EPISODE 205 TRANSCRIPT

Jamie

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.

Amy

Hello everybody, and welcome to Two Bees in a Podcast. Today we are rejoined by Dr. Meghan Milbrath, who is an Assistant Professor and Agriculture Extension Specialist with the Department of Entomology and the Department of Large Animal Clinical Sciences at Michigan State University Extension. Megan has been with us a couple of times now, and I'm really excited to be hearing about updates on some of the research that she has. So, thank you so much, Meghan, for joining us today.

Dr. Meghan Milbrath

Thank you so much for having me.

Amy

We have listeners who will typically start from the very first episode, but I think we're like almost at episode 200 or maybe past that. So, we would love for you to go ahead and reintroduce yourselves to our audience, tell them a little bit about how you got into the honey bee world.

Dr. Meghan Milbrath

Yes. So, I didn't come to the honey bee world very quickly academically, though I've been a beekeeper most of my life. So, I started keeping bees as a kid in northern Wisconsin with my dad who started as a kid as a 4-H farm project. So, he was a hobby beekeeper. I grew up keeping bees as a hobby. I started selling bees for money during grad school because I was a poor grad student and so I was making nucs and things on the side. But I was going to school for public health. So, my degrees are in biology, I have a master's in public health, and then I did my PhD in public health at the University of Michigan, and I studied environmental Health Sciences, which is basically like disease risk assessment and epidemiology, so studied the transmission of diseases in humans.

And then as a postdoc, I contacted Zachary Huang at Michigan State and worked with him on studying diseases in honey bees, which kind of combined my two loves together at the same time.

Jamie

Meghan, we can really talk to you about so many different things, and we've had you on in the past to talk about European foulbrood and the interlink between veterinarians and beekeepers. But I really want to start this conversation off again with European foulbrood because I think like, in my experience, I feel like it's a chronic problem for beekeepers, at least here in the US. And in some ways, I almost feel like we've forgotten how to recognize it. You know, these kind of colony collapse disorder years has caused us to look at things in colonies and always just default to, "This is a mysterious phenomenon that's killing my bees. What's melting the brood? What's going on? It can't be what we know." I just feel like that's caused us to just forget some of the common things, especially something like European foulbrood, which I feel like we are seeing a lot over the last 10-15 years in our colonies and it's going underreported.

So, I'm just going to start here and make this very open-ended. I just want to say to you European foulbrood and then let you run with that idea.

Dr. Meghan Milbrath

And then two hours later when I'm done talking about my one true love, which is European foulbrood. I wholeheartedly agree both that it is under appreciated and that it is very, very important. In my opinion, economically, it's probably one of the most devastating diseases for honey bees. Obviously, Varroa are really bad right now, but Varroa, we do have a management strategy, or I can give really good management recommendations. Albeit expensive and labor intensive and not pleasant to do, but I do feel like we have good strategies. Even with American foulbrood, I feel like I have really good strategies or recommendations. With European foulbrood, we are really stuck managing or trying to control or living with very high levels of disease burden.

A lot of the work that I've been doing has been in collaboration with Dr. Peter Fowler, who's a veterinarian who's been working with me to hopefully very, very soon finish up his PhD work. He and I have been looking a lot in just the prevalence. And then there was also a recent paper put out by the USDA about prevalence or just how many cases that we see in the United States, and it's incredibly high. So, our work is not yet published. It's under review. Hopefully, I'm going to get out there soon, but we've been finding, you know, upwards of 20% if we're just going out. And then when we're going into areas that we know the beekeeper has a problem and it's the right season, we can find operations with above 50 to 60%, which, objectively, that's horrifying to know that 50 to 60% of your herd has a severe bacterial disease and is actively expressing signs. So, that's not even just the presence of the bacteria. So, it's found in very, very large

amounts, which means that one of the warnings we're giving to people is if you're still buying bees, you know, if you're purchasing nucs, just probability wise, you're going to end up with it. Even if you're buying from repeatable sellers or if you're watching it, just because it's out there with such high numbers, it's very likely that you'll see it in your operation.

Amy

Meghan, I don't know if you remember this, but in 2020 was probably when you and I first met because we wanted to start a project together and it was because beekeepers were reporting the crud. I remember we were trying to figure out what that was. I think you told me most of the colonies that showed these clinical signs were EFB positive.

Dr. Meghan Milbrath

Yes. And I think what was happening, and again, it's really hard to say what the crud is because every time you see it is really different and sometimes people were using that term or that brood or something like that to reference parasitic mite syndrome and viruses. But I think there's three things going on, and let me see if I can make it through all three of them and remember all three of them at the same time. So, I think the first thing is that we have a lot of under diagnosis of European foulbrood because of the timing of the bacteria and our diagnostic tool. So, we diagnose it by finding the bacterium Melissococcus plutonius. That bacterium is only present at the early stages of disease. And a lot of times when people are selecting a larva to sample, they're going to pick the grossest one, which for AFB totally works. But for EFB, if you take one that's too far diseased or really, really dead, you won't find Melissococcus anymore. You're going to most likely find one of the other secondary invaders or something that feeds on dead or dying larva. We have a lot of misdiagnosis or false negatives because people are sampling larva that are too far gone.

So, our recommendation is if you suspect European foulbrood that you should sample a larva that is still kind of white but corkscrew. I heard someone reference it as like the stomach ache position. So, when the larva kind of started to corkscrew out of the cell or maybe it's a little like lost some internal pressure, but not something that's brown and gross. I think that was part of it, that there are a lot of under diagnosis or false negatives. The second thing is that we do have a lot of coinfections. So, I've seen European foulbrood alongside sacbrood, I've seen European foulbrood and chalkbrood together. I've seen European foulbrood and parasitic mite syndrome together. And I have not seen it, but I've talked to other people that say they've seen European foulbrood and American foulbrood.

And then the third reason that I think it can be really confusing is that a lot of the work that I've done with Peter is looking at the different strains. There's huge variability in the strains that are circulating in the United States. You can have multiple strains of Melissococcus, the bacteria that causes it, in the same hive and in the same larva. So, it can present really differently because they

have different rates of growth and different virulence. So, you can have European foulbrood that used to look one way because it would kill the larva at a certain speed, and then now it looks a little different because maybe you have different strains in there. So, it's a highly variable disease, even when it's just by itself.

Amy

So, you have new research on the persistence of EFB in combs. Can you talk about that a little bit?

Dr. Meghan Milbrath

Yeah. So, another manuscript that we have out for publication is looking at these different growth curves of these different strains of the bacteria. This was done also with a veterinary student that came in on a summer research program, Robin Underwood. And we were looking at how long the bacteria stays on different equipment. We know that American foulbrood is spore forming and so it can stay forever. European foulbrood is not spore forming but acts like a spore in that it just feels like once you get it in your operation, it just lasts forever. It feels like, if you talk to beekeepers that have it, that it's got to be on the equipment. So, what we did is we took two different strains. We took one typical strain and an atypical strain, which is just a reference to its growth conditions, and we put it on wood, like a beekeeping frame. We put it on cloth to represent a bee suit, little stainless steel washer to represent a hive tool, put it in honey and a piece of foundation to be like the wax. Robin was there for a summer project. So, she, for her poster, grew up the bacteria, put a known quantity on all these different things and then waited a couple weeks and then would retest them. And they were just sitting at room temperature. You had everything sitting up for room temperature. She was able to grow everything after two weeks. That's very interesting for beekeepers. Well, that was 2 summers ago. We can still grow stuff off of that. So, we can take it and grow it, especially the honey's pretty variable, but we can grow the bacteria after it's sat at room temperature off of beekeeping equipment. We were like, well, this is interesting, let's see what else we've got lying around the lab. We used slides to do microscopic diagnostics. And we also grew it off of a larva that was smeared onto a slide from four years ago. We can grow it off of stock that sits in the freezer. Again, even though it doesn't form a spore, it is incredibly, incredibly persistent.

Jamie

Well, that's terrible news.

Dr. Meghan Milbrath

Isn't that depressing? Nothing like a little morning coffee talk to ruin your day.

Jamie

Fortunately, I'm on my fourth cup of sweet tea right now, so I can handle the news. Well, that does answer a question for me because you're right. The way that we teach this concept about American foulbrood is, oh gosh, once you guys get it, it's there for a decade. You've got to burn your hives. I know around the world, beekeepers are able to deal with EFB different, legally, based on whatever their country's rules or regulations are. For better or for worse, one of the ways that they deal with EFB here in the US is through treating colonies that they see it in with antibiotics. I'm curious, we hear a lot about antibiotic resistant American foulbrood. Is there any evidence that European foulbrood also is showing antibiotic resistance?

Dr. Meghan Milbrath

So, for European foulbrood, there's only one antibiotic that's labeled for its control, which is oxytetracycline. And we had submitted a grant a few years ago to look at what strains are circulating in the United States and whether or not they're showing signs of antibiotic resistance. Those are really, the two manuscripts I mentioned before are hopefully what's coming out very soon. We collected through that work about 375 isolates of a variety of different strains. And then we've been sampling select ones for the antibiotic resistance using methods of previously published papers that are trying to look at it. There were two papers, one from Canada and one from Japan, that alluded to antibiotic resistance, but our antibiotic resistance paper now is actually going to be coming out more as a methods paper on the problems with studying antibiotic resistance in Melissococcus. So that's a very long way to say no, we don't see any sign of it yet.

What we do see is that the rate of growth of the bacteria is so variable and it crashes on its own, but it's also so slow growing that basically the antibiotics tend to wear off before the bacteria completely grows. So, this is actually, even though that's not a very clear message and I'm not explaining it clearly, this is actually kind of good news. We don't see a lot of resistance. Actually, we don't see any signs of resistance. I should be more direct on that. And at first, that seems a little confusing because we've used oxytetracycline to control the bacteria for so long. But the reason that I personally, and again, this is just Meghan's thoughts, not data supported, is that when the bacteria go into this persistent mode, it's not receiving any pressure from the antibiotics. So, that type of antibiotics, oxytetracycline, is in a class that isn't a bacteria-cide. It's a bacterial static. So, it doesn't kill the bacteria when it comes into contact, it just prevents replication. So, when that bacteria is in the persistent phase, it's not experiencing any evolutionary pressure to escape the antibiotic when it's in its presence.

So, the antibiotic does seem to be a useful tool still for the control. And that seems to be across all of those strains that we're seeing. The issues are really with the methods in growing it. Historically, if you want to do an antibiotic resistant study, you take the bacteria, you grow it out on a culture and you create what's called a lawn, which basically, you create a nice sheet of the bacteria and then you put the disk of the antibiotics in and you'll see this zone of inhibition where the antibiotics prevent the bacterial growth. We can't do that with these bacteria because it

doesn't form a lawn. It forms these clumps and these biofilms and all these different types of structures, which we are talking about getting some electron microscopy and looking at all these different phases of what it does, but it's very difficult to study. But we don't see any signs of resistance yet is where we're at.

Amy

I feel like this has been an emotional roller coaster, Meghan. I'm like, Jamie –

Jamie

It's everywhere and it lasts all the time, but don't worry, it's not antibiotic resistant.

Amy

I know. I'm like up, down, up, down.

Jamie

Don't ask the question because we're doing some bad news now.

Amy

Okay. So, I have a question about the percentage of colonies with EFB and the amount of dead outs that we see from that. Do you have numbers on this?

Dr. Meghan Milbrath

So, the number of colonies, it is really highly variable.

And we do see it with EFB or with Melissococcus plutonius. And sometimes we'll use those in the same, but sometimes they're very different. So, when I'm talking about EFB, we want to talk about the disease. So that's a colony that's suffering, that has visual signs of illness, but the pathogen is prevalent even without signs of illness. So, we have very high rates of inapparent infection. And there is lots of data for that going back over 10 years, especially in Europe. They found that if you have a colony with the signs of disease, then it's likely that there will be nurse bees with the bacterium in all of the other colonies in the yard. When you're seeing signs of disease in one hive, you probably have the bacteria in every other hive in the yard. So, I know this isn't specific just to the dead outs, but it is specific to dealing with it in your operation. And I think anybody that's had it in their operation, this kind of rings true because, you know, for example, if you have 10 hives and you see EFB in hives four and five last summer, this next year, four and five will look fantastic and you'll see it in one and two. And that makes it really hard to figure out how to deal with equipment because we have a lot of extension materials that say like, oh, put it in a quarantine yard, you know, move this sick hive away. But if you move the sick hive away, you're just doing a lot of extra labor for basically no risk. One thing that you can do is you can use antibiotics to control the disease progression within a hive and within a yard, as

long as you're not collecting honey and you're following the label to make sure your timing is such that you wouldn't contaminate honey.

The other option that you have is to treat it like American foulbrood and do the shook swarm method. So, there's quite a few studies, even fairly recently, I think there's a couple that came out in 2023 that are looking at using the shook swarm method where you take the bees, shake them onto brand new equipment and then you can do that either in conjunction or without antibiotics and then you can destroy the old equipment. So, there are a couple countries that are doing this method that are treating European foulbrood similar to American foulbrood. In those places, they have been able to get rid of European foulbrood for a period of time. There is no place that's able to eradicate it, whereas American foulbrood, in my opinion and others, is eradicable. But you can reduce the amount or the pathogen load and the risk of recurrence quite a bit by doing the shook swarm. So, we worked with another student, Alyssa, this last year to try to look at shook swarms as a way of managing it. We won't know how those results are until this next June, really.

But what we did is a few things of trying to figure out how we can manage it in an operation that has just a few cases, but everything else looks good. And that's actually what we see very commonly is that someone will have a few cases, but most of the hives look good. We had some yards like that on the MSU campus. One yard we just left alone, and we gave them antibiotics and just saw if they recovered. The next yard we did a shook swarm on only the colonies that had signs of disease, and then we destroyed the equipment. Then in the third yard, we did a shook swarm on everything, but that included colonies that looked fantastic. We're not going to tell beekeepers kill all of your brood in the springtime. People aren't going to be able to do that. So, what we did is we took all of the equipment from that yard, and we added it to hives that already were at risk basically or another yard that had signs of disease.

So, the idea behind that is we're shook swarming the whole yard, putting all those bees onto new equipment, we gave them antibiotics and then what we did is bio security wise, you know we sectored off our operation. So, now we have a clean part of our operation and a dirty part of our operation. So, we're not necessarily eradicating it from everywhere, but we know that this yard is going to be much less likely to have it. And I think that that's really important for people who are interested in doing things like selling nucs. If we've got a disease that's at 20% in the population, it just is going to be in so many different operations and we want to stop the spread of it.

So, one thing that we can do is really minimize the pathogen load in the yards from which we would be selling or from moving equipment around.

Jamie

So, it's very interesting, the shook swarm method and all these other ways that you try to deal with it. So, I want to kind of circle back to this idea of a dead out. And I know you've got a lot of experience teaching beekeepers about this. You go up to a hive, there's no bees in it. What do you

do with those combs? And are you willing to put bees back onto those combs? I guess that's two questions. And my third question is, would your answer change if you knew that they had died to European foulbrood? So, I think in most cases I get this question, a beekeeper goes to their hive. They don't know what killed the bees or what's weakening them. So, they always want to know, Jamie, how long should I wait before I reuse these combs? Can I reuse these combs? And again, in your specific case, would your answers change based on whether or not the bees died to EFB?

Dr. Meghan Milbrath

Yes. So, I think for the last part first of whether or not they died with EFB, if I still had EFB in my operation and I knew I hadn't resolved it and I was in a yard that already had it, I probably would just assume that everything has it on it. Like, if that one hive did, but I didn't eradicate it from everything else, I would probably still use that comb just because, so I have a talk called Dealing with Dead Outs, and I have another talk called Drawn Comb is Gold. And they are kind of a little, I'm doing hand motions to show that there's like a balancing act between the two because it takes so much energy to draw out comb. Especially, for those of us in the North where we have such a short season, that drawn comb feels so precious. So, if I know that EFB is at low levels in my operation, it's not a death sentence to put a frame back in like it is if I saw scale for AFB.

But what I would do is, going back to that shook swarm example, is if I can practice good partitioning, I would have yards that it could go into, you know, clean yards that only get new equipment, and then I kind of have these old yards that can have the older equipment. So, I would put it into a yard that probably already was at risk. When I'm dealing with a dead out, which is very rarely, thankfully, she says cockily, and now I'm going to go back outside and all my bees are going to be dead.

Jamie

Karma.

Dr. Meghan Milbrath

I know. People kept asking me, are my bees dead? I'm like, it's too early this season. But no, usually when they do die, you look through and a lot of times it's a queen issue, and you can see examples of the emergency queen cells in the last place they drove brood. Or I always lose one to a darn pygmy shrew every year, you know, and then you're like, okay, well that was noninfectious presumably, but that doesn't mean it doesn't have EFB or Melissococcus on it. For most people, almost everybody is still losing their colonies to Varroa, and the Varroa die thankfully with it. When the bees die, the viruses can also stay on the combs. There's plenty of data showing that. But the viruses act very differently when they're on the comb versus when they're injected into the pupa via vector borne transmission.

So, my thing with dealing with old equipment is really a risk management question. So, my research is dealing with risk science where we look at exposures, we look at dose, we look at pathways, and we can actually calculate risk. But when you're doing risk management, you're also including the economic and the labor decision. So yes, if I wanted to completely reduce risk, I would start with brand new equipment every year. That is not financially feasible. I do not have a benefactor that's just buying me brand new equipment. So, I'm actually making my decisions in a real-world scenario. Even if I bought brand new equipment, there is a 0% chance that I can get sterile bees to put in it. You know, honey bees are very different in that they're not born. They're split off an existing colony. So, they're going to come in with bacteria and with viruses and with all sorts of other things on them.

Because we're taking a group of adult bees out of an existing hive, even if it's a very good beekeeper who has healthy looking colonies, they're not sterile. And so it doesn't necessarily make sense to start over with brand new equipment or take extreme measures to sterilize a hive when the bees are going to be dirty coming in and then they're going to go out and start drifting and flying out in the environment day one. And so, it is really a balancing act. I do check for American foulbrood scale and obviously that would be a big deal if you didn't notice it. And then I do try to switch out 10 to 20% of my brood nest combs every year. And that's not necessarily, you know, one per box. It's usually that if I have a dead out, I'd get rid of most of those. And I make that decision on which ones to get rid of. I usually prioritize ones that have brood in them, like dead brood, ones that have a lot of pollen or a lot of old bee bread and then stuff that's really just the weird comb. But I do have very different standards, and I have this in some photos that October Meghan would throw this away, but May Meghan would absolutely keep everything because it is just a judgement call. So, if I'm feeling short on comb, I'm probably going to use it. If I feel like, oh I've got a whole winter to make frames up then I'm probably going to toss it.

Amy

So, you discussed the movement of these frames. Let's talk about cleaning comb. Jamie had mentioned that you do have a talk, and I think we will link a presentation that you have in our additional resources, but what do you tell beekeepers about cleaning comb?

Dr. Meghan Milbrath

Yeah, So, disinfection and sterilization are a really interesting topic. We don't have a good sense of what you can use to kill the bacteria that causes European foulbrood. That is something we are actively working on, like literally this week as I'm chatting with you, Peter is in the lab suffering. What we're trying to find is different disinfectants that could perhaps be used to kill the bacteria when it's on equipment.

The short answer is I don't have good recommendations. There are options if you really were concerned that you can do gamma radiation and actually sterilize it. We do that sometimes for

research things, but I generally, in terms of the hive equipment, don't tend to sterilize or disinfect the combs and that is mainly a labor thing. I would say one thing that I do differently from a lot of beekeepers is I don't use plastic foundation in my personals. I have about 70 hives that I run on my own and it is all with beeswax foundation, and it is a lot more work up front because I still crosswire and all of that. But at the other end of it, it's much quicker because I can heat sterilize. So, I have a Safeway melter, and it's basically just like a glorified oven with a hole in the bottom and it gets up to 550° and I can run it for over an hour. It melts all the wax out and that will basically heat sterilize the wooden ware. And so that's the system that I use.

For my boxes, I do use wax dipping, and again that's going to be heat sterilization. The most important thing with heat though, is it is a combination of high temperature and time. So, for the wax dipping, I put stuff in for 10 minutes at 160°C. So it's a long time at a very high temperature. Those tend to come out basically sterile. So, when I do have something from a dead out, it goes through a heat treatment. For me, that's a system that works the best basically because I don't have any other things that I know that will kill things and also set up to do it with pretty low labor versus trying to soak frames and troughs or things like that.

Jamie

You did mention something that goes through my mind a lot when I think about rotating combs. You had talked a little bit earlier about this idea of rotating 10 to 20% of your combs, and I know people who do that in a hive, right? You know, two brood frames come out every year, for example. But just like what you said, the rest of the bees in the nest still carry whatever it is and so those things can get adulterated quickly. So, it's kind of an all or nothing, and it sounds interesting given your knowledge of disease pathogen transmission here in honey bee colonies. Your strategies about using pure beeswax foundation. I just like that because I'm pretty old school. I keep thinking when I retire and am able to ramp my bee numbers up, I'm going to go 100% back to beeswax foundation. But I like the fact that you do that. And then you said you waxed it, but basically, you're trying to heat sterilize essentially the boxes and the frames. But then you've got that issue, of course, whatever bees you move into it, it's carrying with them whatever they're bringing from their old nest. And so this is a really tricky issue to try to get on top of.

Dr. Meghan Milbrath

It really is. And I changed my messaging. I'm hopeful that I'm coming across as not having the exact answer. It really does depend. Sometimes, we'll give a talk on the persistence of diseases, and I'll go home and melt down a bunch of frames. There are other times that I'll be making splits and be like, oh gosh, I'm completely out of drawn comb and I'm like, this one looks fine, and I'll pull it out of the junk pile again. So even for myself with this background, it's pretty hard to make decisions. One thing that I would say is, you know, talking about removing the 10 to 20%

we did, just found out I got a grant yesterday to study this. So, I'm pretty excited. Looking at this method of doing a whole hive at a time rather than a frame within each hive.

So for example, if I'm a larger beekeeper, and let's say I have 100 hives, and I was going to switch out 10% of my comb, or 10 to 20%. One option is I take one to two frames out of each box, right? But like you say, everything else in that hive is going to be dirty. It's not going to take very long for that hive to get dirty. Another option is I switch out 10 to 20 hives completely, and I shake those bees onto brand new equipment and then those hives get marked or those hives are in another location, and they only get new comb coming in. And so then I've got this kind of new yard, and then the next year I do another 10 to 20 hives. You can get on a rotation then of kind of having these clean yards.

We actually have a beekeeper in Michigan who does this kind of at scale. So, he does about 400 hives at a time and basically shakes packages from his own bees onto brand new equipment and does this in cold storage. And he has 400 hives that are really, really excellent looking in terms of disease for that year. And then that old comb goes out to pollination. And if you're doing 20% and you actually are pretty systematic about it, then at some point you only have comb that's five years old and ideally, you've removed all of the very old stuff that's in there over time if you can be systematic about it.

Jamie

I think it'd be different Meghan, in that context too, like if you're a honey producer and a pollinator, so your job is to keep colonies alive, versus you sell nucs, right? People who sell nucs get to do this because they can just rotate combs out into the nucs that are for sale. I don't want to scare people. Those combs can still just be one or two years old, but it benefits the nuc producer because just by virtue of producing and selling nucs, they're able to do that.

Dr. Meghan Milbrath

Yes, exactly. And I used to sell nucs, and it was a great way to both manage Varroa and comb rotation. That was one of the main ways that I managed disease in my hives. But again, yes, it's not because I was selling a bunch of disease. It was just that I was rotating everything so quickly. You did talk about like the honey production and the pollination. The beekeeper that I was referencing before takes the really nice hives on the new equipment, they go out to honey production. The old equipment goes out to get hammered on blueberries and is the stuff that's going to build up a lot more pesticides.

Amy

Well, Meghan, I think that's really great advice. I'm so excited to see what the results are on your research. I know you said it just got funded recently, so congratulations on that and we'll have to bring you back to discuss the results of that project. You know, I think it's great to think about it

from not only just within a hive, but from an apiary perspective. So, was there anything else that you wanted to share with our audience today?

Dr. Meghan Milbrath

No, I don't think so. Thank you so much for the chance to talk about all these fun things.

Amy

All the fun things, the emotional roller coaster that we just went through. But we're so happy that you were able to join us today, and we cannot wait to have you back.

There's so much to talk about here. You know, we were talking about how we could probably just speak to Megan about EFB for days. It's really nice to have someone who really just specializes and focuses on it. That's her thing, right? She is like the EFB expert. So what were your thoughts on the interview?

Jamie

Yeah, it was great. I really enjoy speaking to Meghan as well. One of the things I like about her, she's doing really practical research to help beekeepers because she's a beekeeper and also because she has that extension slant, so she has to communicate results to beekeepers. So, she's constantly thinking of ways to assist them. Important for me from a scientist perspective also is her knowledge about European foulbrood. I mean, it's just what I said way back when I made my first question for Meghan. European foulbrood, I think, is a big deal and I think is under recognized and under addressed. So, it's really nice to know that she and her collaborators are trying to tackle this really, really important issue on behalf of beekeepers.

Stump the Chump

It's everybody's favorite game show, Stump the Chump.

Amy

Welcome back to the question-and-answer segment. We got all these questions at our just recent Bee College that we had here in Gainesville and we did something new this year and had a Q&A session for you. So, you've got a ton of questions and I'm excited to share them with our audience today.

Jamie

Yeah, that was fun. I've been part of lots of Q&A sessions at various meetings where I would go, and then they would have all the speakers show up at the end of the day and answer questions. But I've only ever done it solo this one time, and it was fun. I know you and I did it one time, an American Beekeeping Federation meeting where we kind of staged it almost like a Stump the

Chump, questions that you asked me. But this is the first time it was just me for an hour answering questions, no class involved. It was an interesting experience.

Amy

Well, the questions that we have are all very different. So, we finally should have given you like two or three hours. But the first question that you had was that someone was asking about breeding for resistance to the yellow-legged hornet. And I guess once I asked that question, I'm wondering how would you do that? What does that even mean? And what was your take and how did you answer that?

Jamie

Yeah, that was a fun question because I really never considered it before. And this was actually asked by a beekeeper who's come to our bee college two years in a row from France, where he is dealing with the yellow legged hornet. So, shout out to him for that question. And his comment essentially is kind of predicated, “Well, I live in France. This hornet's been here for a long time, and we've tried electric carps, we've tried colony muzzles, we've tried trapping, we've tried finding and eradicating nests and, and, and, and are there any efforts maybe to get a leg up on the yellow legged hornet from a bee breeding perspective?” And I asked for a little bit of clarity, and he explained, you know, the way we breed for Varroa resistance and things like this. So, in order for breeding to work right, in order to breed bees to be, quote, resistant to a tolerant of the yellow legged hornet, there has to be some underlying behavioral traits that would make them such.

And so thinking about what that means, we know, for example, the yellow legged hornet is a threat in its native range to Asian species of Apis. So, Asian honey bees. One species in particular, Apis cerana, the bee that gave us Varroa, thank you Apis cerana, that bee is capable of balling hornets that show up at the nest entrance. So, what does this mean? Well, we all know the term balling when we use it to describe what bees do to queens when they don't like a queen. A lot of worker bees will ball her. They'll get around her in a tight cluster, stinging at her and biting her, etc. In the case of Apis cerana, they will ball hornets that attack their nest and they will raise the temperature and the inner part of that ball to a temperature that kills the hornet but stop short of killing the bees in the center of that ball. So, when they ball the hornet, they will heat that hornet or cook that hornet to death, so to speak. So, we know that Apis cerana uses this behavior to help against the yellow legged hornet. Maybe there are some other behaviors it uses as well. Thus, if these behaviors exist in any capacity in Apis mellifera, the bee we keep, is there a chance of breeding for resistance to it? Well, honestly, the only behavior of which I'm aware that serrata uses against the yellow legged hornet would be this balling behavior. And we know Apis mellifera can ball, but we don't think they use it for a heat purpose against intruder. We know that they will ball an intruder that lands on the nest entrance and bite and sting, but we don't think it's for heat purposes.

Another catch is the yellow legged hornet doesn't really land on the nest entrance, at least for Apis mellifera. It's hawking out in front to capture bees coming and going. So, you'd have to be creative when thinking about what behaviors might confer resistance. I know that Gard Otis and researchers have shown that honey bees, I forget what species, but some Asian species, maybe it was cerana, can actually use animal feces to mask colonies that are being thwarted by these hornets.

So, my point is, is that there are behaviors that Apis species use in their native range against this hornet. So, the way this could work, if it could work, is to identify similar traits in mellifera. But I'm kind of scratching my head wondering what those would be since they don't exhibit exactly the same type behaviors that these Asian species do when they're trying to combat the hornet. So good question. I just can't think of any behaviors that we would target.

Amy

Jamie, do you remember when in the news it basically said that honey bees like fling poo poo at the hornets?

Jamie

I do remember when the news gets a hold of something, they like to make it something different than what it is.

Amy

That's so funny. You brought it up. I just remember, you know, like one of my friends asked me, is it true that they just like fling poo? And I'm like, no, that's not how it works.

Jamie

Amy, speaking of poo, what about the next question?

Amy

All right. Well, it's a question about honeydew.

So, the question is about honeydew honey in the United States. So, I guess the first question is what is honeydew honey and is that something that we have here in the US?

Jamie

Yeah, ding, ding, ding. That's why I said speaking about poo. So, honeydew is actually a very interesting thing. There are insects, there are groups of insects that have piercing, sucking mouthparts that would be like a needle. Instead of chewing mouthparts, they insert a beak of some sort, almost like a needle. They pierce the wall of a plant, and they suck up plant juices as their food. And now these plant juices are low in nutritive compounds, so the insects have to

have a lot of these plant juices running through their body before they can filter the nutrients out that they want.

As a result, these piercing, sucking insects that go after these plant juices excrete a ton of wastes out their rear end, and if they're feeding on plant juices that have sugar content in it, they will excrete these juices – I don't know what to do except use the biology terms – literally out of their anus that forms what we call, we humans call honeydew. Honeydew is just sweet, sugary liquid that comes out of the rear end of some sort of insect that is feeding on a plant. I know. So, speaking of poo, here we go.

Amy

Is it poo, though?

Jamie

Well, it is because it's coming out of their rear end after eating.

Amy

What kind of Q&A were you having at this event?

Jamie

I know. I know. It went south fast. No, but in all seriousness, this is a good question because you know, aphids are the classic example of this. Aphids are little, tiny, soft bodied insects that do this. They excrete honeydew. And if you look close enough when you see aphids on plants, you'll often see ants ending the aphids. A lot of Ant species are aphid farmers. They will huddle these aphids up. They will take care of these aphids while these aphids are feeding on the plants because the ants like to collect honeydew. It's kind of a symbiotic relationship. The aphids offer the honeydew to the ants, and the ants protect the aphids while they're feeding freely exposed on the plant. Well, honey bees can collect this stuff. There can be so many aphids and other plant juice sucking insects that honeydew can literally rain down from some trees. I'm thinking in the US about the invasive spotted lanternfly. And if you've ever parked your vehicle under an oak tree and gotten sticky stuff all over your vehicle, that can often be honeydew because there's aphids up in the oak trees working those plants.

Now, what does this have to do with honeydew? Because it's a sugary liquid, honey bees can collect it, and they will take it and process it and store it in their colonies like honey. We call this honeydew honey. And yes, in the US, we do produce honeydew honey. In fact, in some places around the world, it can be the primary honey source. I lived in Germany for six months some years ago, and beekeepers in one region of Germany were producing a lot of what they called forest honey. And all it was, was honeydew honey. It was aphids and other insects feeding on these trees and producing honeydew, and bees were collecting that and making honey out of it.

I know that you and I had a Greek colleague visit us. In fact, we interviewed him on the podcast, who talked about aphids feeding on pine trees producing honeydew honey and so bees can produce it. Here in the US, we get it as well. Now, this is an over generalization, but honeydew honey tends to be a darker and stronger tasting honey. That doesn't mean all dark strong honeys are honeydew, but that tends to be what you see associated with honeydew honey.

But the short answer to the question is, is there honeydew honey in the US? There certainly is. It happens across the US, in fact, where soft-bodied insects that have piercing, sucking mouth parts will feed on plants and secrete this sugary liquid right out of their rear end.

Amy

That's so funny. So, you know, we do have some spotted lanternfly honeydew honey here at the lab, and that was gifted to us by Robin Underwood at Penn State. So, she's actually going to do an episode with us here in a couple of weeks to talk about just the interest in the honeydew. And at the American Beekeeping Federation this past year, she had some honeydew honey mead. I will tell you, I tried it, and I thought it was really good. It was so, so good. Nobody else liked it.

I did. I thought it was pretty good. But you know what it tasted like actually was a bag of Fritos. You know the chips?

Jamie

Yeah, I do.

Amy

That’s what it tasted like.

Jamie

So, Frito-flavored mead? Sign me up.

Amy

Yes, it was so good. For people out there, I'm not really a sweets person. So, I really like bitter or salty flavors. And that's what I liked about this mead is that it wasn't too sweet. I really enjoyed that aspect of it. But it was funny because, you know, a good friend of ours said, what does this taste like? What does this taste like to you? And I sat there, and I tried it, and I was trying to figure out what it tasted like. And of course, he had a bag of Fritos in his hand. He's like, I'll give you a hint. I'm like, oh my gosh, it tastes exactly like Fritos.

Jamie

That's hilarious. So, you know all of your fans around the world are going to start sending you bags of Fritos now.

Amy

I can't wait. I love Fritos.

Jamie

Well, I mean, it is crazy. People don't think much about honeydew honey here in the US, but it certainly can be a major honey in some areas. It's tricky like the spotted lanternfly, right, an invasive species, but honey bees are going to use it, and it's just one of those weird that you see in the beekeeping world.

Amy

Definitely. All right. So, the third question that we have today, this individual asked, does living between commercial beekeeper apiaries present challenges for the backyard beekeeper?

Jamie

It certainly can. There are a few ways that it can impact you. The first way that I think is the most significant way that I think is something people think about last is just sheer competition. Even the best environments only have limited resources available to bees and, and over time, for example, you can figure out in your area how many colonies you can keep in an area before you start depleting the resources, which you'll see as an amount of honey that is being reduced per colony that you're producing.

For example, let's say you keep 10 colonies in your apiary, and you produce 100 lbs. of honey per colony. Let's say you double that to 20 and now you're only at 50 lbs. per colony. Well, you've discovered that it's resource limited in your environment. If you've got a lot of commercial beekeepers around you and you're just inundated with commercial beekeeper apiaries, then it can lead to significant competition for resources.

The second way that I can think of that it would impact is when resources become limited, it can lead to significant robbing events. So, their bees might be visiting your apiary and vice versa. A lot of hobbyist beekeepers can be worried about disease and pest transmission when they're close to commercial apiaries. But honestly, I think you'll oftentimes see it the other way around. Commercial beekeepers are usually very much on top of disease and pest management in their colleagues. It's not perfect, right? It's hard to get it right all the time, whereas a lot of hobbyists might let it go and try to do the more natural approach. So, commercial beekeepers often complain about the potential impact of unmanaged hobby colonies impacting their apiary. So, I think resource competition and robbing behavior are really the two greatest impacts that you'll see. But there could be some disease and pest transmission and things like that.

Amy

All right. Well, there we have it. Those are the questions for the Q&A for today. If you have other questions, feel free to send us an e-mail or send us a message on one of our social media pages.

Hey everyone, thanks for listening today. We would like to give an extra special thank you to our podcast coordinator, Jeffrey Carmichael. Without his hard work, Two Bees in a Podcast would not be possible.

Jamie

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.