

Finding Modern Medicines in the Botanical World – Cassandra Quave, Ph.D. – #986

Dave Asprey:

You're listening to The Human Upgrade with Dave Asprey. Today is a first ever attempt at having a live online audience with the upgrade collective and a live in person audience with my daughter Anna, because she's so interested in the topic of this episode that how could we not have her here in the room? I'm thinking about aiming the camera at her right now and she's giving me very dirty looks like I shouldn't do that, so I won't. But now you guys know we have a live audience. The reason that she's here is that she's a plant nerd and we're going to talk about plants. Specifically where plant medicines come from, not just the kind that make you see little robotic machine elves and Smurfs, but all of the different kinds of healing that can come from plants and how we actually figure out what happens. I want you to learn what botanical remedies you can use to treat infectious and inflammatory diseases.

The reason the show is important is that those things work. They have worked for many thousands, if not tens of thousands of years, and they're not patented. So there is an active campaign running right now that's been running since at least 1990 and really since about 1930 with the advent of the AMA, to make sure that no one believes that plants actually can heal people. It turns out they can kill us and they can heal us and there's a wide variety of effects in between those that you might want to leverage in your ability to be a bio hacker. We're also going to talk about how antibiotic resistance evolves and how plants and microbes work together. Actionable information for you and just some curiosity like, "Whoa, how does this stuff work?"

Our guest is a leader in the field of medical botany who's traveling across the globe to really weird remote locations and communities to figure out how we can make modern medicines from the botanical world. To do that, she also leads anti-infective drug discovery research initiatives and at the same time teaches normal people like you and me about medicinal plants, food and health. The technical term for what she is an ethnobotanist. Her name is Cassandra Quave, a PhD, and she is an associate professor of dermatology and human health and the herbarium curator at Emory University. Cassandra, what the hell? You're an herbarium curator and an associate professor of dermatology. How do those possibly go together?

Cassandra Quave, Ph.D.:

I mean, I'm just an enigma. I don't know. I mean, plants have been at the very basis of medicine since the beginning of time, as you mentioned, and we're studying plants used to treat skin disease, so it actually is a really great fit.

Dave:

What is the worst skin disease you could get that a plant would heal?

Cassandra:

Ooh, there are a lot of bad ones. I guess the one that I'm most interested in right now is atopic dermatitis or eczema. This is something that really affects a lot of kids in particular and they can really-

Dave:

I had that as a kid.

Cassandra:

Yeah, it's really awful. It's very itchy, it's very red and inflamed. We've been working on plants that can help to dampen that inflammatory response by targeting some of the bacteria in our skin microbiome with these plant compounds.

Dave:

You're lowering inflammatory cytokines in skin by targeting bacteria that also irritates skin, but you're not directly telling skin cells to just behave?

Cassandra:

Exactly, we're targeting the skin microbiome instead.

Dave:

Is the problem that I take too many showers?

Cassandra:

I mean, it depends on what you're doing every day. I think that showers are fine. I think that at the same time, you have a really robust skin microbiome, it's not easy to disturb it. So showering is not going to necessarily put everything out of whack.

Dave:

You're the CEO of Phyto Tech and you guys are looking at antibiotic resistant infection treatment using botanicals. Okay, how does that work? How would you know? You walk into jungle and there's a bazillion different colored plants. I've always wondered this actually, and like, "I'm just going to pick that one because I think it's going to disrupt a biofilm," it seems like an impossible thing. How do you do that?

Cassandra:

Yeah, well first of all, we're studying lots of plants. I have over 700 species in our collection and we're not picking just random plants. We are taking a very targeted approach by looking at plants that are already used by healers to treat these kind of infectious inflammatory skin diseases. The work that we do in Phyto Tech is on a technology that I discovered in, oh gosh, around 2010 from the elm leaf blackberry bush. Now, I grew up eating blackberries, I don't know if you did as well.

Dave:

We have all three species on our property here in BC. We've got the European, the Himalayan, and the native ones. Is it one of those?

Cassandra:

Awesome. It's one of the Europeans, but there's thousands of blackberry species, yeah. And this one actually happens to grow in the Mediterranean where people eat the fruit just like we do other species. But they also would use the leaves. Get this, they would mix it with pork fat and then put it onto the skin to treat oozing postulate wounds. Now I get really-

Dave:

We're doing this, we raise pigs too on the property. What kind of pigs did they have to use to get the pork fat from? The Mediterranean or the European?

Cassandra:

I think it was just a regular pig. I mean, they didn't specify.

Dave:

Hold on a second here. You're telling me what flavor of blackberry I need, but not what flavor of pig. I feel triggered right now. You've discriminated against me as a pork-o vegetarian, meaning I only eat pork and vegetables. I'm horrified. Okay, so they use some pigs.

Cassandra:

They use pigs.

Dave:

Now my daughter in the room's like, "What is the scientific name of that blackberry?" Because she knows all the scientific names because she's an actual real plant nerd.

Cassandra:

That's awesome.

Dave:

What is it?

Cassandra:

It is *rubus ulmifolius* and if you say it enough times you'll sound like a wizard in Harry Potter. But yeah, *rubus ulmifolius*.

Dave:

Anna, what was the *rubus* variant that had the rudest name of any plant on the planet? Do you remember that?

Anna:

I don't know, you found it. It wasn't me.

Dave:

Okay, there's one blackberry species that's called *rubus* something and every part of it after that is a seventh grade joke. I sent it to Anna because it was the funniest one ever. Do you know the one I'm talking about?

Cassandra:

No, no.

Dave:

If you saw it you'd remember it. But I'm not going to say it on the air because I'd probably say it wrong, because whatever I would say would sound filthy because the name is that bad. All right, so it's a rubus one. Did that do it for you? All right, she says, "Of course, it was rubus, dad. Geez." All right.

Cassandra:

All blackberries are rubus, don't you know that, dad?

Dave:

Pretty much. Now, you wrote a book called *The Plant Hunter: A Scientist's Quest for Nature's Next Medicines*, which is really interesting because it goes through some of this. How would you go about it? Let me ask you this though and this is the scientific part of what I do. There's a thousand kinds of blackberries. What you did though is you went to the locals and said, "What do you do?" And like, "We mix this stuff with pork fat," so you looked at that one. You didn't just start with every kind of blackberry and just do a random thing, you actually looked at what people did and then you'd tested for efficacy of a known practice.

Cassandra:

Exactly and that's why it's so targeted. If you wanted to look at all species on earth, I mean it's estimated we have somewhere between 374,000 to 390,000 species. That's a lot of plants to test in the lab. Even if you look at the number of species that are used in traditional medicine, that's still a huge number. Over 34,000 species have been documented as being important in different systems of traditional medicine. So there's still a lot for us to sort through.

Dave:

Tell me about the Explorers Club, what is that?

Cassandra:

Yeah, the Explorers Club is a club for explorers. These are really interesting people. I joined the local Atlanta chapter just a few years ago, and it's great. We have these gatherings and go scuba diving and hanging out together. You get to meet people that have been to the Arctic and have rolled the poles, which I had no idea what that meant until this one dinner. They basically fly your airplane upside down over the North Pole. These are just people that share a spirit of celebration, of exploration and of understanding what's happening not only in the terrestrial setting but also under the oceans and mountains, in outer space. That's what the Explorers Club's all about.

Dave:

I think it's actually remarkably cool. It's a 100 year old club that's exploring for science. I didn't know about that until I was doing my research for this show.

Cassandra:

Oh, cool.

Dave:

They actually have a club like that, I think I should join it. Part of what that club does, it gets people of all ages together to go do things that haven't been done before. At this point in your career, you wrote a

book about this. Why did you decide to write the book? Because writing a book's a really personal thing and it's a lot of work. What was the reason why?

Cassandra:

Yeah, I mean especially writing a memoir is very personal. There are a couple of motivating factors. Number one is there aren't that many books that are written by women in science about their life in science. I felt like that was really a big gap that I could contribute to filling. I think that I've had a somewhat unusual life. I mean, and I have some cool stories to share. So when the opportunity came across to work with a literary agent to put this pitch forward, I thought this is a great way for me to talk about what it's like to be a woman in science, what it's like to be a disabled woman in science and a mom. But also to really share my passion and love for the natural world and share this message of the fact that we have this incredible resource in nature that's largely been left untapped when it comes to discovery of new medicines.

I also wanted to raise awareness around the challenges that we face in medicine, particularly with antibiotic resistant bacteria. There were multiple motivations and multiple angles I was trying to hit in the book. So hopefully it all came together to where it makes sense. But that's the reason why I decided to write the book.

Dave:

There's an interesting thing that happens when people have an interaction with a bacteria or say a microorganism that gives you a good punch in the face or maybe kick in the shin in your case. It can become a personal battle. I'm thinking about a guest I had who was experiencing recurrent strep infections. He's in his 70s now and he has kicked strep's ass. He's the research scientist for a company called Bliss and he's got lozenges that are probiotics, you put in your mouth that combat that specific kind of... Also, they stop cavities, but they stop that specific kind of strep that messed with him. He's like, "I will get even with you. Fuck you."

Then I was really heavily affected mentally and biologically mitochondrial-ly by toxic mold. Moldymovie.com is my free mold documentary. My company, Home Biotic makes a probiotic you can spray in your house that eats mold for lunch. I'm like, "Why?" Because how dare you mess with me? I was thinking you might say something like that because you're like, "Hey, I had MRSA, which is a biofilm bacteria," and as you mentioned, you're disabled. As you write about in your book, you had one of your legs amputated, right?

Cassandra:

Yeah.

Dave:

And that's because of this, so are you getting even? Do you feel like you've gotten even enough with it?

Cassandra:

Yeah, yeah. I think of it almost as a vendetta.

Dave:

Totally.

Cassandra:

[inaudible 00:13:12] Yeah, absolutely. I mean, I think we're all shaped by those experiences in life. It's also taught me a lot of lessons and empathy and patience and understanding. I get a lot of emails and letters from the general public when they read about the work that we're doing. I get it, man, when people write and they say, "I'm battling this life threatening infection and it's so hard and nothing's working," I get it, I've been there and it really motivates me to keep working on the projects that we work on in the lab.

I think we have this almost colonial mindset that the only individuals that can study the natural world must be in white lab coats or in a medical coat. But that's just not the case. I mean, people that live in a connected way to their environment, number one, are constantly observing what's happening. Here's another perhaps shocking thing for many of the audience and that's that many animals use plants as medicine. I mean, if you've ever seen your dog gnawing on some grass for upset stomach, we know that primates do this. We know that even butterflies self-medicate. This idea that humans self-medicate shouldn't be that strange, but we're also observing what's happening and how these other animals are self-medicating.

Then second, anecdotal evidence and trial and error. Over time, I like to compare it to grandma's best recipe. Let's say if your grandma has an amazing recipe for apple pie, if that's a really good recipe, you're going to keep passing it down from generation to generation. If her pie tastes awful and no one likes it, are they going to share that recipe? No. It's the same concept with traditional medicine. They're passing down the things that work. At each generation there are some slight changes sometimes where they might do a little something extra or add a little bit of this or take away some of that or prepare it in a slightly different way. But that's how that knowledge evolves.

Dave:

It's interesting. It's thousands of years of observation and then saving what works, passing it down and all that. What I feel like is there's maybe an 80% to 90% accuracy doing that and then there's 10% to 20% oh, we just do it because that's what grandma did. I think it's one of our family stories, I've heard this somewhere, but the lady who takes the pot roast, cuts the end off of it, sets it next to it and then cooks it. And her husband when they first married says, "Why do you do it that way?" She says, "Oh, that's just how you do it." Then she goes and she asks her mom, "Why do you do it that way?" She says, "That's how you do it." She asked her grandma. Her grandma says, "Oh, that's because it wouldn't fit in the pan." There's hundreds of pot roasts cut for no reason. So I know we're doing that with plant medicine, in fact doing a lot of that.

Cassandra:

I'm sure we do to some extent, I'm sure we do. But I think it's also important to keep in mind, especially among scientists that perhaps have some doubts about how or if some of these plant-based medicines work, and this is a point I try and tell all of my students, is that we today do not have all the right questions. My job is dedicated to finding the right answers, how things work. But really a scientist's job is also finding the right questions and we just can't even fathom what some of the right questions are today. I'm very hesitant to discount different medical traditions out of hand just because I can't provide a laboratory explanation for them. I may say, "Okay, it doesn't work in this way or that way," but I don't just say, "Oh, it doesn't work at all," unless there's robust evidence of trials in humans with this that show that there's no improvement.

Dave:

You're a little different that way and I want to go deep to understand why you think the way you think because there are a very large number of people out there highly skeptical. It feels like there's more men who are skeptical this way than women on average. But it could just be a sample size thing. But they go, "That can't work because there's no mechanism of action that I know about, therefore it doesn't work."

Cassandra:

Yeah, that's the arrogance, it's arrogant. I, mean-

Dave:

It is arrogant, right? But you don't seem like you have that. I always say, "Oh, you need a mechanism? Leprechauns, there now you have a mechanism so you can try it and see if it works." Because whatever we think the mechanism is, we're probably wrong. We just have a good story that's probably mostly true.

Cassandra:

Well, I mean, I think this argument that you must know the mechanism and if you don't know the mechanism I mean, that's just nonsense. There are plenty of examples of drugs that have been used successfully in the clinic for which we've never figured out the full mechanism.

Dave:

You mean like aspirin? We still don't know some of what aspirin does.

Cassandra:

I mean, there's lots of different targets involved in a lot of these processes. I mean, at the same time, I think some of the reasons that there is a lot of skepticism is that there's also a lot of snake oil being pushed in the market. Sometimes there's dangerous information that's pushed out, especially when you have times of crisis. I mean, I had to come out of my comfort bubble during the early days of the COVID-19 pandemic and write an article saying, "Please, please, please don't eat oleander to treat COVID. It will kill you," because that was something that was being discussed in the media as a possible treatment. No, it will kill you.

Plants can be very powerful. Yes, there's reason to be cautious of new things and we do need to study these rigorously. But I think that's part of my argument is these do merit study, they do merit attention, especially at a time when so much of biodiversity is at risk. We are losing plants across the globe and we're also losing the languages that hold the knowledge to how these plants are used across the globe as well, at an astonishing rate.

Dave:

One other thing that you've done that's interesting is you studied with a double major of biology and anthropology separately. Was this your goal? You're in high school, you're like, "You know what, I want to go study plant medicine in the jungle." Those are disconnected disciplines. Why'd you do that?

Cassandra:

I didn't even know what anthropology was I mean, beyond seeing National Geographic magazines as a kid. I took it as one of my general ed requirements and I just really got fascinated with it and just kept

taking classes until I actually accumulated enough just out of interest that I developed a second major. I mean, when I went to college, you have to remember too, I had been having one to two surgeries a year basically from the age of three until I went to college. Then I had another one my freshman year of college. I'd been in and out of the hospital constantly and my mind was really set on pre-medicine. That was my path, that was what I was going to do. Biology was part of the necessity as that course of study along with all the chemistry classes. Nowhere in my scope of ideas was this idea that I could someday study plants or discover new medicines.

It was really a series of events. It started with some of my medical anthropology courses where they started to open up my mind to the fact that not all medicines are practiced in the same way. That actually people in different countries and different cultures look at health and disease in very different ways. A lot of this had to do with my recognition of the differences in the disabled identity. In some cultures being disabled is a sign of great fortune and almost mysticism. Whereas in others it's something that's really to be discarded or trashed. That got me thinking like, "Okay, from my own perspective, where does that put me?" Then I took a course in tropical ecology and that's the course where I first read this book called *Tales of a Shaman's Apprentice* by Mark Plotkin, an ethnobotanist that worked with a shaman in the Amazon. I was like, "Whoa, this is cool."

Here all of a sudden I have medicine, I have my love for nature, I've got science, I've got anthropology and it's all in one field, which I didn't even know could be possible as a student prior to that. I basically turned 21, I got a buzz cut, which I was not super happy about. I told the hairdresser I was going to the Amazon, I needed a cool haircut and she just gave me a standard buzz cut. I was like, "Okay, well I'll stay cool." Then I headed off to the jungle for six weeks for the initial trip and ended up returning over the winter break for another six weeks. That experience really, really shaped my path because when I got my acceptance letter to medical school, which was just brutal to go through that process and get accepted, I wasn't excited. That's when it really hit me, this is not my path and I need to pursue a different path. But it took a lot of experiences to get to that stage.

Dave:

You actually met with a shaman and shamans are masters of using plants as part of what they do. When you ask them how did you know, the typical answer from a Terrence McKenna or even an Alberto Villoldo is, "Well, the plants tell you." It's an altered state, but a state that humans are capable of going in and interacting with the plant kingdom according to shamanic states and then knowing what to do. Some healers will say, "Well, hold on, let me just figure out," and then they just know. Here, take some of this. Is that something that you've experienced? Is that something that you know how to do? Is that a part of your practice or you just watch people do and go, "That's amazing, tell me what you found. I'm going to go find drugs in it."

Cassandra:

Yeah, I mean I wish I had that level of psychic ability to actually learn directly from the plants. But alas, I have not gotten that ability. But yeah, in a very systematic, scientifically driven way interview a lot of people, I speak with a lot of people, I observe what's happening in different medical traditions. This is done of course under appropriate ethical paradigms and with permissions of the community leaders and the people I'm working with. Through that process of observing their practice of medicine, the ways that they practice medicine, that's the starting point for our laboratory investigations.

Dave:

When it comes to using plants for healing in humans, there's quite often rituals. This isn't a plant ritual, but if you are looking at clarified butter or ghee, when you make it properly, you do it under a full moon with a crystal and you're [inaudible 00:25:01] the whole time you stir the butter. That's part of making ghee work in Ayurvedic medicine. When I talk with especially, we'll call them, well you could say herbalists, but just the more energetic, which is whatever you want to call medicine women or medicine men, in some cases, like, "Oh yeah, these mushrooms are the best because I picked them under a full moon during the equinox while I was drinking sake." There's all kinds of, I don't even know what all they do, standing on your left foot.

There's the harvesting and even the time of day and time of season you get into Rudolph Steiner's work, that's an important variable. Then what do you do when you take them? Do you ask your salad to treat you well because you're supposed to ask your psychedelic mushrooms to give you a good trip. I mean, with kale it'd be like, "Please don't get in my mouth so I don't have to eat you," because it's bad for you. There's all these things. Do you study any of that stuff? How humans interact with the plant when they're using it?

Cassandra:

Yeah, I mean I do. I think it's important to document those factors because what may seem like ritual that has little bearing on the chemistry of something, actually might have some influences. I mean, you mentioned time of day. If you think about the respiration of plants and when they open their stomata, you might be releasing more volatile compounds during certain times of the day. If you think about interactions between species, if there is a greater pest threat to a plant, if it's being more eaten up by pests, it's actually going to increase its production of certain defensive compounds, which might in turn be useful as medicine. I think there's definitely reason to document some of these rituals. I like to think of it as also an important element of the culture and a way for a group to really recognize the incredible gift that some of these plants are bringing to them.

I would say one of my favorite plant ceremonies is kava circle with piper methysticum, it's a member of the pepper family. It tastes kind of peppery when you drink it and it looks like a bowl of mud water. I mean, these are pounded up roots and it's really important that you actually drink the full solution because it falls out of solution. It's not something you can just sip because all of the active compounds, the kava lectins settle at the bottom of the cup. So you go in a circle, you tip up your gourd or coconut shell, or whatever you're drinking out of fully to drink it during the ceremony. Now I've never had the opportunity to participate in a full ritual ceremony, for example in Polynesia, in Samoa. However, I've done this with other botanists that bring this to conferences. I think one of the nice parts of that ritual too is offering some of the liquid back to the earth.

It's just for me, that's special. I think that it really drives home that sense of connectivity, not only between the people participating in the ceremony but also our connectivity with the earth. Just stopping and having a sense of gratitude for what we're about to experience. I think that's something that we can all benefit from, is if you look at other systems of meditation and Buddhist practices, there's a lot of focus on gratitude. What does that actually do for our mental health in the end, when you have that sense of belonging and a sense of gratitude and a sense of connectivity to the earth? I think those are aspects of health that should not just be discounted out of hand.

Dave:

I love it. It's funny, the guys from True Kava have been on the show. They'll be at the Biohacking Conference too, coming up here serving kava.

Cassandra:

Nice.

Dave:

One of the things that's interesting is that there's different species of kava, as you would well know. Some of them are liver toxic and some of them aren't. They had to go through their sourcing to find the ones that don't cause problems that happened in the '80s from basically people who didn't know what they were doing going in, lookalike species. When you go deep in the world, agave is another one for tequila or just agave syrup. A lot of the agave they're using to make agave nectar, which is very high fructose anyway, it's not actually from edible species because the edible species are becoming very rare because it's basically hippie corn syrup.

When people are taking non plant based species that look like them and are good enough, we end up with these problems where people don't understand what it is. It's not just plants. You look at sushi, white tuna is banned for sale in Japan because it causes anal leakage, but here they sell it like it's real fancy. It's actually got toxins in it, but [inaudible 00:30:00] species. How do you know when you look at a plant? Is it just from years of looking like, "Oh, this is the good one and this is the one that harms your liver only a little bit," or when-

Cassandra:

What's fascinating is you can have different species but then you can have the same species and have different chemo types. It may actually be the same exact species but has a different level of expression of certain toxic compounds over others. You see this also with kratom, with *mitragyna speciosa*. There's differences across chemo types. I mean, the mention of kava too and some of the problems that they ran into in Europe years ago weren't just about different chemo types, it was also about the way that they were preparing it because they were making alcoholic extracts of kava. In traditional use of kava, it's never prepared in alcohol. In fact, you're really prohibited from consuming alcohol with kava. It's because the way it's traditionally prepared is in water or it's pounded up and mixed with water and sometimes with a hibiscus leaf. That mucilage like an okra mucilage.

That's because you can have a preparation of a plant, prepare it one way and you're basically concentrating all the toxic components, prepare it the other way, you're concentrating non-toxic components or the components that might have health benefits for you. We see this in many different plants. We did some work for example in St. John's wort, which is used as a supplement also for depression and mental health issues. But in the Balkans, they prepare it in oil, like you mentioned steeping cottonwood buds in oil, they do this with the flowers of St. John's wort. In my lab we actually looked at the chemical makeup of that oil compared to some of these other preparation methods. What was really fascinating to us was that the traditional mechanism of preparing it by steeping it in oil reduced or removed the toxic compound that can cause skin reactions, really severe sunburns, but it kept some of the antimicrobial properties. I think that's just another lesson in paying attention to how they prepare these medicines in different cultures.

Dave:

So how they do it culturally could make a big difference as well. It seems complex as a scientific study because if one of those variables is important and you're not even tracking it, you wouldn't know how to do it. But we do find some really cool stuff. I wanted to highlight some things that I'm hoping listeners haven't heard of. At this point, anyone who's listened to me probably has heard about turmeric and

curcumin. These are well known things and probably resveratrol from Japanese knotweed and things like that. We've come across these before. What about dragon's blood? Tell me about that stuff.

Cassandra:

Oh, dragon's blood's such a cool story. It can also be tricky because if you Google dragon's blood, you're going to see most likely these big beautiful trees from an island that's located off the coast of Yemen, known as Socotra, these big dragon's blood trees. But that's actually a tree that's in a completely different family from the dragon's blood that is used today as a botanical medicine, even as a FDA approved medicine. The dragon's blood I write about in the book is croton lechleri. It's in the euphorbiaceae family or the spurge family. If you take a machete and you cut into the trunk of the tree, it weeps out this bright blood-like resin. I learned during my time in the Amazon that you can apply this resin to your skin to treat insect bites and minor skin abrasions and wounds and infections. But they also use it internally to treat diarrhea.

In fact, it was for that purpose that it was developed into an FDA approved drug. It's a mixture drug, so it contains multiple components from the same plant. It's known as a botanical drug under the FDA's pathway. This is used now today to treat HIV related diarrhea. Started off as a project under Shaman Pharma and now it's I believe under Jaguar as the company that developed that. But they also put a lot of effort into sustainable development with local people in Peru and ensuring that there's equitable paths in place for that development, which is I think just a really cool example.

Dave:

I was speaking at an event in Montauk, New York right before the pandemic shut down public events for two years, that I still don't understand. In my room they gave me some dragon's blood topical serum and people give me all sorts of stuff. I have bottles and bottles, I know the stuff that works. I use a lot of [inaudible 00:35:19]. I'm like, "I'll try it," and that stuff really worked. That was the first time I'd ever heard of dragon's blood. But you could put it on and in an hour like, "Wow, my face looks better than it did before." What plants do you smear on your face on a regular basis?

Cassandra:

Well, that's top secret. I mean, okay, of the ones that I make in my home kitchen, I like to make ointments out of plants like plantain or plantago major, which is the broad leaf plantain just for insect bites and things for kids. It's really easy to make with some beeswax and oils. I make a lot of skin creams with calendula. I'm a big fan of calendula, especially for dry or chapped skin. That's also really popular in the Balkans.

Dave:

Anna makes that from calendula that grows in our backyard.

Cassandra:

It's fabulous. It's such a-

Dave:

Oh, that's right. In fact, she used plantain ointment she made on a wasp bite and it worked very well.

Cassandra:

It works really well, right? It does, it's really nice. I mean, I do things like that. I am decent at growing mints in my garden. That's the one group of plants I can [inaudible 00:36:40].

Dave:

You can't stop mint from growing, so congratulations you didn't kill them. It's like getting [inaudible 00:36:46] species of mint.

Cassandra:

Then they get big enough and I just come in and chop them all up and dry them. Some of my favorite mints are, I definitely like to grow Holy Basil or ocimum sanctum. It's an adaptogen, it's a great one to throw into different teas. I grow a lot of peppermint and spearmint.

Dave:

Holy basil is not like Thai basil or Italian basil. Unrelated, right?

Cassandra:

I believe it's also known as Thai basil.

Dave:

Thai basil's like a [inaudible 00:37:21].

Cassandra:

Tulsi, tulsi, sorry.

Dave:

It's known as tulsi, yeah.

Cassandra:

Tulsi, tulsi, not Thai basil.

Dave:

Thai basil's a purple-y basil.

Cassandra:

Thai basil's a different one. That's a different one, yeah. Well, and this is where common names get tricky because if you don't use a scientific name they can get confusing.

Dave:

The tulsi Holy Basil is one of the most powerful anti-inflammatory stuff for people that have toxic mold. I've used Holy Basil for many years and it was such a difference in overall inflammation. It's on my regular. Yeah, I take that most of time.

Cassandra:

It has a nice flavor too. I like it.

Dave:

Yeah. I mean, tulsi tea exists for a reason.

Cassandra:

Yeah, exactly. I like lemon balm. I use lemon balm and oh, catnip. A lot of people don't [inaudible 00:38:03].

Dave:

What do you do with catnip?

Cassandra:

Yeah, a lot of people don't recognize the amazing things with catnip. I learned about the uses of catnip with some work I was doing with this ethnic minority group in the Shar Mountains in Albania where they will actually bathe children in baths, just throw catnip in there and then make a tea of it for them to drink and it calms them. If you're having nightmares or anxious. I'm like, "I'm anxious when I have big work deadlines," so I keep some catnip in my office. I do a little blend of tulsi and catnip and lemon balm and it makes a nice tea.

Dave:

I love that idea though because it would be calming and some people smoke it too. I don't think it's probably good for you, smoking anything because it [inaudible 00:38:43]. Well, I'm a biohacker and there's a thing you're doing around MRSA, the antibiotic-resistant staph infections and you're disrupting quorum sensing, which is what hackers like me do with computer networks. Talk to me about what quorum sensing is in bacteria and what plants do to it.

Cassandra:

Bacteria are single-celled organisms and if you think about it from their perspective, if they are trying to get into your body, they're really weak when they're on their own. Quorum sensing is basically a communication system through which they coordinate their activities. If you reach a quorum or you have enough of these individual single cells together and they have enough of these secreted signals, these peptides in the extracellular environment, it's like they have an aha switch. Like, "Oh, I'm not alone anymore. I'm now going to change my behavior because there's enough of us to produce the toxins that are needed to then get in deeper into the body."

What I've found with some of these medicinal plants used for the treatment of infectious skin disease is that they don't act like normal antibiotics. Some of these plants don't inhibit the growth of bacteria at all. I started thinking, "Okay, am I asking the right question?" Going back to that idea around should we just dismiss these as not being effective as traditional medicines or should we start asking other questions? One of the questions I asked was, "Well, what does it do to the ability of these bacteria to cause harm?" Indeed, we found in both the European chestnut, and it's the same chestnut that produces the fruit that you eat, chestnuts roasting on an open fire, that chestnut, the leaves of that plant. Then also the Brazilian pepper tree, the fruits which were used going way back centuries as a topical poultice for ulcers and wounds.

What we found in both of those plants are some interesting molecules. We actually discovered a new molecule in the chestnut leaf, in addition to the known ones in pepper tree, but which their activity was unknown prior to our studies, that they can basically shut down the signaling and they trick the bacteria

into behaving as if they're on their own. If you can imagine if you have a bunch of these bacteria in a wound site and you're telling them, "Hey, you're not with your group, so don't start producing these toxins," they just sit there and it also makes them weaker to the immune system because some of these toxins they can produce can actively basically explode your white blood cells. When you switch that off, it gives your immune system a better shot at clearing out the infection. I think that's a really cool example of how traditional medicines work sometimes in very unexpected ways, through more nuanced ways instead of just killing things.

Dave:

It is remarkable to me how our mitochondria also do quorum sensing. A lot of the stuff happening inside our bodies is following those same patterns and some of the crypto networks follow the same patterns for sensing whether you can trust something that's on the blockchain or not. Leemon Baird from Carnegie Mellon was on the show a while back, we talked about hashgraph and the algorithm for that. It's neat to see it mirrored inside our cells and then to also see it mirrored in the way plants interact with bacteria. You have to imagine the plants are doing this because they got tired of the bacteria that were eating the plants and like, "Okay, we know how to hack these bacteria and since they do it for their own good, we can steal that ability from plants by making a tea and then do it for our own things," so that we don't have a biofilm growing where we don't want it, which is remarkably, remarkably cool. You would never know this when you just look at smearing something on, but that's what's going on.

Cassandra:

Yeah.

Dave:

Now, I want to ask you about chestnut because, well, you know a thing or two about them. One of the OG biohackers who's been on this show for a while and has since passed was pretty well known for talking about taking horse chestnut for vascular health. Have you come across that? Using it so that actually you get healthier blood vessels, so when guys are looking for more veins, it actually helps with that because you get thicker, healthier walls in your veins. What do you know about blood flow and chestnut?

Cassandra:

Yeah, so this is actually another good example of common names and botanical confusions. The European chestnut is *Castanea sativa*, totally different plant than the horse chestnut. You're talking about *Aesculus hippocastanum*.

Dave:

I am, there you go.

Cassandra:

I'm bringing out my wizardry words. That actually, yes, there's been lots of records of its use, especially the leaves of this horse chestnut that are wrapped around legs, people that have varicose veins and other vascular problems. This is a very long and old standing traditional remedy for that, but a different species than the one that has the quorum sensing inhibitors, but both very cool plants and very important to medicine.

Dave:

I love it. All right, I'll use both. I just want all the chestnuts, there we go. There's a whole world of plants out there and for listeners, you definitely want to read the book, *The Plant Hunter* if you want to be inspired and learn about the basics of this. But more importantly, you're surrounded by a pharmacy that you don't even know about. Maybe if you live in a high rise in New York, you're surrounded by less of one, but more of one than you might think. And if you live anywhere near nature, there's huge amounts of stuff that actually works and works noticeably. We're heading into a world where there's supply chain shortages that actually don't make any sense if people were motivated by profit or by helping other people. I don't know what's going on. Either there's random mathematical fluctuations or there are people who have other motivations besides you and me getting access to the things that we want.

Whatever the deal is, if you can go in your backyard and pick the right stuff and it does what you wanted and you didn't have to pay anyone, it seems like now is a good time to hone those skills. You should learn a little bit of foraging, learn a little bit of herbalism. It's interesting in its own right and it's fun. If you use one of those apps for instance, it actually can be engaging and worthy of social networking, a bonding with people. So on your next hike, just have a question in your mind, "Can I eat that? Can I eat that? Can I eat that?" And if it's kale, the answer is no, don't do it.

Cassandra:

There you go. Well, I think that's why ethnobotany has been described also as the science of survival, because once we understand how to appreciate and use resources in nature, we can survive in different ecosystems. I think that's pretty cool.

Dave:

Now you run a podcast as well, it's called Foodie Pharma.

Cassandra:

Foodie Pharmacology, yeah.

Dave:

Foodie Pharmacology. That's just your Twitter handle, it's shorter. Foodie Pharmacology where you talk about this stuff and it's absolutely true, everything that you put in your body has a medical effect. That's probably why the Food and Drug Administration tried to lump foods and drugs together, even though they usually now try to get you to eat foods that cause you to need drugs, which wasn't the original intent. But the idea that when you put real vanilla in your coffee, if you like to do that to coffee you bad person you, the vanilloids activated by vanilla are the same ones activated by capsaicin, which comes from eating spicy peppers. Spicy peppers, anti-inflammatory, they're good for you. Yeah, they're copying vanilla, which has a very different flavor profile. If you're just putting vanilla in your stuff and you don't know that, and some days your joints don't hurt when you have vanilla and some days they do hurt and you just don't know, you'll never know what's going on.

Likewise, with the capsaicin, if you're nitrogen sensitive, that might not be the right choice for you, but it may also be really helping you. For you to know your biochemical individuality and then to know the palate of plant kingdom things that you probably already eat and to look for an effect, all of a sudden you're going to realize I'm putting vanilla in there every day, because I like my life on vanilla. But if you just don't know because you're totally ignorant and you just open a packaged, ultra-processed food thing made out of crickets and sawdust, that's not a world you want to live in. It's not a world any of us

wants to live in. It's one of the things you can do, learn how to eat what's around you and read this new book [[“The Plant Hunter: A Scientist’s Quest for Nature’s Next Medicines”](#)]. It's worth your time.

Cassandra:

Awesome.

Dave:

Cassandra, it's been fascinating to chat with you. Upgrade Collective, thank you for your questions. I think I got all of them through here and I'll see you all on the next episode. If you liked this episode, read the book or listen to a different episode. Just do something that's going to keep you on the path of learning cool stuff that's of benefit to you. Because when you do something that improves you, it provides dividends forever because then you can use that new energy to continue to improve more efficiently or to do something else in the world with more energy. You don't lose when you do that versus frittering your time away. And by the way, there's nothing wrong with listening to one of these episodes while you're frittering your time away, you can do that too. I'll see you soon.