place. Apis mellifera, as a species, the Western honey bee, is not endangered. It's not endangered. Its population is massive, certainly in its introduced regions, North America, South America, Australia, but also in its native regions across Africa, the Middle East and Europe. So I don't believe, at all, the Western honey bee population is

threatened. On the other hand, I could be easily convinced that subspecies of Western honey bees could have threatened populations, something like the Egyptian honey bee is an example. But I do not believe that honey bees, the Western honey bee, is at any risk in the near future of dying out as a species on planet Earth. And most of the problems that we hear with honey bees is happening in managed apiary situations and not really, necessarily, all over the world. So I am an optimist when it comes to the future of honey bee population and survival. I think if, by the time honey bee populations were truly crashing, whatever would cause that would be causing a lot of other problems as well. So I'm not too worried about it, at least in my lifetime. But the fact is, that's a truly opinion answer, so I can absolutely be wrong.

Amy 41:50
All right, so in the future, when you're listening to this podcast, then let us know what the honey bee population is like at that time. All right, so those are the questions for today. Thanks for answering those questions. I think the next couple of podcast Q&As that we have are from our Bee College list, and so, listeners, stay tuned for that and be sure to ask us any questions through our social media page or by emailing us. Thanks for listening to today's episode. This episode was edited and produced by our podcast coordinator Mitra Hamzavi. Thanks, Mitra.

Jamie 42:32
Visit the UF/IFAS Honey Bee Research and Extension Laboratory's website, UFhoneybee.com, for additional information and resources for today's episode. Email any questions that you want answered on air to honeybee@ifas.ufl.edu. You can also submit questions to us on X, Instagram, or Facebook @UFhoneybeelab. Don't forget to follow us while you're visiting our social media sites. Thank you for listening to Two Bees in a Podcast.