

Sawbones 471: Carpet Python Parasite

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Intro (Clint McElroy): Sawbones is a show about medical history, and nothing the hosts say should be taken as medical advice or opinion. It's for fun. Can't you just have fun for an hour and not try to diagnose your mystery boil? We think you've earned it. Just sit back, relax, and enjoy a moment of distraction from that weird growth. You're worth it.

[theme music plays]

Justin: Hello, everybody and welcome to Sawbones, a marital tour of misguided medicine. I'm your cohost, Justin McElroy.

Sydnee: And I'm Sydnee McElroy.

Justin: Sydnee, it is occurring to me, toots, I have no idea what this episode is about. Normally, I would say— I would ease it in. I don't think you sent— You haven't indicated...

Sydnee: I did.

Justin: ... to me—

Sydnee: I shared the notes with you, but if you look at the title, you'll have no idea.

Justin: Yeah, uh...

Sydnee: The title does not help you at all. And I thought about that because I titled my documents for me, right? For me to search. But then I do, indeed, share them with you.

Justin: Mm-hmm.

Sydnee: Um... We will have to not use the title of my document as the title of this podcast episode.

Justin: Okay, I'm seeing it now. Okay, I have no idea what this is, Sydnee.

Sydnee: Would you like to read it?

Justin: Neural larva migrans.

Sydnee: Hey, good job. You pronounced it all right.

Justin: I don't need that in my life, that energy you're bringing to me.

Sydnee: I bet you could piece— I bet you could kind of piece out, like, neural... What is neural related to?

Justin: [overlapping] I feel— I feel good enough about myself as a person, I'm a very, like— I've achieved a lot with my life, I have two great kids. I don't need your— I have a, uh, a shorty award from 2007 for my Twitter account. I have a regional AP award from the state of Ohio for business reporting. I don't need it, Sydnee. I was a fine—

[wheezing while laughing] I was a runner up for the National Honors Society. I was an alternate for the National Honors Society. I went to college for five years, okay? I know things. I don't need the patronizing.

Sydnee: Do you think that it makes you better at college than me that you went for five years and I only went for four? Is that a brag?

Justin: You didn't know. You didn't—

Sydnee: Was that a brag?

Justin: I'm just saying, I had five years of college.

Sydnee: Although, technically, I guess I did for eight.

Justin: Don't—

Sydnee: And then if you include residency, that's eleven.

Justin: Why do you have to be like this?

Sydnee: [overlapping] So, I don't know.

Justin: Why are you like this? What happened to you? Why are you like this? Just— We're equals in every way! Just accept that, just say, like, "Justin, we are equals... "

Sydnee: We are—

Justin: "... in every way."

Sydnee: We are equals in every way. We don't have the same... [pauses]

Justin: [squawks] What do you think equal means?

Sydnee: We— No, we are equals. We don't have the same knowledge bases. There are lots of things you know about that I don't know— I don't know anything about video games. Nothing.

Justin: [quietly] "I don't know anything about video games." That makes me feel so much better, thank you.

Sydnee: Well, I don't know anything! I'm— There's lots of technology things I don't know.

Justin: This is— None of this is useable, obviously, we're starting again—

Sydnee: Whenever you talk about technology or internet, I find it very confusing.

Justin: This is— None of this is useable. Welcome to Sawbones, I'm Justin, that's Sydnee, we got another great show for you.

Sydnee: I bet you could— Okay. Neural.

Justin: That I'm gonna try desperately...

Sydnee: [overlapping] Think about the root of neural, like... Neuron—

Justin: Brain! I know, that's brains!

Sydnee: There you go! Brain, brain.

Justin: Brains!

Sydnee: Okay. Larva. You know what a larva is.

Justin: It's a baby bug.

Sydnee: Yeah. And think about migrans, like, migruh...

Justin: Baby bugs that give your brain a headache.

Sydnee: Well, yeah, but also migration. Migrate. Migratory.

Justin: Oh, it's not migraine?

Sydnee: Like, migrans.

Justin: Okay.

Sydnee: Moving around.

Justin: Baby bugs moving around your brain.

Sydnee: [proudly] Mm!

Justin: I hate this.

Sydnee: There you go!

Justin: This sucks.

Sydnee: Look at that!

Justin: I wish I didn't figure it out. I feel worse now that I've figured it out.

Sydnee: You figured it out! Um, sometimes there are medical maladies, cases that are so rare and so, um... I think part of it is that it's upsetting for people to think about...

Justin: Mm-hmm.

Sydnee: Um, it's disturbing, um, the fact that they are rare makes them hard to diagnose, usually, and so people will— I mean, it's, like, why House is a show, right? Like...

Justin: Right, it's all about finding the...

Sydnee: ... people present with something weird...

Justin: ... little puzzle and—

Sydnee: ... and it's a puzzle and it takes a long time to figure it out and in the meantime, the person gets sicker and that's scary and so we made a whole TV show about it, of course, because it's so interesting to people.

Justin: Mm-hmm.

Sydnee: I don't know. Anyway, and it also becomes the focus of media attention when these things happen in real life, right? It becomes kind of sensationalized. And there was a story like that recently, where a, uh— And this is all, like, the paper has published, so if you're interested in this, you can actually read, like, the article, um, where this case study was presented.

I believe it's in Emerging Infectious Diseases, but anyway. I found it. I was able to read it for free on the internet. That's always very... a wonderful moment, when I can read a journal article, um. I'm subscribed to lots of journals, but I can't be subscribed to every journal. And sometimes, there was one article I tried to find on the history of this that would have cost me \$635 US dollars to buy the article online.

Justin: You all are always very good to support us during the Max Fun Drive, but you don't support us that much. We can't—

Sydnee: I cannot purchase a \$635 article. Um, I— And this is no shade on the people who generate these articles. I know, intimately...

Justin: You gotta—

Sydnee: ... how difficult that is.

Justin: Yeah, you got— It's very specific knowledge, right?

Sydnee: Yes.

Justin: So you gotta— It's not like your mass marketing these, yeah.

Sydnee: [overlapping] So I value your work, I just can't afford that to read the article. Um, so this article, I was able to access for free and so you can too. And, um, thank you to everyone who puts in the hard work to these incredible articles, 'cause then we can do podcasts like this.

But this is about a, uh, a woman in Australia who was diagnosed with an incredibly rare case of neural larva migrans. We'll get into, like, the idea that some sort of parasite could get into your brain or somewhere else in your body and kind of move around, that's not...

Justin: Good.

Sydnee: Well, it's not good, but—

Justin: [laughs] It's bad to think of.

Sydnee: That in and of itself is not, like, brand new. We know this happens. Um, what was new about this is that it was caused by a specific worm.

Justin: Mm-hmm.

Sydnee: Uh, ophidascaris robertsi.

Justin: Mm.

Sydnee: Which is also called the carpet python parasite.

Justin: Ooh! That's a good one.

Sydnee: Or nematode, roundworm.

Justin: That's a good one.

Sydnee: Yes. A lot of different species have their own sort of, like— Their own private nematode. [laughs] Their own specific—

Justin: I love that Keanu Reeves movie, My Own Private Nematode.

Sydnee: [laughs] There are different, like— And we'll go into some of them, but there are different species that have, like, this is the nematode that generally can live inside this thing. This is a nematode that lives inside, um, the carpet python. Which is a kind of snake, as you may imagine. A python one.

Justin: [laughs]

Sydnee: That lives in Australia. And I thought it was worth talking about because the thing about— I mean, we think about, like, what— How, in terms of diseases, the way that, like, a virus interacts with your body, right?

Like, it gets inside you, but the reason that you get sick is because of what it's doing. Like, it's interacting with stuff in your body. Bacteria interact with stuff in your body.

Justin: Mm-hmm.

Sydnee: What I think is interesting about this specific parasite, is that it's not really interacting with us as much as just, like, it doesn't belong in us and then it gets big and then that damages stuff.

Justin: Okay.

Sydnee: Do you know what I'm saying?

Justin: Mm-hmm.

Sydnee: You just stick, like, a— I mean, it's not an earthworm, but if you imagine just sticking an earthworm in someone, like, that wouldn't be good, right? But not because it— I don't know. It's a different kind of infection. I think it's interesting because it's a different way of thinking about infection than, like, the flu virus.

Justin: Mm-hmm.

Sydnee: Okay?

Justin: Okay.

Sydnee: So there are several parasites that can cause syndromes like this and, like I said, this specific case that I want to go into first was caused— Was the first one that we know of. There could have been more that we didn't know of, that was caused by this worm.

So it starts in January 2021. Uh, a 64-year-old woman in New South Wales, Australia, went to the hospital and basically had had, like, this kind of— And when you, if you know much about parasites, this is a very classic sort of course. It starts with GI symptoms, so maybe some abdominal pain, some diarrhea, maybe a little bit of nausea, lack of appetite. Stuff like that.

Justin: Okay.

Sydnee: And then developed after that, some respiratory symptoms. A cough and some shortness of breath and that kind of thing, okay? This sort of story is not unique to this kind of parasite because there are a lot of times where you eat a parasite, probably through some—

Justin: [laughs] In isolation, a terrible sentence, we can all agree. "There are some times you eat a parasite."

Sydnee: Yeah. Sometimes you eat a parasite and it gets into your GI— It was, like, probably in some food. That's a very common route. That's not the only way you get infected with parasites, but, like, a very common route is it's in a food...

Justin: If it's not food, I don't know how you ate it and that troubles me. That, I find challenging.

Sydnee: Well, maybe dirt.

Justin: Maybe you ate dirt.

Sydnee: That's also a very common way this happens.

Justin: Okay.

Sydnee: So, you eat— Something gets in your GI tract.

Justin: Okay.

Sydnee: And then, like, the worms are there or maybe, like, the eggs or the larva, whatever. Whatever you have eaten is there. Sometimes you will actually sort of aspirate that up into your lungs.

Justin: Ooh!

Sydnee: Like, you'll cough, like, it'll regurgitate from your GI tract and get down into your lungs. That's not an uncommon pathway for parasites to take.

Justin: Oh, gosh.

Sydnee: Yeah, I know, that's very unpleasant to think about.

Justin: Yeah. Don't like it.

Sydnee: Um, but that definitely happens with other worms. So this is a very classic kind of parasite story, um, so GI symptoms, then the respiratory symptoms. She had seen someone, some sort of healthcare provider, who had said this seems like a pneumonia that you have going on. Which isn't an unfair thought, right?

Justin: Right.

Sydnee: Like, a lot of pneumonias or even, like, the flu can cause GI and respiratory symptoms.

Justin: Right.

Sydnee: So she was treated with, um, my favorite antibiotic. I expect you know this about me. It's, like, a... For me, that's like what's my favorite color. You know my favorite color.

Justin: [quietly] Purple.

Sydnee: Okay. Well, what's my favorite antibiotic? This is a very important thing to me.

Justin: Uh, yeah, man. Um...

Sydnee: I'm so disappointed right now. How could you not know?

Justin: Give me a letter.

Sydnee: D.

Justin: Give me two letters.

Sydnee: Okay, it's doxycycline.

Justin: Oh, yeah! Doxy, got it.

Sydnee: I love doxy. That's my favorite antibiotic. We all have our own.

Justin: Really?

Sydnee: Um, but it did not— Obviously, she didn't get better with the doxycycline. Um, it can do a lot of things. It can't treat this. On this admission— So, she comes back to the hospital. She has more workups.

So, they're, like, "Okay, let's do a little more research to try to figure out what's wrong with you." So they do some blood work and they notice that a certain kind of white blood cell, her eosinophils, is high. Eosinophils are the kind of cells we see high when you have a parasite.

Justin: Okay. So we're leaning parasite.

Sydnee: So again, still— We're leaning in this direction. And they do a CAT scan of her chest. So an X-ray gives you some of the information. You do a CAT scan to get a better picture. And you see all these little areas of, like, inflammation or infection. They call them ground glass opacities.

It's just the way— They look like ground glass and it's an area you can't see through, an opacity. It's opaque. Anyway. The point is, the doctors think about a parasite. So they take a history and everything.

She has a remote travel history, but nothing that really points to a specific parasite, you know? There's no, like, clue in the history like on House where he goes [snaps fingers] "Ah! Why didn't you tell me, you idiot? That you went to... " Wherever.

Justin: "She has a collection of stamps!"

Sydnee: [laughs] Right. That's often the clue, is the stamp collection.

Justin: I'm not saying—

Sydnee: [crosstalk] I mean, it might be.

Justin: [crosstalk] ... it's like an example, right? Like, it's not a wild thing to think, like, "She's been licking poisoned stamps from the 40s," you know?

Sydnee: The other day on House, the clue was that his uncle had nosebleeds, so. Go figure.

Justin: I mean, it could be anything.

Sydnee: It could be anything. Um, so anyway, she had been— So she, uh, she has these eosinophils, they're thinking, like, eh, maybe it is a parasite. So they work her up for a common thing, a more common parasite, strongyloides, which can cause this sort of constellation of symptoms.

And they don't find evidence of that. Um, so they can't find the parasite, you know, they're only— We can only test for things that we know can infect humans. So, you imagine there's a big problem here. If this worm has never really infected humans, you wouldn't— We don't have a test for it.

Justin: Yeah.

Sydnee: You wouldn't test for it, right?

Justin: Right.

Sydnee: It's new. Same issue we had in the beginnings of the COVID days, right? It was new. So workup was negative, so they kind of treated her for, like, what they called idiopathic eosinophilic pneumonia.

We know you have a pneumonia, an infection in your lungs. We know that your eosinophils are high. Idiopathic means we don't know why, we didn't crack this one. [laughs]

Justin: It's good that you have a word for it.

Sydnee: Yeah. We have a word— Idiopathic. When your doctor says that, that's our way of saying, "I don't know why." And some things we still don't know. There are many things that are idiopathic, not because, like, we didn't do due diligence, it's we still haven't figured them out. Um, so they gave her steroids and she did get a little better with that.

Justin: Good!

Sydnee: Um, and so, you know, for a while, like, she leaves the hospital, things are getting a little better, and sometimes this happens in medicine. Somebody comes in, they're sick, you never really quite figure out why, but you find a treatment that's working and they get better and you kind of go, "Well, I'm glad they got better. I wish we had figured it out."

And then you got to move on. But three weeks later, she's back, because she's sick again. Um, they do some more imaging of her body. They look at other parts and they see that she's got these areas on her liver and her spleen and then these places in her lungs are back again.

Justin: Mm-hmm.

Sydnee: So there's all this stuff going on, this inflammation or infection or something and they still don't know why. They start looking for other parasites because, again, they've been pointed in this direction.

The workup keeps coming back negative. They start looking for autoimmune stuff to see if that might be what's going on. They, uh, treat her for strongyloides, just... maybe?

Justin: Strongyloides is a bad name. I don't think that one's very good. You guys should try again.

Sydnee: Why?

Justin: Strongyloides?

Sydnee: Well, I don't know. I didn't name it that.

Justin: Somebody said that and they were, like, "Yeah, perfect." Right?

Sydnee: Do you know, I empirically treated somebody for strongyloides once?

Justin: What does that mean?

Sydnee: I, uh, I couldn't find proof that they had it, but I had a very high clinical suspicion based on many factors and I treated them and they got better.

Justin: There you go folks.

Sydnee: There's a story for you.

Justin: There it is.

Sydnee: Yeah. And they did get better, but I couldn't— I will tell you that sometimes it is hard to diagnose this stuff, um, in places where you don't see it as much because I was trained in how to perform a stool ova and parasite test. A stool O and P is how we abbreviate that. And what that means is we take a sample of your stool and we look for ova.

Justin: Oh.

Sydnee: And parasites.

Justin: Okay.

Sydnee: Eggs and little bugs.

Justin: Makes sense.

Sydnee: Um... I have been trained in how to do this, because of some of my tropical medicine training. It's very difficult, um, because you could miss it, right? And so we usually repeat this test multiple times, but it's also difficult if you haven't really seen them a lot.

Justin: Mm-hmm.

Sydnee: Um, we had a case of malaria one time here in Huntington.

Justin: Yeah?

Sydnee: Uh, and I was called in to look at the slide because I had seen malaria on a slide. And if you haven't, I mean, you can look at a textbook all you want, but until you've seen it in real life, sometimes it's hard to know, to trust yourself, that this is what you're looking at.

So sometimes this stuff is hard to diagnose, if you don't see it a lot. And rare stuff, by definition, you don't see a lot. So anyway, they treat her for that, even though she was negative. They continued steroids. Um, but as they would try, over the course of the year, to wean her off steroids, because she would get better with the steroids.

Every time they would try to wean her back off of them, she would kind of relapse in these respiratory symptoms, right? She would get sick again. So she was actually started on some other sort of immune system modulating things.

Like, let's just decrease her general inflammation, maybe there is some sort of autoimmune condition. So they were treating her in ways that suppressed her immune system to try to fix this problem. But no diagnosis had ever really been settled on and that is when things got really weird. It had all been this, like—

Justin: This seems weird so far!

Sydnee: This weird sort of pneumonia kind of thing that, just, she couldn't get off the steroids and it was really that, and then it shifted. And that would give us the key to what it was.

Justin: Which was?

Sydnee: Well, I'm gonna tell you after we go to the billing department.

Justin: [sighs] Let's go.

[theme song plays]

[ad break]

Justin: Okay, so what was the weird— You said it was about to get weird.

Sydnee: So, and this is so much like a House case. Sometimes on House, House will intentionally let things get worse because whatever direction they get worse in, clues him in to what's going on. I will tell you that in medicine, we don't do that. [laughs] We would never intentionally let someone get worse.

Justin: I know Cuddy's always, like, "Please don't."

Sydnee: "Please don't let the patient get worse."

Justin: "Please don't let the patient get worse. This is a hospital."

Sydnee: You don't ever do that intentionally, but sometimes, despite your best efforts, a patient declines because you haven't solved it, right?

Justin: Wink!

Sydnee: No, no, I mean—

Justin: Wink!

Sydnee: I— No. No one was allowing this to happen...

Justin: [overlapping] This was intentional.

Sydnee: ... it's, they hadn't figured it out.

Justin: Wink.

Sydnee: There is no wink.

Justin: Okay.

Sydnee: Okay, so, in 2022 now. So this has been going on since January of 2021. We're in 2022 and the patient starts getting forgetfulness and some depression.

Justin: Ooh.

Sydnee: So now we have some, like, what we would call some neuropsychiatric symptoms.

Justin: Okay.

Sydnee: Which we hadn't had previously. It was stomach, then lungs...

Justin: Affecting the way the brain works.

Sydnee: Now it's affecting the way the brain works. The patient is still being treated with these immunosuppressant medications and the steroids, um, but they're still seeing, like, other markers in the blood work that show some sort of inflammation is going on, okay? So they do an MRI of the brain.

Justin: Okay.

Sydnee: And what they see is, in the right frontal lobe, the right front part of the brain. They see this, what we would call, like, a ring-enhancing lesion. So we see this big lit up area.

Justin: Ring-enhancing?

Sydnee: Yeah. It looks like a ring and it enhances, it brightens.

Justin: Huh.

Sydnee: So we see this big area in the right frontal lobe, they don't know what it is, so they did an open biopsy in June of that year.

Justin: Okay.

Sydnee: And you probably, if you have heard of this case, you may have seen pictures of this already shared on the internet.

Justin: I have not.

Sydnee: Um, because when they did the open biopsy, what they found was a string-like structure and as they pulled this string-like structure out of this patient's brain... [distressed noise] They realize that it was alive and moving.

Justin: Oh, no! That's the worst possible thing for you to say.

Sydnee: So, it was 80mm long.

Justin: Ooh.

Sydnee: 1mm in diameter.

Justin: Ooh, man.

Sydnee: It was a worm!

Justin: That's a worm!

Sydnee: It was a worm. Um, again—

Justin: That one's a worm!

Sydnee: And you can look at pictures of the worm, if you'd like. Again, these accompany the article.

Justin: [overlapping] I would actually, thank you, I would not like. Thank you.

Sydnee: Uh, and, uh, the worm was found. So they had to then do some, like, analysis of what the heck is the worm because they're— A lot of these worms can look very similar and their, you know, their features, their distinguishing features are small.

So you have to, like, look at— You have to analyze it. So they did tests to figure out what it was and they found it to be this carpet python parasite, which previously had not been known to infect humans.

Justin: Mm-hmm.

Sydnee: So... That's why they hadn't figured it out.

Justin: Alright. That's so weird.

Sydnee: She was treated with, um, some medicines we use for parasitic infections, albendazole and ivermectin, which is not for COVID, still. But it is for certain parasitic infections. Uh, and slowly weaned off of another steroid, dexamethasone, over time because that has been shown to be helpful in treating these sorts of advanced parasitic infections and, anyway, got better.

Uh, I believe at the end of the article, they mention that some of the neurological symptoms have not completely resolved. Um, it's hard, you know. Whenever some structures are damaged, they heal better than others...

Justin: Hm.

Sydnee: ... in our bodies.

Justin: Okay.

Sydnee: Some things are a little more resilient, some things, once you kind of damage those cells, they don't really grow back, per se.

Justin: Okay.

Sydnee: Our brain's great at forming new pathways, but it doesn't necessarily, like— Like a brain cell that has been permanently damaged, it doesn't— You know what I mean? It doesn't heal itself.

Justin: Yeah, okay.

Sydnee: But our brains are good at forming new pathways over time, so, not all the symptoms have resolved, but certainly...

Justin: They make new pathways sometimes, right? If there's like, damage to one area, sometimes they'll figure out ways around it?

Sydnee: Yeah, mm-hmm.

Justin: Like, detours.

Sydnee: Yeah, they find detours around it. There are a lot of— Um, we do the same with blood vessels, if a blood vessel is damaged enough, you'll form collaterals, all these new little pathways around it to, like, bypasses.

Justin: Wild.

Sydnee: I know. Our bodies are fascinating and great. And gross sometimes, but that's a good thing.

Justin: Do you ever think about, I know evolution doesn't exactly work like this, but do you ever think about, like, stuff in the brain that we had to take generations— Or stuff in anywhere in the body that we had to take generations to, like, figure out.

Generations of generations of generations, like, at first the brain just didn't do that. It didn't work out. [laughs] And they're, like, "We got to try something different, evolution, this is not working. We got to come up with this, we got to come up with a system."

Sydnee: [laughs]

Justin: Think about until we got fingernails, man. Times were tough. Times were tough. And then one guy's just, like, "Check these out." And everybody's, like, "Oh, man! I got to mate with him!"

Sydnee: I bet we had fingernails—

Justin: "Look at his finger armor!"

Sydnee: Yeah.

Justin: Amazing.

Sydnee: It is amazing.

Justin: Amazing.

Sydnee: It is amazing! Well, and I think that how we gain the knowledge about, not just how we evolved, but, like, our evolution of our knowledge of the structure and function of the human body is really important to understand and appreciate.

Justin: And it allows us to stand in defiance of God, which is nice.

Sydnee: Well, I was gonna say it helps keep us humble. [laughs]

Justin: Oh, boy. See, I think it's the opposite. We learned so much that we're able to evolve faster than evolution, right? So we're augmenting ourselves digitally, speeding up the process and standing in defiance of God and nature.

Sydnee: But this is a bad thing because then AI is trying to take, I mean, your job. Not mine, so.

Justin: Everything's a balance, Syd. They're taking your job! They got, uh, these things reading, like, MRIs and stuff like that.

Sydnee: That's true, I'm not a radiologist though.

Justin: I know, I'm just saying...

Sydnee: But they don't have a heart. And that's what I use in medicine, more than my brain.

Justin: Do— [pauses]

Sydnee: [laughs]

Justin: Have people gotten artificial hearts?

Sydnee: Yeah, no, I mean AI doesn't have a heart.

Justin: [overlapping] Okay, so there are— Hah-bah-dah-shah! But there's robot hearts.

Sydnee: I... No— Well— I mean... There are parts of hearts that are robot hearts.

Justin: There's artificial hearts?

Sydnee: Heart parts.

Justin: Heart parts that are robots.

Sydnee: Like, mechanical valves, is that what you're getting at?

Justin: Robot hearts— There's robot heart parts.

Sydnee: Like, in synthetic...

Justin: There's robot heart parts.

Sydnee: Yes.

Justin: Okay, so robots have hearts.

Sydnee: Okay. Anyway. [laughs] Um, I'm just saying—

Justin: Are you saying that comedy robots would have heart, by the way? The comedy podcast robots that are coming for my job, you think that they do have heart?

Sydnee: I was— [laughs] No!

Justin: You said they don't—

Sydnee: I was talking about, as a family doctor, I use my heart more than my brain.

Justin: You said the robots—

Sydnee: Well, I would say it's equal measure.

Justin: You were saying the robots are coming for my job and not yours.

Sydnee: I meant 'cause you're in the union.

Justin: [cackles] This is true.

Sydnee: This is my—

Justin: This is true, us in the union are standing in opposition to SkyNet and its ability to recreate our performances.

Sydnee: That's all I meant— I meant that I'm— I meant that this is my part time job, my main job is the doctor thing I do.

Justin: I'm with you. I'm with you, yes.

Sydnee: That's my primary calling.

Justin: [laughs] I have such a good time making this show with you. I'm sorry to derail you so much, Syd, I just like talking to you.

Sydnee: All I was saying is that, and I think that this case actually illustrates this point.

Justin: Okay.

Sydnee: When we learn about how our understanding of the human body evolves, I hope that it makes us humble because for so many years there

were things that we didn't understand that now we just take for granted, right? There are certain facts about the human body that...

Justin: Yes.

Sydnee: ... we were completely, you know, that eluded us for thousands of years and now we know them and we take for granted that we know them and we don't think about how hard-won that information is.

And if you think about it, it keeps you humble in the face of new stuff. And you remember that there's so much we still don't know and that new things can happen and our understanding of something can evolve and change and shift over time.

Justin: Can I ask you a question about that? Again, I don't— I know there's lots of other stuff, uh, to talk about in this episode, but—

Sydnee: There's not a lot. I just want to give you some context for worms in your brain.

Justin: Do you— For you, personally, this is just for you, personally, I'm not asking to to speak for doctors at large, but for you, personally, where you are doing this show that is so much about people, like, imagining new diseases that do not exist, imagining new treatments that do not exist, how do you balance, like...

You have to be somewhat surefooted in your principles and your knowledge because there's these people that are just making crap up, right?

Sydnee: Mm-hmm.

Justin: But at the same time, the information does evolve. So how do you balance that for yourself?

Sydnee: Um... I mean, gosh. I feel like I talk about this a lot. How do you keep an open mind but also be skeptical about pseudoscience?

Justin: Yeah, right, exactly, right? Yeah.

Sydnee: I mean, I think it has to do with how information is obtained more than what the information is. There is stuff that is true that sounds even weirder than the stuff that's fake.

Justin: Alpha-gal.

Sydnee: Yes.

Justin: We just talked about it.

Sydnee: We just talked about it, right? And we said this in the episode, like, that— If you say that, your instinct is, "That can't be true." Um, but it is. And so you can't focus so much on the fact or figuring out if it is a fact, I guess. The fact or the myth. As to how that information was obtained, I think really understanding the history of science and medicine gives you a deep appreciation for the scientific method itself.

How did we get that information? What was the human quest for truth about that and how did you go about it? Because if you went about it by saying, "Well, I've noticed that that's true a lot, so it must be true." That's not how we obtain facts.

There's lots of reasons we would notice something that is fake. But if you went through a rigorous process of understanding it, then that piece of information has a lot more validity to me.

Then that's a fact, to me. With the understanding that if we did those tests a thousand more times, in a thousand different ways, in different populations of people, in different places, at different times, maybe our answer would change just a little. And maybe we would see it a little differently because our tests can only— I mean, the power of the study you're doing can only tell you so much, right?

Justin: Mm-hmm.

Sydnee: You only tested so many people. It's like with a new medicine. You give that medicine to so many people to make sure that it's safe and

effective, but then when you start giving it to the entire population, you're gonna see stuff you didn't predict.

Justin: Yeah.

Sydnee: 'Cause you can't test everything and everyone. So you do the best you can, you understand what that science tells you and where the limitations of that are, and you keep an open mind that it might change. But when somebody tells you, "This is true because we've done it since ancient times." You have to know that's not scientifically rigorous. That's not a basis for anything.

Justin: It's like how everybody agrees Shawshank Redemption kicks butt and...

Sydnee: [laughs]

Justin: ... you meet one person and— When you release it to the whole world and everybody watches it, you will find people that you married that think that it's— That don't really enjoy Shawshank Redemption. But it's, like, it doesn't make it a bad movie.

Sydnee: You're gonna get so— I— So much hate is gonna be directed at me for not enjoying Shawshank Redemption now. You realize that?

Justin: No, I would never! I would never. If anybody does, I'll beat 'em up. How's that?

Sydnee: It's just not my— I don't know. We all have our own— I— The Princess Bride is my favorite movie, I feel like—

Justin: Get busy living or get busy dying! Nothing?

Sydnee: I feel like that— I feel like that informs a lot of my movie preferences. Anyway... This isn't the only worm that can do this. We're familiar with this syndrome. The idea that, like, you somehow accidentally ingest a worm and then it does something in your body that, because it's not supposed to be there— Like, it doesn't want to be there either, by the way.

Justin: Yeah.

Sydnee: Like, it has no interest in being in your human body.

Justin: I think that it probably has no interests period, right?

Sydnee: [laughs]

Justin: It's a worm.

Sydnee: I mean, that's a big— I don't know.

Justin: I do.

Sydnee: [laughs]

Justin: [laughs] It's easy! Alright—

Sydnee: Uh... There is a—

Justin: [overlapping] Dogs, some. Cats, less. Fish, none. Like...

Sydnee: There is a raccoon roundworm that we know causes this syndrome that you may be a little— Well, you're probably— Those of us in healthcare may be more familiar with. Justin, you're probably not familiar with the raccoon roundworm that we all know about, right?

Justin: No.

Sydnee: No. The, uh, baylisascaris, uh...

Justin: Does it have cute little eyes? Like, the little eyes, the little fingers?

Sydnee: Um, I mean the raccoon is. This is still just a worm.

Justin: Oh, it's a worm in the raccoon.

Sydnee: Yeah, it's the raccoon. Like I said, a lot of different animals have their own special roundworm. This is the roundworm that raccoons have. Um, is this one. Yeah. And, uh, it—

And this is when we come in contact with, I would say more, because, um, urban environments, like, places where people are are good for raccoons because you've got, like, food in the form of, you know, trash cans and dumpsters and stuff.

So if you have a place with a large concentration of humans, you have a lot of concentration of, like, their trash outside and then that's great for raccoons.

Justin: Same with rats. Rats are an indicator of human cohabitation, like, we move together.

Sydnee: Because we also scare off a lot of the predators for these animals. That's the other reason that we are advantageous. Raccoons chill with us because the things that eat raccoons don't usually chill with us. We kind of drive them out, right? So anyway, raccoons seem to have—

Justin: Except for Alberta.

Sydnee: ... right. They don't have rats?

Justin: Alberta don't have— They don't allow rats.

Sydnee: They don't let rats be there.

Justin: Yes. Sorry, Alberta. Keep your emails to yourself, Alberta. I know that you're holding it down for me up there in that paradise, that rat-free paradise.

Sydnee: Now, here's a question. I'm assuming you have raccoons.

Justin: Hm?

Sydnee: In Alberta. I don't know.

Justin: Those are kind of like big rats, but...

Sydnee: Now, if the eggs from any of these roundworms get into our bodies, then they hatch and then the worms just sort of move around. So this is— We know that this, what the raccoon roundworm, we have cases in medical literature of this happening in different places.

Um, and a lot of this, I'm focusing on the United States. Of course, other parts of the world where there are raccoons, this is certainly happening too. This is also true for, there's something called toxocara canis and toxocara cati.

Justin: Hmm.

Sydnee: Cati, C-A-T-I. I bet you can guess canis and cati...

Justin: [crosstalk] ... dog, cat.

Sydnee: Yeah, there you go. See? These are roundworms that infect dogs and cats and, again, if you come in contact with the eggs from these roundworms... And what happens—

Justin: Why do they use cati and not something that's feline derived?

Sydnee: I don't know.

Justin: That's weird.

Sydnee: Um, and we are all— Like I said, the worms don't want to be in us. We're paratenic hosts for this worm. And what a paratenic host is, is any kind of animal, in this case the human, that a parasite can infect in the sense that it can get inside our body, but it can't actually develop and mature and reproduce inside our body. Um, so you're not gonna get this ongoing production of these worms.

Justin: Okay.

Sydnee: What is happening in these cases, is the animal, whether it's a raccoon or a python or a cat or a dog, has the worm in it and the worm lays eggs inside it, right? So when the cat or the dog or whatever poops, there's eggs in the poop. Somehow, those eggs get from that poop into our mouths.

Justin: Don't— Don't think on it.

Sydnee: And we swallow them, they hatch in our GI tract and then we have these worms. But it's just those. There's not going to be more. They're not going to make more worms inside you. There are other parasites that do that, not in this case. Not when we're a paratenic host for something.

So basically what happens is these larva, once the eggs hatch, start migrating through the body, wherever they are, whatever system they're in, and they can cause harm just by their presence, like, the physical space they're taking. And also by our body trying to, like, attack and rid ourselves of them causes inflammation at all of these sites. So—

And depending on where they are, you get a different name. So neural larva migrans is in the nervous system, the brain, whatever. Cutaneous larva migrans means you can— And you can actually see some of those under the skin. You can see, like, little curly-q pathways of it right under the skin. Um, ocular larva migrans, it's in the eye.

Justin: Mm-hmm.

Sydnee: As you can imagine. You would notice that. If you see a worm squiggling through your eye. Especially if, like, you are seeing it. Um, and visceral larva migrans, which means it's somewhere in an internal organ.

And obviously, depending on where it is, it can make it more dangerous. Something that's just squirming around under your skin is not going to be as fatal as something that's, like, in your heart or your brain.

Justin: Okay.

Sydnee: Right? Um, we have known about the fact that there are different worms in animals since the 1700s, but it really wasn't until the 1900s that

we started to understand what they could do to humans and you have to imagine a lot of this has to do with how much interaction we're having with animals.

Justin: Hmm.

Sydnee: As the human population became denser and we had more interactions with animals, then you're more likely to accidentally become a host to the worms that infect these animals. Um, we didn't have great diagnostics or imaging to figure out a lot of this back then. You couldn't easily cut someone's brain open and look for a worm. You can imagine, in the 1900, you wouldn't want to do that.

Justin: Sure.

Sydnee: Um, we have cases of the ocular one dating back to, like, the 1940s, probably because you could see it. You can't see someone's brain, but you can see a worm in their eye.

Justin: Mm-hmm.

Sydnee: It was 1984 that we have the first, in the US, recorded case of a worm in the brain. Um, so it— I mean, this is all very recent, our understanding, even if it's probably been happening and nobody could figure it out. Like, people got sick just like this case illustrated, and nobody could figure out why for a very long time...

Justin: Mm-hmm.

Sydnee: ... before we were able to start diagnosing these things. Um, in this case, in case you're curious, how did this patient come in contact with carpet python poop.

Justin: I am.

Sydnee: Because...

Justin: I would like to avoid this.

Sydnee: ... she reported no interaction with snakes themselves. Like, she was not around carpet pythons. Uh, what they figured out, their theory— I mean, they couldn't prove this, but this is what they think must have happened.

She foraged often for food and there is a kind of green, warragal greens, that were, um, that she used for cooking and they were around her house and if a carpet python had pooped in that area and then she gathered those greens and then didn't wash them... And then ate them, then she may have inadvertently consumed the eggs...

Justin: Got to wash your foraged greens!

Sydnee: ... of the nematode.

Justin: Got to wash your foraged greens.

Sydnee: Yeah, well, it's a good reminder that, um, if you are gonna forage for food— First of all, know what you're foraging for.

Justin: Yeah.

Sydnee: Like, don't just eat everything you find out there.

Justin: As a general rule... [crosstalk]

Sydnee: Yeah, 'cause there are plants that are your friends and will, you know, provide you with nutrients and then there are plants that are poisonous. So, if you're going to forage, know what you're doing. Um, and then wash what you find.

Justin: Yeah.

Sydnee: Because there are animals out there that poop outside, of course, like, that's where we want them to poop, right? Not in our houses.

Justin: For sure. For sure.

Sydnee: You want the raccoons to poop outside.

Justin: For sure.

Sydnee: But if they've pooped there, even if you don't see the poop, those microscopic eggs from those worms could be there and if you ingest them, then you can end up in this situation. This is also why we see a lot of this happening in kids, some of these infections.

Because kids eat dirt and kids eat sand and I used to think that wasn't that big a deal before I learned about all this stuff in medicine. Like, who cares if your kid eats a little dirt, what's the big deal? Well, if a carpet python pooped in that dirt recently, or a cat, or a dog, which you may come in contact with. But, although, of course you can deworm cats and dogs, right?

Justin: You can, you can.

Sydnee: Like, there are ways to treat cats and dogs, but you're not probably deworming all the raccoons in your community. Um, so don't eat dirt, don't eat sand. You know.

I know how hard it is to keep your kid from eating stuff they're not supposed to, trust me. We're parents too. But, um, and wash things you forage, um, are good messages to take home from this case. And thank goodness this patient— This is a happy story, right?

Justin: Yay!

Sydnee: Because they figured it out, they cracked the case, they got out the worm, they treated the patient, the patient got better.

Justin: Everybody wins.

Sydnee: Happy case. Yes.

Justin: Everybody wins. Thank you so much for listening to our show. Thanks to the Taxpayers for the use of their song, Medicines, as the intro

and outro of our, uh, program.

Hey, uh, you want to see Sawbones live? You can, October 13th in New York City Comic Con. That used to be a show that you had to have a badge to get into, now you can just, like, buy tickets no problem. Head on over to bit.ly/mcelroytours to, um, come check us totally out. Uh, that is gonna do it for this week. Until next time, my name is Justin McElroy.

Sydnee: I'm Sydnee McElroy.

Justin: And as always, don't drill a hole in your head.

[theme music plays]

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