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EPISODE 230 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 this segment of Two Bees in a Podcast. Today, I am super excited to be interviewing Dale McMahan, who owns and operates a state-of-the-art machine shop where Apis engineering products are developed and manufactured for queen instrumental insemination.

He is a bee breeder and a master beekeeper through the University of Montana, and he is located in Wheatfield, Indiana. I met Dale because I took a training with him and Krispn at Purdue University. We'll interview Krispn here in a couple of weeks but took a great training through them and I just thought it would be really cool.

Dale has this very interesting perspective of the bee world, and I'll let him talk about his background in a bit with his engineering. But he has developed a ton of technology and different projects, and he collaborates a lot with Purdue University.

So, the stuff that he comes out with is just really great and relevant for beekeepers. So, I'm excited to talk about product development and how that evolves through time. So, welcome, Dale, to the podcast.

Dale McMahan

Oh, thank you for having me.

Amy

All right, so the first question we always ask our guests is to just tell us a little bit about yourself and how you got into the honey bee world.

Dale McMahan

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My introduction to honey bees was when I was about, I would say, between 10 and 12 years old. We've always lived on a farm and there was a bee tree just beside our house. And every year those bees would swarm, of course.

And my dad called this local beekeeper. He's an old gentleman. And most of the time they swarm in the early spring through summer. So, I was home, not in school at the time. And one day he was coming to get the swarm, and I was home, and he encouraged me to come over there and watch him pick up the bees.

And he put a handful of bees in my hand. And at that point, I was hooked. So fast forward till I was in my 20s, after I got out of the Marine Corps, I got my first hive of bees on my own. That was in 1981, and I've been in and around bees ever since.

Jamie

Dale, I love that story. I love it because so many people I know have kind of had a similar experience. There's a bee colony in my tree, there's a swarm that landed in my yard, and man, obviously Amy and I are here, you're here because we all love honey bees and we all just got drawn into this.

I think it's the greatest hobby in the world. I think they're fascinating, and I really love that you got into it at such a young age and now you're on the very technical end of it. In fact, you and others, your specialty is product development, right?

Specifically, queen insemination equipment. So, you've taken it from that boyhood fascination all the way up to very technical work.

So, can you tell us a bit about your history with creating instrumental insemination equipment? I'm assuming it has something to do with your background. You mentioned off the air that you've got an engineering degree. So, could you elaborate on the history of getting you to the point that you create instrumental insemination equipment?

Dale McMahan

Yeah, I'd be glad to. So, I was in product development for most of my adult working career for Fortune 500 companies and big organizations. I was a director of engineering for a major corporation, and I was tasked with creating the prototypes, the pre-production units, and the production units for certain products.

And so, I really have a solid background in product development, and I learned to love it because it's never the same thing two days in a row. But how I got into instrumental insemination equipment was, I'd say about 10 years ago, I took the instrumental insemination course down at Purdue.

By the way, I have a bachelor's from Purdue in engineering and a master's in business from Olivet. So, I have the technical background as well. But anyway, I took the course and there's a lot of time to talk to the instructors and, you know, fellowship with the students and all that.

And one of the comments that Krispn made, who is my partner in crime here, was that he would like more instruments. But he was using Schley brand, and the original Schley were nonexistent. They had sold the company and then they had lightened them up, and he was not a big fan of the recent stuff, although they do work fine.

I'm not knocking them. And I said, well, I can make you some of the originals. He called them the long base. I can make you some of those, because I had a full-blown machine shop on my farm. And he said OK, sure. So, he let me bring 1 back and in two weeks I made three clones of this thing and he was blown away.

He said we've had other students say they could do it and they didn't ever show up with anything usable. So, we got to thinking and brainstorming, like, this is a good instrument, but it's not a great instrument. We can do better. And so, we sketched out some concepts on, literally, a napkin having coffee one morning.

And that became what we call the queen station, which is a, you know, you've seen it on the website or seen it in person. It's a comprehensive all-in-one unit with everything you need out of the box to inseminate queens.

From that beginning, we made the microstation for people with lighter budgets, and then we've developed a whole bunch of other products around that. Amy took a couple of them home when she left here. I still don't have a name for that box by the way, Amy.

Amy

We're still working on it.

Dale McMahan

I'm going to have a contest at Nobby to name it. So, we've got a bunch of products, but all of them center around queen rearing and insemination.

Amy

So, Dale, you know, first of all, I did take the training, and it was fantastic. I enjoyed it so much. It was a 2-day training, Jamie. We basically learned about the equipment that you need to inseminate queens. We learned about queen biology. We learned about drones and whether they were, you know, how to tell if they were mature or immature.

And it was really just a great, great training and it was very difficult to do. That's all I'm going to say. Inseminating queens is very hard. I'd say it's probably the next hardest thing next to, you know, harvesting honey in Florida in the summertime.

I don't know which one is harder between the two, but you know, it was just so much fun hearing about the experience and how this piece of equipment kind of came into fruition. So, I guess Dale, the next question that I have is when you're starting to build a product, what did you take into consideration?

Like, what things did you, I guess, what have you learned in the past 10 years, you know, with making the equipment better and better? And if someone was to just start coming out with a new product, you had mentioned earlier that Krispn had said, oh, wow, you know, everyone has ideas, but it's hard to actually come out with something that's usable. And so, what would someone need to take into consideration when they're trying to build a new product?

Dale McMahan

Yeah, that's a complex question, Amy. First you have got to ask yourself, are you trying to fill a need that everybody can see, or are you trying to create a need that nobody can see? And I'll give you two real basic examples. One was the light bulb. Edison was not the inventor of the light bulb, but he was the person who put enough effort into it to make it work.

Everybody could see the need. So, that's one end of it. And the other is creating a need that people didn't know they had or they have. And my example on that is the post it note. It took 12 years to develop the glue on the backside of a post it note, and they weren't even trying to develop that.

They were trying to develop a permanent adhesive, but it kept failing and became this reusable adhesive. It took 12 years for another researcher to come along, say, hey, let's quit fighting the dragon here, let's make this work. And now everybody needs post it notes.

So, first, ask yourself, are you filling a need that everybody can see or are you creating a need? I guess I'll back up just a second here and say that almost all of the inventions for beekeeping have happened in the last 50 years. Prior to this, it was discovery about bees.

You know, Doolittle discovered how to transfer larvae. He didn't invent it. He discovered that it could be done. Watson discovered how to artificially inseminate queens in the 1920s, but he didn't invent it. The inventions have all come in the last 50 years or so.

You know, the perfection of the instrumental insemination instruments, the plastic hives, modern processing equipment, that's all recent. We've just scratched the surface of what needs to be done for beekeeping. But if you're a young entrepreneur and you want to develop something, find that thing that interests you the most.

One thing I hated about corporate development was that they would force us to develop a product I had no interest in. Did it because I got a good paycheck. But in the end, product development by committee does not work and you get frustrated with it. So, find that niche that you love, stick with it, and only collaborate to the point that it aids in development your product.

Jamie

I really like that answer because I tell you, in all of my years of working with beekeepers, there's just so much ingenuity out there. I mean, it's crazy the things that people have come up with and the different products and ideas that they've had. And it's neat to hear you talk about it from a successful perspective, and also, given your background with what you did for a career.

So, I want to zero in a little bit on this. There are lots of beekeepers who come to us with ideas, and they've got this new little thing that goes on a hive or this new little thing that will help out with this or that or the other. And I'm curious, you just said product development by committee is difficult.

So, how do you build a small team of trusted confidants who help you with the idea? I mean, can you talk a little bit about the importance in this case of collaborating with Crispin, you know, a university researcher on your product development? So, how do you get the insight you need to make the product what it needs to be?

Dale McMahan

Yeah, the very best products are a combination of discovery and innovation, and that's where the university ties come in. If you can collaborate with a university – Universities are great at discovery, but they're poor at product launch because the product launch really belongs in the entrepreneurial range.

So, the very best products come from the collaboration of a university that is high in discovery and an entrepreneur that's high in development. The products come to market fast. They come to market without very many mistakes or reworks. And I just think it's the absolute best way to do it. In the case of me and Krispn, I mean, he's got like, I'm making up a number here, but 20 years with some of the best researchers in the world, Dr. Hunt and others, you know, he knows or has collaborated with him on many projects.

So, when he says something like, well, you know, your invention is great, except this or this, you need to listen. It's like, what's that old finance company? When E.F. Hutton talks, people listen, or something like that. You have got to listen when these people talk to you. He doesn't know about product development. He doesn't know the pain and agony to get there, but he sure knows how that product should work.

Amy

So, Dale, once you come out with a product you and Krispn have been working together for 10 years or so, so you do classes together. And that was kind of how I found you, was I took a class through you. I know that the insemination training is not the only class that you teach.

And so, I'm interested if you could tell our audience, just tell us a little bit more about some of the educational workshops that you have. We here, at the University of Florida, we are flying you and Krispn down here in March of 2026, and we're going to do an insemination training.

But I would love for you to tell us just a history of how this all started as far as your educational workshops, how they're set up, the different types of classes that you teach, and how you and Krispn kind of share that responsibility.

Dale McMahan

So, we do teach instrumental insemination here at Apis Engineering and we have a machine shop and a small lab. We can train five people comfortably, and we have trained up to eight uncomfortably. It's a 2-day course. Krispn teaches the biology and I teach the mechanics of insemination.

We also, Krispn and I co-host a training at Purdue on queen rearing. That's the various grafting or non-grafting methods of larval transfer, knowing the very best larva to select, and all the things that you need to get quality queens.

So, we do that together. But that's at Purdue. From time to time, I'll host specialty courses here on general beekeeping and honey production. We are putting together, or attempting to put together, a master inseminator course where we teach more advanced things about the bees.

You know, one of the things that comes to mind is that we would teach people how to make a diluent to preserve semen for longer periods of time and various other aspects of the equipment that people wouldn't otherwise need to know, you know, just the general hobbyist. The instrument itself is really complicated at first glance.

And I think, unless you can operate the equipment that you have, you're not going to be successful as an inseminator. You're going to kill a lot of queens. You're going to have them improperly inseminated. They won't last very long. So, we decided, Krispn and I, that it would be best to train on our equipment, in our setting so that people really, thoroughly understand how to do it.

Some people bring their own instrument. They may have a Schley or some other brand. I don't know the other brands, but they may have that. We allow them to bring that so they're being trained on every instrument they're going to use, because I think it does make a difference if you understand your equipment very well.

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Jamie

So, Dale, so far this is all very interesting to me. My wife and I were having a discussion the other day. She tells me I'm not a risk taker, that she and I would never be able to open a business because I'm low risk. And I'm sitting here thinking about your instrumental insemination device. Obviously, you've got a very limited market, right?

I mean, beekeepers, number one, and then, number two, beekeepers who are interested in queen rearing, and then, number three, beekeepers who are interested in queen rearing but want to take it that next step. So how old do you market? Can you give any tips and tricks to any of that?

Dale McMahan

So, we're the only manufacturer in the United States that I know of. We, as a marketing tool, offer a lifetime guarantee on our products. So, that's one thing that we offer that no one else offers. The other is that it's word of mouth in this industry.

We do have a website, and I am remiss in keeping it up to date among all the other things I have to do. But it does generate some interest. But kind of getting back to the classes, the classes is where we sell our instruments.

Almost everybody that attends one of our sessions buys an instrument because, you know, it's a huge investment for most people, and they want to make sure that they like the process, that they're going to be that much into it. But nearly everybody that comes through our class takes home an instrument.

But as far as marketing, I mean, I'm pretty poor at marketing. My son-in-law and daughter are moving back from Pennsylvania in a couple years and they're going to help take over the business, more training on some of the machine shop work and kind of transfer that out. But he and she are going to be a great addition to the marketing side of this.

Amy

So, Dale, you know, as a product developer, I'm sure you've got some challenges that you've learned along the way. And I would love for you to share just some of the challenges that maybe we haven't considered yet as far as your product development. So, tell us about some of the challenges and how you've overcome some of these.

Dale McMahan

One of the biggest challenges is that I can design things that physically can't be made. The machine simply won't reproduce the model. For instance, heavy undercuts that can't be machined or there's too many setups.

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The queen station is like a seven or eight setup product just for the top side. I'm working on reducing those. But it's easy to get into a trap that you can't make what you design. So, that's one of the biggest problems.

The other problem that you have as a product developer is getting the price point right. We're cost-competitive. We're not the cheapest, we're not the most expensive, but we are the best. At least, we say we are. One thing I would like to mention if you're listening to this and you're interested in product development, it's always best to choose a product that the barriers to entry are high.

In other words, a low barrier would be 3D printed stuff. Anybody can buy a 3D printer, make some stuff, but the quality of 3D printed products is very, very low. Notwithstanding, they do make multimillion dollar 3D printers that print metal, but most of them print plastic, and it's limited use and whatever.

If you're going to prevent others from copying your product, make the barrier to entry high. Put up a couple of million bucks for a machine shop and see how many people jump in on that. Not very many. You can farm it out if you like, but then your product is not yours.

It's really a collaboration between you and somebody else, who, at any time, can disrupt your product flow. Not a good solution either. So, if you're thinking about product development, really think about how you become the best and the only at what you're doing and you'll be a lot more successful, I think.

Amy

Dale, do you ever just make random things out of your stuff at your shop?

Dale McMahan

Yeah, that's a good question. I make stuff. I could build a new building for the metal I've wasted thinking about things and machine stuff that didn't work.

Jamie

I was just going to say, Dale, this is a bad question to ask you here at the end, but do you like making things or beekeeping better?

Dale McMahan

Oh man.

Jamie

The listeners really want to know.

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Dale McMahan

So, people often ask me why I've been a beekeeper so long. I started beekeeping in ’81. I tell them it's because I have yet to figure it out. I mean, I have a Learjet type rating, commercial pilot license.

I got degrees I could paper a wall with. None of it matters because I finished it. I've gone as far as I can, but I've yet to meet a single person who, in honesty, would say I've figured out bees. I've got it all done.

Amy

That's the beauty of it, I think, isn't it?

Dale McMahan

Yeah. So, until I get to the end of it, beekeeping's number one.

Amy

Awesome, I love that. Is there anything else that you want to share with our audience?

Dale McMahan

I would just encourage anybody that wants to do product development to aim for the fence. There's so many products that need developed. You know the old movie Alice in Wonderland? She and her father said, I think of six impossible things before breakfast every morning.

And if you do that, you're in line for product development success. Keep your nose to the grindstone, figure it out. Keep reiterating your products until they become successful. You know, last year, just as a side, I developed a new grafting tool. For the first time, I thought, I'm going to do a study group on this and see if this is viable.

It functions a lot like the Chinese one, but it's made out of stainless steel, carbon fiber and high-tech stuff. To me, it works. So, I gave a hundred of them away with a big kit on how to change the quills and all kinds of stuff with a signed agreement that they would – that the people that got a free one would report back to me on its use.

How did you like it? What happened with it? Out of a hundred, I got three replies. Two were positive. One was neutral. So, here I am. I don't know what to do with this thing. So, there you go. By committee, it never works. One of the problems that I have as an inventor is that I can use this grafting tool all day long.

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I like it, it works good, but, because I invented it, I know its shortcomings and I think I'm automatically compensating for them that a novice or somebody has no vested interest in this other than to use it would not be able to overcome, if you follow my meaning.

Amy

Dale, did you just tell our listeners to shoot for the fence? How tall of a fence is this, is what I'm wondering?

Dale McMahan

Well, you saw the World Series, right?

Jamie

I suppose we did.

Amy

I did not, but I'm sure Jamie did. All right. Is there anything else that you want to share with our listeners?

Dale McMahan

No, if anybody, any of your listeners has a question, they can find me on my website.

Amy

Sounds good. We'll definitely link your website on to our additional notes and resources but thank you so much for coming and talking to us about product development today.

Dale McMahan

My pleasure and thank you for having me.

Stump the Chump

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

Amy

Welcome back to the question-and-answer time. Jamie, the first question that we have today is regarding robbing. And not just robbing, but usually, depending on where you live, sometimes, as we know, migratory beekeepers here in the United States will send semis of trucks out and they'll bring them back home.

And so, I guess this is from a backyard beekeeper. There have been commercial bees that have been placed kind of nearby. And I guess there are some hungry bees out there. So, yeah, what

happens when you are a backyard beekeeper and your neighbors who are commercial beekeepers bring their bees back and all the bees are hungry? Is there any way to deal with this, and what do you recommend?

Jamie

Yeah, robbing is super-duper duper duper annoying, right? And I suspect it is largely an artifact of the way that we keep bees. I thought about this, really, a lot over the years because, you know, we've talked about on this podcast how our lab is starting to do some research with wild bees.

And no doubt in the wild honey bee world, there's robbing when a colony weakens or dies. There are resources available in the nest and bees can get that stuff. There's no doubt that this happens, but I just suspect it doesn't happen at the level that we see in our managed apiaries because we tend to take lots of colonies, stuff them up in the area, and when the honey flow stops there or cuts off, there's really nothing for all those colonies to get.

And it just creates this situation where they all want to take resources from one another, and they pick on the first weak colony or the weakest colony in the apiary, and it just moves from there. In this particular question, the questioner is an individual saying, well, I'm a hobby beekeeper, a commercial beekeeper dumped his or her colonies nearby and now mine are getting robbed when they weren't before.

What do I do? It's very tricky. Again, this is an artifact of just a high density of bees in an area that, probably, at the time, can't just naturally support that density of bees. So, there's a few things that you've got to keep in mind in this particular circumstance.

First of all, you've got to manage your bees to be as strong as possible because strong colonies tend to be able to keep that robbing at bay. They tend to be able to keep out other bees. That's number one. Number two, you can reduce the entrance. The questioner even mentioned that in their question. What can I do beyond reducing the entrance?

Well, you should at least reduce the entrance to where fewer bees can go through the entrance at a time. Makes it more possible for the colony being robbed to defend itself. And kind of a sister recommendation to that particular recommendation is check the boxes. Are bees able to get into the hive in places that aren't the entrance?

Are there notches in the inner cover? Are there holes in the corners of the super? Because if there are holes in these areas, you really want to close those holes because you've got to limit bee access to your colonies. Another thing that you need to consider is what about feeding?

If you are feeding your bees at a time of year where your colonies are being robbed, you have to be extra special careful with feed. For example, I see a lot of folks use jar feeds, feeders that go

on the lid of the hive or at the entrance of a hive. If these things have any sugar syrup on them at all, it's just going to attract bees to your hive.

You know, feeding bees inside the hive is usually better in this circumstance to keep bees from being attracted to the nest. When you work your hives, you want to be in there and out of there as quickly as possible because the longer you leave them open during the robbing season, the more likely they're going to be robbed.

I mean, all these are things that you have to do with your bees because you can't really control what's happening with this influx of other colonies that will be there, even if only temporarily, that are causing the problem. If it's really bad, if you can't get ahold of it or a handle of it, with all of these recommendations I've given, you may have to move your bees for a spell.

I know it doesn't seem fair, right? Your bees were there first. This is their permanent apiary. You've got this other massive number of colonies that were brought into an area. But there's really very little recourse that you have in this particular situation. And if your goal is to protect your bees, you may have to move them away for a spell until the coast is clear.

All of this is dictated by high density and low forage availability, which means they're going to try to take resources from one another. You can't control the forage availability, so you may have to reduce the density yourself, if these other tricks haven't helped.

Amy

All right. Moving on to the next question for today. There is a new product out there and it is called Norroa, and it is a little unique as far as a product that goes out there. So, I don't want to highlight the product specifically, but I do want to highlight how this product works. So, Jamie, tell us about Norroa, what it is, and what it's supposed to do.

Jamie

I think like what you said, Amy, it's really good that we take that neutral stance, that we're not necessarily highlighting the product. But since the question was how does it work, I can definitely go into that because I do know a little bit about this. So, this product is based on something called RNAi technology, and the I stands for interference. So, RNAi means RNA interference, but that may not be helpful at all because you also may wonder what RNA is.

Amy

Yeah. Thanks, Jamie.

Jamie

Yeah. I'm in great danger of over explaining it, so I'm going to try to keep it as upper level as I can. But all of us know that we have DNA in our cells, and the DNA is the blueprint for proteins that basically make us or compose us.

So, DNA stands for deoxyribonucleic acid. It is a double stranded molecule, so you got a strand and a second strand that paired together nicely. I'm not going to go much into that except to say that DNA has, within it, genes, and a single gene is a gene that, when read and interpreted appropriately, is the blueprint for a protein.

So, that gene is basically the fancy instruction guide telling the cell how to make a protein. In our bodies, there is an intermediate stage between DNA and protein, and that stage is called RNA.

So, if DNA is deoxyribonucleic acid, then RNA is ribonucleic acid. It is single stranded. DNA is double stranded; RNA is single stranded. Think about it this way. This is kind of an oversimplification, but DNA contains all the instructions for building a particular protein.

A gene contains the instructions for building a particular protein, including extraneous information. If you take the DNA gene and cut out that extraneous information, you're left with essentially, again, an oversimplified message here, the RNA equivalent, which is finally the blueprint that is read to make that protein. It's kind of that intermediate between DNA and the protein.

So, it's like DNA is overly complex instructions to build a doghouse. RNA is the sweet and simple steps to building the doghouse. So, RNAi is a process that interferes with the RNA process.

So, if you are able to stop the RNA process, you're able to stop the production of the protein that you are trying to build. So RNAi, then, relies on the ability to identify genes that are very important for the health and well-being of an organism, in this case, Varroa.

So, you find a gene that codes for something that Varroa really needs, and you turn it off. And rather than turning off the gene, you're simply shredding up the RNA copy of the instructions so that the doghouse is never built, so to speak.

And that's the interference part. You're interfering with the RNA component. And this particular company has identified a gene, a target in the Varroa genome that, if it is silenced, it cannot express its protein, then it's not going to have that protein that's important to their life.

Unlike a traditional pesticide, Amy, that you would put in a colony to kill Varroa outright, RNAi really doesn't necessarily kill the adults outright, but it compromises them in some way. Maybe it affects their reproduction, maybe it affects their feeding behavior, etc.

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So, Norroa, if you read on the website, claims that it impacts reproduction. So, the idea is that, you know, whatever it's targeting, it's stopping that RNA process and you're getting a reduction in Varroa loads in your colony. And I will say one of the benefits about RNAi technology is that you are trying to find genes that are important to that organism that only that organism has.

You're only silencing that organism's gene because there's no equivalent of that gene in other organisms, which makes it incredibly organism specific, which makes it, therefore, safe for bees and safe for other mites and safe for humans, etc.

That's one of the beauties and promises of RNA technologies. You're finding things that really only target that pest and won't target other things. That's why people have really gravitated towards this and gotten really excited about this type of controlled technology.

Amy

Yeah, definitely. OK, I've got two, maybe three follow-up questions to that if you're OK with it.

Jamie

Go for it.

Amy

All right, so when you're talking about this, it kind of makes me think, I also used to be part of the plant world and, you know, they basically had like invasive species that they ended up making like infertile varieties of and started mixing. Is that similar at all?

Jamie

It all depends on what the technology is that they're using to achieve that purpose. So, in theory, RNAi could be used to make mites infertile. I don't know that that's what this particular target's doing, but in theory, you can do that. But there are lots of these types of molecular technologies out there that are showing promise for lots of disease and pest control applications, and this is one of them. So yeah, depending on how they're doing it in the plant world, it may be comparable.

Amy

Okay, second question is how do you give the RNAi? What does that look like?

Jamie

Yeah, great question and honestly, I should have read more about Norroa, but it can be delivered in multiple ways. I mean, in theory, to overexplain this, RNA is single stranded, but what you do is you create a double stranded version of the target RNA, which we call DSRNA, double

stranded RNA, and that causes the cell to initiate a shredding process where it will shred the target RNA.

So, you can create this stuff, and you can deliver it to the bees multiple ways, but the most popular way that we've tested in the past is through sugar water. And I believe Norroa is one of those types of things that you feed. It's in a liquid form and the bees take in that double stranded RNA to do its thing.

Amy

All right, the last question, maybe this is a comment and a question, but you're talking about how it doesn't kill the mites outright. So, I mean, this is not an end all be all one thing that's going to just make the entire mite population go away, right?

Jamie

Exactly, that's a really good comment. So, when we think about control, you know, we're kind of programmed to think, pest go get chemical, application of chemical, pest walks through it, it dies. That's not usually how these RNAi technologies work.

Instead, you're targeting something that's important to the organism. Therefore, it could take a little bit of time to see the effects on this. In the case of Norroa, they've been testing this in labs and, you know, industry for a while and they're seeing, you know, Varroa cessation, not cessation of reproduction, but slowing down of reproduction.

So, you have lower Varroa numbers in the nest over time. But it doesn't have to be reproduction. It can be things like cuticle formation, right? You know, Varroa have a soft body stage and then a hard body stage. Well, you could in theory find the protein that's responsible from going to soft body to hard body and silence that.

So, the Varroa themselves aren't dying, they're just staying soft when they come out and make them easier for bees to attack. So, in this particular case, I believe the Norroa folks are claiming that it's slowing down Varroa reproduction. Therefore, one would believe from those statements that it's probably targeting some sort of part of the reproductive pathway, or something that somehow affects the reproductive pathway.

Amy

Wow, pretty crazy.

Jamie

It really is amazing, but it's tricky because you know, the bodies are trained to shred double stranded RNA, and so you've got to get enough of it in there.

And if you think about it in the Varroa's case, how do you get it to the Varroa? Well, you got to pass it through a bee, right? And so then you worry about the bee zone mechanisms throwing it down. So, I know people have been studying this for a while with this particular product. And you know, even Dr. Cameron Jack in our lab has looked specifically at this product. And I know there are papers that will be coming out soon talking about the efficacy.

But yeah, it's a really neat technology. And hopefully there's another target and another target and another target. You know, that's the beauty of this. It doesn't just have to target one pathway. It could target multiple pathways in a mite. And so hopefully, this will only get better over time as people find more and more genes that are important.

Amy

All right. OK. We're going to go over to the last question. And I guess it kind of still has to do with genetics.

Jamie

It does, I see that.

Amy

Yeah, I know. I'm like, oh, we didn't even do that on purpose, but OK. So, African bees are kind of known for having mean traits, right? I mean, they're kind of known for being defensive, kind of known for being mean. That's what people always say. You hear killer bees, and they always kind of refer to the African bees as killer bees. So, the question is, do those traits, you know, that mean trait in African bees, does that come from the mother or the father? Does that come from a queen or drone?

Jamie

I was kind of prepared for this question because I actually got a very similar question. You know, I write the Q&A for the American Bee Journal, which is a journal that we have here in the United States, and I write the Q&A for that series. And I actually got this question, similar question, Amy, I don't know, two or three years ago. And I said, well, I wasn't 100% sure.

And someone said, well, I read that it had to do with the drones. I'm like, I don't know why it would have to do with the drones because, presumably, the defensive behavior is controlled by one gene, and it's probably multiple, maybe a couple genes, but it would have to do with different alleles on that gene. And in the case of workers that are exhibiting the defensive behavior, the drone would be contributing as much to that as the mother would be.

So, I couldn't, at the time, see why one or the other, the queen or the drone, would have more or less impact on the expression of that defensive behavior. So, I kind of wrote it off. And then, I

was thinking about it and someone emailed me and said, well, Jamie, you know, look at this paper.

And the paper that they told me to look at was this paper I'm going to mention. And the title of the paper is Eternal Effects on the Defensive Behavior of Honey Bees. And it was published in the Journal of Heredity back in 2005.

And this is something, Amy, we need to link in our show notes. And in that, Ernesto Guzman, who is a scientist at University of Guelph in Canada, he was a specialist on African honey bees, still is a specialist on African honey bees, studied it a lot, in many different ways.

And he and his colleagues looked at this, and they did this through some back crossing and hybridization between Africanized honey bees and European honey bees. And it's been a while since I've read the paper, but we're going to make sure and link it in our show notes for people who are interested. But he and his colleagues found that the paternal, so the drone influence on defensiveness, is disproportionately skewed towards drones.

In other words, there seems to be a greater male influence on defensiveness than female influence on defensiveness. And they give a couple of hypotheses for why this might be the case in the discussion of this particular manuscript. But I don't know that they followed up and tested those hypotheses.

But it was really interesting to see. So, I mean, the question is, do the quote, unquote, mean traits in African bees come from drones, and I wouldn't say exclusively from drones. I would just say that there is research to suggest that the drones have a disproportionately high or strong influence on the expression of defensiveness in the African honey bee and possibly, honey bee population in general.

So, there you have it. It does seem to be that there is a significant influence of the paternal side of things with regard to defensive behaviors, and I'm curious to see why that's the case.

Amy

Yeah, definitely. It's crazy how many publications are out there and how much research has been done, just on, I mean, just about everything. Everything and still nothing at the same time.

Jamie

Oh my gosh, people always ask us, how do you guys have enough things to talk about and study? I'm like, how do we have enough lives to study it? And you're so right on, Amy. I mean, especially since 2006 when colony collapse disorder came into existence, it created bee programs.

There are so many papers being published on honey bees every year. It's so ridiculous, and yet we still know so little. What an amazing field to be in. What a great thing to study, this enigmatic crazy thing that we call the honey bee. Amazing.

Amy

Yeah, definitely. All right, listeners, you know what to do. Send us an e-mail if you've got questions. We're always looking for questions. 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 An Equal Opportunity Institution. 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.