Just Blowflies and Extreme Temperatures Transcript

Just Science Introduction [00:00:05] [music playing] Now, this is recording RTI International Center for Forensic Science presents Just Science.

Voice over [00:00:21] Welcome to Just Science, a podcast for justice professionals and anyone interested in learning more about forensic science, innovative technology, current research, and actionable strategies to improve the criminal justice system. In episode five of the 2020 R&D season, Just Science interviews Dr. Travis Rusch, a post-doctoral research associate at Texas A&M University, about fluctuating temperatures and forensically important blowflies. Forensic entomologists use predictable developmental rates of certain necrophagous insects to estimate time of colonization, postmortem interval and the time of death. However, extreme fluctuations in temperature can affect these development rates in unknown ways. Dr. Rusch hopes to shed light on this issue and advance the field of forensic entomology through his grant work. Listen along as he discusses the utility of forensic entomology, the life cycle of blowflies and the next phase of research in this episode of Just Science. This season is funded by the National Institute of Justice's Forensic Technology Center of Excellence. Here is your host, Dr. Megan Grabenauer.

Megan Grebanauer [00:01:39] Hello and welcome to Just Science. I'm your host, Dr. Megan Grabenauer with the Forensic Technology Center of Excellence, a program of the National Institute of Justice. Today, our guest is Dr. Travis Rusch, a doctoral research associate at Texas A&M University. Travis, welcome to the podcast.

Dr. Travis Rusch [00:01:56] Thank you for having me.

Megan Grebanauer [00:01:57] So I'm curious, where did your interest in forensic entomology start?

Dr. Travis Rusch [00:02:00] So that's actually kind of a interesting question, because I would say it has a little bit of luck because I was graduating at the time from graduate school that my current PIs doctors, Aaron Tarone, Dr. Tomberlin, were awarded an energy grant and they were looking for somebody outside the field of forensic entomology that had more of a background in thermal biology. And they reached out to my Phd advisor, Mike Angeletta. And behold, I was a good fit for it and eventually got offered the position.

Megan Grebanauer [00:02:29] So when you were a kid, you didn't say, I want to grow up to be a forensic entomologist?

Dr. Travis Rusch [00:02:32] Not particularly. I always liked the classic, you know, forensic shows on TV, but it wasn't a career aspiration of mine or anything like that for graduate school. Actually, I worked with lizards for as a model organism and then for my post-doc switched to forensically important insects such as blowflies.

Megan Grebanauer [00:02:50] So yeah, I was reading your bio earlier and it said that you start with an interest in how animals function across landscapes.

Dr. Travis Rusch [00:02:57] Yes.

Megan Grebanauer [00:02:58] Can you tell me what what exactly that means?

Dr. Travis Rusch [00:03:01] That's more of like a comparative approach. So you could be interested in a single question.

Dr. Travis Rusch [00:03:05] So maybe what is the critical thermal maximum? So the hottest temperature an organism can be exposed to for giving performance, maybe survival. And then what I'm interested in is how does that change across different landscape? So how do desert organisms compared to tropical organisms and compared to temperate organisms? So I'm interested in different traits to mean not just survival, but maybe over position in blowflies would be an interesting thing to look at.

Megan Grebanauer [00:03:29] So how did that lead to your current position? You have publications in the field. Or was it just interpersonal networking?

Dr. Travis Rusch [00:03:35] A little bit of both. I had some thermal biology publications at the time before I was obtain this job, and I think mainly this was networking where I said my current bosses were kind of reaching out to somebody. My my advisor for PHC was pretty well known in the field of thermal biology. He wrote the book Thermal Adaptation that Dr. Tarone used to formulate some of his grant. So I was kind of what attracted them to reach out to my Phd lab. It was a good fit. So I could do more thermal biology work with them and just kind of brought in my system. Move on from vertebrates now to working with invertebrates.

Megan Grebanauer [00:04:13] So you're currently a post-doc. Do you do any casework along with that or are you strictly a researcher at this point?

Dr. Travis Rusch [00:04:19] I have been given the opportunity with Dr. Tomberlin to assist in some of his casework. So I'm not a board certified forensic entomologist, so I don't do any casework on my own. But I have helped process some data and write case reports with Dr. Tomberlin.

Megan Grebanauer [00:04:33] Do you know what's involved in becoming a board certified forensic entomologist? Is that a career prospect you're considering?

Dr. Travis Rusch [00:04:38] Yeah, that that is something that I would like to eventually achieve from what I've been told. It's a two part examination from a ABFE, the American Board of Forensic Entomology. They give you a written exam. So which is my understanding is basic questions on the field and history of forensic entomology. And you get scored on that and you have to make a minimum score. And then. The other part is they give you some evidence bag could be photographed. It could be actual dead insect specimens, could be juveniles, adults. And you have to analyze the evidence and write up a case report and it has to be to the certain standard of the ABFE. And then if you pass that exam, you become board certified.

Megan Grebanauer [00:05:19] You need to be a board certified in order to lead casework?

Dr. Travis Rusch [00:05:22] Technically, you do not need to be board certified. But I think it provides you with good credentials that law enforcement are maybe more willing to work with you because you've actually proven yourself to the field of your peers. You do know the history of the field. You are able to adequately write case reports and interpret the data that goes with it.

Megan Grebanauer [00:05:39] I am coming into this with very little knowledge, admittedly, about forensic entomology. So before we get into specifics about your research, can you tell me a little bit about what role entomology plays in forensics?

Dr. Travis Rusch [00:05:51] So forensic anthropology is actually a fairly broad field. It has three different branches. It has urban entomology. It has insects as feed and food. And it has medical legal entomology, which is what I specialize in. What that is involving more death investigations. But urban entomology can be something like an example is termites in a home. So say somebody buys a home. A few months later, they find they have termites. They call in an urban forensic entomologist and these are more civil lawsuits. So it's kind of who's to blame, where the termites are already there? Or did the people bring them with them? And the insects in your food is kind of a similar idea. Think about cases where you get to go to a restaurant and you get a cockroach on your plate. So did it come from the kitchen or sometimes people try to, you know, win eligibility lawsuits and they put it on themselves. So they call in a forensic entomologist that specializes in that area and they can determine who is at fault.

Megan Grebanauer [00:06:44] I never thought about who you would need to call in a situation like that, but that makes sense, that you want someone with some knowledge to help figure out where the cockroach came from. So for the medical, legal, forensic entomology, are there any key assumptions that have that have been established through basic research at this point?

Dr. Travis Rusch [00:07:03] There are a few assumptions in the field. One assumption associated with the postmortem interval, which can be interpreted as the time of death. In order for that to be a valid measure, you have to assume that the insects colonize a dead body immediately after death. And in some cases that has been validated. For example, I use pigs often as kind of surrogate bodies and we put them on the field and by the time I drive one out there, I've already got flies around my truck. So they find it kind of on the way in and they have they're really good at finding bodies. But there can be other times where maybe a body is not exposed. So maybe it's in the trunk of a car and there's a delay in the colonization. So it really kind of depends, you know, what type of situation we're dealing with. If insects can find the body immediately or if there's a delay.

Megan Grebanauer [00:07:48] I feel like your postdoc experience is so vastly different from mine being cooped up in a chemistry lab versus driving dead pig bodies with flies swarming around your track.

Dr. Travis Rusch [00:07:59] Yeah, I'm always curious what people on the highway think when I've got 10 pigs dead in the back of my truck and but it is Texas. So there's a lot of feral hogs out there. So I actually get a lot of donated hogs and hog hunting is pretty popular sport for removal of the invasive hogs.

Megan Grebanauer [00:08:15] All right. So I'm very familiar with what a chemistry lab looks like and what a tox lab looks like. I would love to know more about what your research environment and your laboratory looks like. Do you just have jars of larvae sitting around? What does it look like when you go into the lab to work.

Dr. Travis Rusch [00:08:32] Depending what room you go into it looks very different. So we have some wet labs that look more similar to a chemistry lab or a molecular biology lab, because some of the people in our lab do molecular work and DNA work with the flies. Other rooms. So we have a specific room. We call it the blowfly colony room where we have a wall. It's a bookshelf, a metal bookshelf. And we have plastic bins that are filled with jars of larvae at certain times. So there's a strong ammonia smell. So you get used to the smell of larvae and we feed them beef liver primarily. So there's rotting meat in that room. And it's it's something to definitely get used to. And it's a shock factor if you haven't experienced it before. And also in that room, we keep a bunch of individual cages where we keep a couple of hundred flies in each cage. And at any given time, we can maybe have 20 to 40 cages set up of flies. So you also get that when you walk in, there's that you can almost feel the buzzing from these flies. We have our meat and blood refrigerator. We feed them blood as the adults are developing as a protein source. And we also keep a whole beef livers. We cut those up and put them in Ziploc bags and then we feed that to the larvae so they get a good protein source to develop on this similar-ish to human tissue.

Megan Grebanauer [00:09:51] So how do you choose which ones become a part of the experiments?

Dr. Travis Rusch [00:09:56] Probably depends on your question. So if you want to ask real basic questions and start get development sets, you're probably going to choose species, especially for that region, or you don't have current development data sets. But if you once you establish those, you can ask other research questions. Part of it is logistics. You know what's available to you. You can go out and catch certain blowflies in your region that you can't you know, other regions have different species of blowflies. So each lab kind of more or less seems to work on the species that are more native to where that lab is.

Megan Grebanauer [00:10:29] So you go out and catch low flies?

Dr. Travis Rusch [00:10:31] Yes.

Megan Grebanauer [00:10:32] What does it take to catch? Do you have like a big bug net?

Dr. Travis Rusch [00:10:37] Yep there is a net. So there's different ways to do it. I use I go out and I put out a piece of meat. So it could be it could be a dead pig. You could be beef liver. Chicken liver works really well because it's really nasty, smelly so like flies are more attracted to it, it seems. And they'll come in, they'll fly around and you can use a bug net and you swipe them. And then I put them in a insect container and take those back to the lab. Alternatively, sometimes we piggyback off of our collections on different research. So another project I'm working on is measuring the temperatures of decomposing bodies. So I have a thermal fleer camera that I take photos of dead pigs or dead humans over time and measure the different temperature profiles of that decomposing body. And when those are out there, obviously they're going to be colonized by blowflies. So an easier method for collecting flies is then I just grab handfuls of the larvae and put them in the jar rear them out. And then some species you can tell by larvae pretty easily. Some species we wait until they're adults and then we separate them and put them in different colonies. People have also developed traps where they put up some type of meat out and the flies can get in, but they can't get out.

Megan Grebanauer [00:11:44] All right. So this week you presented results from an energy funded grant at the American Academy of Forensic Sciences annual meeting, a presentation entitled Development Responses to Fluctuating Temperatures of a Forensically Important Blowfly. That's part of the NIJ Forensic Science R&D symposium.

So before we get into the details, are there any other researchers on this project that you'd like to acknowledge?

Dr. Travis Rusch [00:12:06] So for this particular project that I presented on both doctors, Aaron Tarone and Dr. Jeff Tomberlin, the PIs on the grant. So I'd like to acknowledge that they helped me through various aspects of this project. They provided the funding they were awarded, allowed this project to happen. There's also the student, Abigail Orr she's a Phd student currently in Dr. Tarone's lab. She was very instrumental in helping collect the data and take care of the flies that are required for this project.

Megan Grebanauer [00:12:35] So, Travis, can you just give me an overview and sort of in layman's terms of the purpose and goals of the project?

Dr. Travis Rusch [00:12:41] The purpose of this project is to improve our current methods for measuring the effects of temperature on development of blowflies.

Megan Grebanauer [00:12:48] You're focusing on one specific type of blowfly. I'm not even going to attempt to say the name. Can you for our listeners, tell us exactly which blowfly that is.

Dr. Travis Rusch [00:12:57] Sure for this a study I use cochliomyia macellaria.

Megan Grebanauer [00:13:00] And why are you focusing on that particular insect as opposed to any others?

Dr. Travis Rusch [00:13:05] Well, I guess there are a couple general reasons why it's one of the two species that was proposed in the grant. So we have to kind of use that insect. But also it's a forensically important blowfly as it regularly colonizes dead bodies. It's been documented in casework numerous times and it's a pretty common blowfly in North America and particularly in Texas where I'm doing the research.

Megan Grebanauer [00:13:28] You're looking at how extreme temperatures and temperature fluctuations affect the development of this blowfly. Can you tell us a little bit more about what the typical development or lifecycle of this insect is?

Dr. Travis Rusch [00:13:41] The typical lifecycle of a blowflies? You have an adult, an adult female typically needs to find a protein source and often you'll get two types of females that will utilize a dead body. You'll get virgin females that use it as a protein source. They'll drink the blood or drink some of the fluids coming off that body and you'll get gravid females that are already have eggs and they use it as an over position site. And then the eggs are laid on the body and they hatch into larvae and these larvae go through three different instar stages. So they molt into from first to second to third as they grow and shed their skin. And then they finish feeding. They obtain enough protein and they leave the body and they find a place to pupae and they form a puparium. And then pupa stage last for a certain amount of time, depending on species and depending on different environmental conditions. And then the pupae emerges into an adult and repeats the lifecycle.

Megan Grebanauer [00:14:36] So how do you measure that development? Is it just visual inspection? Do you have any kind of tools to help you out?

Dr. Travis Rusch [00:14:44] The way we measure the development really relates to the different larval instar stages? So we can do in a lab is we can create development data sets by exposing the developing blowflies to different temperatures and measuring the duration of each of. These different life stages so innocent. How long does it take you an egg to hatch at twenty five degrees vs. at 27 or 30 degrees? And then we can, you know, continue observing the blowflies through their different life stages. And for how long is the first instar stage last? How long does a second how long? The third pupa and so on.

Megan Grebanauer [00:15:18] So what are your findings so far? What kind of development responses are you seeing?

Dr. Travis Rusch [00:15:22] So what we're seeing is there's two main findings. One is that with a large enough magnitude, we get deviations from comparing it to development at constant temperatures. Other result is depending on if we initially ramped the temperature up or ramp the temperature down. That is if we exposed the eggs to initially cold temperatures or warm temperatures that has downstream effects, meaning that it affects the development beyond the egg stage all the way through until adult emergence.

Megan Grebanauer [00:15:51] So you also mentioned in your presentation today that results from stays in the literature on the effects of temperature fluctuation on development are mixed. Yes. Why do you think that is? What are some possible explanations for these differences?

Dr. Travis Rusch [00:16:04] I think one possible explanation is a lot of these studies are done and they apply different magnitudes of fluctuation. So from my results when I did plus or minus five degrees, it's fairly moderate fluctuation. I did not see as extreme or results as I did when comparing it to the plus or minus 10 degree fluctuations. So if they didn't have a large enough magnitude of fluctuation, they might not have seen a strong effect. Another one could be where they were these fluctuations dipped into. So if they did it at an optimal temperature and fluctuated around there, it might not be very costly to deviate right around the optimal development temperature. But if they did it at maybe a warmer temperature and when it is suboptimal, maybe possibly close to lethal temperatures, that might be costly and actually be the reason for some of these developmental effects that I'm seeing.

Megan Grebanauer [00:16:52] At what time intervals are you measuring the development? Are you looking at these things every 30 minutes, every hour?

Dr. Travis Rusch [00:16:59] Not quite that much. The eggs, I checked those ones every hour so we could know pretty precisely when they hatched. And after the eggs hatch, collecting larvae and measuring their development at twelve hour intervals. And the reason for that is the egg stage lasts anywhere from 10 to 24 hours, depending on temperature. So we wanted a finer resolution for the egg, but the larval stages can last for twenty to seventy five hours potentially depending on the stage. So we don't need to collect continuously from a single stage.

Megan Grebanauer [00:17:30] For that egg stage are you guys pulling all nighters in the lab?

Dr. Travis Rusch [00:17:33] Yes. Not that's not the fun day. Yes. Sit in your office, work on something, and every forty five minutes, walk to the back lab and open all the jars and see if you have larvae. And then when you finally do, you get to go home.

Megan Grebanauer [00:17:46] So you mentioned one alternative approach that is currently being used to account for temperature variability, which was the accumulated degree day or hour model.

Dr. Travis Rusch [00:17:56] Yes.

Megan Grebanauer [00:17:57] Can you talk a little bit more about what that is?

Dr. Travis Rusch [00:17:59] It's a product of temperature by time. So you get a universal measurement of accumulated degree hours or days depending on your resolution. And what we can the way we use this then is in the field. Obviously, they're not in the laboratory where we find a dead body. We need to use weather station data to relate temperature to development. And these weather stations, if they record them in daily temperatures, we use accumulate degree day models. If we can get hourly temperatures from them, we can then use accumulate degree our models. And with these models do is they take into consideration some of the fluctuation by taking an average when the averages are driven by daily highs and daily lows. So that way we can use average temperatures from these weather stations to estimate development rates of the blowflies.

Megan Grebanauer [00:18:45] So the data that you're collecting in the lab is in much finer time points than you would get. You know, the temperature fluctuations on a much more precise scale and just looking at an accumulated temperature model or something like that. Does the data that you're producing, does that agree with an accumulated day model? Have you tried calculating it out?

Megan Grebanauer [00:19:06] Actually, yes. So when I first presented the data, it was in general hours. But I do have it plotted and other figures for the paper where we translate it to the accumulate degree, our model. And you can use any resolution really. I mean, I guess within an hour to a day you can take my data, which I have done. I just didn't present it that way today. But it it fits into the accumulated three day system.

Megan Grebanauer [00:19:29] Are there any other sources of research outside the realm of forensic entomology that you found useful?

Dr. Travis Rusch [00:19:35] Actually, yes. Agriculture literature has been really helpful because they also use to accumulate degree day model, but they've also been doing it for a little bit longer than forensic entomology and they've developed some curvilinear models. So if you remember what the thermal performance curve that I was showing up there, kind of like the skewed bell bell curve to some degree. If you think about that model, there's some nonlinear. And in the community agreed a model assumes that the relationship between development and temperature is linear in certain regions, particularly in the middle. That fits the hypothesis really well. And these models do a really good job of estimating time intervals. However, there are some non-linear portions to that curve. The cumulative 3D model in some cases can still kind of be robust enough to be accurate, but in some cases maybe curvilinear models would be a little bit better in estimating these timelines.

Megan Grebanauer [00:20:30] So you presented some very interesting cutting edge results here this week, proving particularly here, you're finding that not only does temperature fluctuation itself affect the development, but which direction the temperature fluctuates, rather. You start with your ramp going to a higher temperature versus your ramp going down to a lower temperature can have a dramatic impact on the final development of the blowfly. So envisioning the future, how do you see practitioners using this information? How is it going to impact how these cases are worked?

Dr. Travis Rusch [00:21:02] Sure. A really good question. One way that I see it using in the near future is thinking about what the ramping directions mean. So if you have an over position event in the morning, they're exposed to a moderate temperature. It's kind of cool and then it warms throughout the day. So that's kind of like a ramping up treatment for my experiment.

Megan Grebanauer [00:21:23] All right. So in an oval position event, does that mean that the fly lays eggs?

Dr. Travis Rusch [00:21:27] Yes. Alternatively, do that. If you have an oval position event where the flies lay eggs in the evening, they're going to be exposed to a moderate, even in temperature that is going to ramp down overnight. So if we know that early on in the life of these flies, particularly the egg stage, if the thermal exposures have lasting effects that are either going to accelerate or slow down development, we could potentially use this to adjust some estimates of development for blowflies.

Megan Grebanauer [00:21:55] So in your estimation, how far could the adjustments be? Are we talking a matter of one to two hours up to a day? How big of an impact could this have?

Dr. Travis Rusch [00:22:05] At the egg stage, we saw an 8 hours of variability just depending on the initial ramping direction and the magnitude of fluctuation. And they all had the same same average temperature of twenty five degrees and those eggs hatched at 16 hours. And then there was eight hours of variability. So that eight hours is 50 percent variability. So there can be quite a bit of variability. So they can have early on us along impact. And then the total difference was forty five hours in this case. So that could be as much as two days difference in development just based on initial ramping up or down. So again, these early thermal experiences by blowflies have downstream effects that are affecting by a matter of days in this case. But granted, this is one study. This is one species and one population. So I don't want to overextend the results of this. It can't be extrapolated to other species. And I'm really hesitant to even extrapolate it to the same species in other regions that experience different thermal environments.

Megan Grebanauer [00:23:07] You mean perhaps blowflies that are accustomed to different temperature fluctuations as a part of their normal daily routine than the ones that you used in your study?

Dr. Travis Rusch [00:23:15] Yeah. So say we have a population in Florida of cochliomyia macellaria that are used to fairly warm and humid conditions. And you have a population in Arizona that are used to very warm and dry conditions. I imagine their responses to a given thermal treatment may differ just based on their evolution in their different environments.

Megan Grebanauer [00:23:35] So where do your flies come from?

Dr. Travis Rusch [00:23:37] College Station, Texas.

Megan Grebanauer [00:23:39] Is that where they're born and bred and have evolved from or are they?

Dr. Travis Rusch [00:23:43] Cochliomyia has been native to that region for quite some time.

Megan Grebanauer [00:23:47] Do you colonize your own supply or are you hatching and reusing them? Or are you bringing in fresh new eggs for every study? How do you keep your supply?

Dr. Travis Rusch [00:23:56] Both. We have laboratory colonies for multiple species that we keep in the lab. And then before they reach 10 generations, we always make sure we go to the field and bring in new flies that are referred to as wild type. This will help prevent them from acclimating to laboratory conditions to some extent. And it also increased the genetic diversity so we don't have all flies it end up brothers and sisters.

Megan Grebanauer [00:24:20] I suppose that would be important, too. So what's next for your research? Is there another phase or what do you plan to do next for your extensions?

Dr. Travis Rusch [00:24:28] Sure. So the next phase that I want to take, the research is moving away from these no choice experiments to more choice experiments, particularly looking at the thermal regulatory ability of larvae. What I mean by thermo regulation is how accurately do blowfly larvae maintain stable body temperatures? So is there any been research out in the field? Jason Bird did some back in the 90s revealing larval preferences where you put larvae on a thermal gradient, including cochliomyia macellaria the species I'm working with. They were on a thermal gradient where one end was warm and one end was cold and he watched them throughout their development to see where they moved to. Given a choice and they showed very specific thermal preferences that actually differed by age. And I find this really interesting, because if the larvae are actually seeking out microclimates, they're able to maintain very stable body temperatures and they might be even more reliable to tell what temperature they're going to develop at. Because giving them no choice experiments in the lab either if it's a constant temperature or even these fluctuating temperatures I use to simulate more ecologically relevant scenarios, they may during the warming phase. Other than the egg, obviously, because they're immobile or the pupae, but the larvae might be able to move to cooler microclimates when it gets hot into warm microclimates when it gets cold. And even though the weather data said there was a 20 degree fluctuation, the larvae may actually only be experiencing a 5 or 10 degree fluctuation. So we know a narrow range of temperatures they experience and we can even more accurately predict their development times.

Megan Grebanauer [00:26:02] As all these new revelations are being discovered about the development, what do you think needs to happen? What's the missing link to take from the research into the practice?

Dr. Travis Rusch [00:26:13] Well, one thing that definitely needs to happen for everything that comes out of the research and is there needs to be field validation so I can do all these experiments in a lab and get really interesting results. But if I can't replicate this under field conditions, then there's limitations to actually applying it because you're not going to get a lot of dead bodies falling in the laboratory. So they're gonna be in these different field conditions.

Megan Grebanauer [00:26:35] So when do you expect to release your final findings and data from this particular research project?

Dr. Travis Rusch [00:26:42] Well, this research project is ongoing. So it's the lifecycle for them typically takes about a month. So in order to do a couple more trials, it's going to probably another couple of months to finish the data collection. And then by the time we write up the manuscript, realistically by looking at maybe six months before these results are gonna be out for publication potentially.

Megan Grebanauer [00:27:03] So somewhere around fall of 2020?

Dr. Travis Rusch [00:27:05] Yeah, that will be a good time estimate.

Dr. Travis Rusch [00:27:07] It also depend on the journals speed of reviewing the paper.

Megan Grebanauer [00:27:10] So do you think you'll pursue this line of research after your postdoc because you start your own independent research career?

Dr. Travis Rusch [00:27:16] That is the goal I'm currently applying to faculty positions right now. So if anybody listening is looking to hire, I'm looking for a job and I'm looking to do forensic entomology. And that's what I've been pitching in my job applications because I really like doing thermal ecology. And this forensic entomology is kind of made it almost the best of both worlds for me. I get to do basic thermal biology that has this really cool application. I think in human dimensions of forensics, something that even doing graduate school, I didn't even see as an option.

Megan Grebanauer [00:27:47] Are there any other final thoughts you'd like to share with our listeners?

Dr. Travis Rusch [00:27:51] Just want to let them know that forensic entomology is a growing field. Something interesting that people might not know is there's only one full time forensic entomologist in the United States. That's Dr. Michelle Sanford. She works for the Houston Police Department. So all the other forensic entomologists are a lot of them are college professors. So that's what they do for research in their laboratory. And then they take on casework in addition to their faculty position role.

Megan Grebanauer [00:28:17] So if someone is interested in pursuing that career, what is the course of study? Do you go into biology, chemistry? What kinds of classes do you take leading up to that? Remember when I was starting out in undergrad, entomology wasn't something you can just take on its own.

Dr. Travis Rusch [00:28:35] Fair enough. And now it is like Texas A&M has a forensics program and they also have a separate entomology program that you can get degrees. And a lot of students are double majoring in forensics and entomology. And if they want to do forensic entomology, because they're gonna have to do something in addition to just straight forensic entomology. So they'll have to go into academia, potentially, like I mentioned, being a college professor or a lot of forensic entomologist. They might work for government positions like USDA. They could work for and take on potential casework. ABFE, the American Board of Forensic Entomology. We talked about board certification. They actually have a forensics forensic entomology technician certification that they are just starting up. There's only a handful of people that have been certified at the technician level. The difference here is they don't write the case reports, but they're trained in insect identification and they're trained in insect collection and shipping the specimens to forensic entomologist. So somebody that's maybe in law enforcement could be a crime scene investigator where they collect, you know, different types of evidence and they get the certification and they can also collect into entomological evidence. So it's kind of an add on to what they're already doing.

Megan Grebanauer [00:29:47] All right. Well, that's all we have time for today. I'd like to thank our guests, Dr. Travis Rasche, for sitting down with just science to discuss his NIJ funded grant. So thank you for being here with us Travis.

Dr. Travis Rusch [00:29:57] Thank you for having me. My pleasure.

Megan Grebanauer [00:30:00] I'd also like to thank you, the listener, for tuning in today. If you enjoyed today's conversation, be sure to like and follow just science on your podcast platform of choice.

Megan Grebanauer [00:30:10] For more information on today's topic and resources in the forensic field, visit Forensiccoe.org. I'm Megan Grabenauer. And this has been another episode of Science.

Voice over [00:30:23] In the next episode of the 20/20 R&D season, just science interviews Dr. Jose Almirall of Florida International University about novel statistical approaches for the interpretation of trace evidence. Until then, stay tuned for a special release episode in honor of Sexual Assault Awareness Month Just Science. We'll be sitting down with Marya Simmons to discuss COVID 19 and its impact on supporting victims of sexual assault. Opinions or points of views expressed in this podcast represent a consensus of the authors and do not necessarily represent the official position or policies of its funding.