TPWKY	(This Podcast Will Kill You intro theme)
Erin Welsh	Hi, I'm Erin Welsh and this is This Podcast Will Kill You. Welcome everyone to the second episode in this season's miniseries of bonus episodes. If this is your first time listening to one of these episodes, first of all thanks for tuning in. And second, what I'll be doing in each of these episodes is chatting with authors about their books on science, medicine, epidemiology, history, basically all of the topics I know listeners of this podcast love so very well. This is a bit different than what I did in last season's bonus episodes where I interviewed experts about a topic that we had covered in our previous week's regular season episode. But I am super excited for this miniseries which I'm calling the This Podcast Will Kill You Book Club. We're going to be reading some fascinating books this season on subjects ranging from the troubling origins of American gynecology to the persistence of race science in research today, from the birth of food safety regulation to the scientific quest to understand SARS-CoV-2 which was the topic of our first bonus episode featuring David Quammen and his latest book 'Breathless'.
	This week we'll be digging into a topic that's near but not necessarily dear to every one of us, sweat. I'm sure that many of you like me have experienced that intense feeling of embarrassment or worry as we sense our sweat pooling in our armpits, lower back, palms, behind our knees, seemingly everywhere at a very inopportune moment, and anxiously wondering not only how much our growing sweat stains are visible to those around us but also how stinky we are. And we can try to quell that rising self consciousness by telling ourselves that everyone sweats, so there's really nothing to be ashamed of, which is absolutely the truth. But I at least have a hard time not seeing sweat as the enemy, or rather I used to.
	In 'The Joy of Sweat: The Strange Science of Perspiration', author Sarah Everts, award winning science journalist and journalism professor at Carleton University, asks us to reconsider our animosity towards sweat and body odor and instead take a moment to reflect upon these incredible secretions, why we produce them, what secrets they hold, and what the future might have in store for their use. 'The Joy of Sweat' serves as a much needed perspiration pep talk in Everts' words and one which by the end will have you thinking more about sweat than you ever have before and even appreciating this super power we possess. Everts takes us on a fascinating and often hilarious tour through the world of sweat, touching on the evolutionary origins of sweat glands and the possible purposes of body odor. Did you know that humans are one of the few creatures that can sweat and that there are many other body cooling strategies that other animals employ that we probably should be thankful we don't possess?
	She also reveals that our modern quest to suppress sweat or body odor is actually not modern at all, taking readers through ancient perfumes, smell museums, and the story of how antiperspirant was popularized thanks to the advertising campaign that shamed the nation into using it. Everts' sweat adventures are hardly confined to the dusty past however and she shows us just how much there is on offer if you would like to dip your toes or your nose into the world of sweat today, whether that's through participating in a sweat dating event, attending the World Sauna Theater Championship, having your armpits sniffed by a professional sniffer, or getting to know some of the forensic and medical uses of sweat along with the ethical concerns they may present.
	The Joy of Sweat' is a wonderfully captivating and entertaining read, absolutely brimming with stories and facts that will have you texting your friends and family at all hours with sweat trivia and BO did you knows. But even more than that, it will encourage you to reexamine why you may feel shame over sweat and why we work so hard to cover up any trace of body odor. I could spend all day raving about this book by myself. But instead, let's take a quick break here and then get to the interview where I will rave about the book directly to the author herself.
TPWKY	(transition theme)

Erin Welsh

Sarah, thank you so very much for taking the time to chat with me today. I can't wait to talk about sweat and body odor and all things related to that.

Sarah Everts

I can't wait to talk to you about that too.

Erin Welsh

First of all, I have to tell you just how much I loved your book. It really did make me appreciate sweat and body odor in more ways than I ever have before. And I especially love the title 'The Joy of Sweat' because I don't think too many people find joy in perspiration or the body odor that can come with it, although I'm sure that would change once they read your book. So tell me, what about sweat brings you joy and what inspired you to write a book about the topic?

Sarah Everts

Great question. Okay well, so for most of my life I've been like a lot of people kind of mortified by my own sweat. I worried that I sweat more than average, I'm literally the first person sweating in any workout class, sometimes reaching for the towel just at the warm up stage in hot yoga, when I should be focusing on being zen and my downward dog I'm like peering at other people's mats looking to see if they're dripping too. And I just thought this is comically absurd at some point, right? This is a class that I have paid for with money that promises to make me sweat and yet I am embarrassed by the thing that A) I have paid for, and B) which makes me human.

Because that's the other part, I'm a science journalist and I've spoken to enough evolutionary biologists to know that they count sweating as one of the unique features of being human, including things like big brains or being the naked ape. And not only that, it's one of the things that make us amazing in the animal kingdom, it's a superpower that has helped us dominate the natural world. And so at some point I figured I need to find some joy, some serenity in sweat instead of stress. And so part of writing this book was like a perspiration pep talk. But in terms of what inspired me to not just dig into this for my own personal edification but to actually write a book about it, it's kind of two things.

I moved to Berlin, Germany and they go to the sauna a lot in Germany. And I thought okay, I need to when in Rome, be like the Romans kind of thing. And I thought okay, I'm going to have to start going to the sauna too. And I'm like really? I don't want to pay to just sit around and sweat. And once I got over my cognitive dissonance about that, because also there's this irony of your paying to go to a spa to sweat in large quantities and then you shower off and then you apply anti-sweat products. So do you want to sweat or do you not want to sweat? Anyway once I got over that cognitive dissonance, I got hooked on saunas and started going to all sorts of spas. And the problem though is that spas spout all sorts of dubious health claims about the benefits of sweating. And again as a science journalist, I kind of was curious to dig into those and to debunk the ones that are clearly hogwash and to kind of lean into the ones that aren't. So that was one reason.

And then another was a random email that I got in my inbox one day. Again as a science journalist, you get a million and one press releases and I'll be honest, most of the time you just press delete. But this time the subject line said something to the effect of 'new synthetic sweat product', blah, blah, blah. And I was like what? Synthetic sweat? You people are making sweat in a lab? I produce a lot of sweat, should I make a side hustle here and sell it? And I ended up writing an article about the artificial sweat industry because right now there are bottles circulating the globe with rather expensive artificial sweat products for all sorts of industries from forensic science to guitar string manufacturers. So I just realized there's so much more to this thing that we're all kind of embarrassed about and maybe I should write a book.

Erin Welsh

I love it, I'm so glad you did. And there is so much that I want to ask you about the uses of sweat in forensics and guitar strings and also the history of antiperspirants because it's so fascinating. But first, let's get into the what, the how, and the why of sweat. So what is sweat and how do we make it?

Sarah Everts

Sure. So we actually have two kinds of sweat. We have the salty, watery stuff that comes out when we're overheated and that's called eccrine sweat. And that sweat is actually just the liquidy parts of blood with all the big things like red blood cells and platelets filtered out. And it makes sense if you need to dispatch water to the surface of your skin to cool down, that's what sweat is for, then the best source is the liquid pouring through our veins. So actually eccrine sweat, that salty water stuff, is just blood minus the big stuff. And then there's the other kind of sweat, the one that's responsible for making us stinky, and it's called apocrine sweat. And it's actually produced in only a few zones, anywhere where you grow hair at puberty is where a apocrine sweat is produced. And it's not salt water at all, it's actually more of a waxy kind of a sweat. And that is what's responsible for morphing our armpits into stink zones at puberty.

Erin Welsh

What I also want to talk about is the why, right. So we have these different types of sweat glands. And as you mentioned, humans are pretty unique in our ability to sweat and it's also a superpower. Why do we sweat? And what do we know about the evolutionary origins of human sweat glands?

Sarah Everts

So truly evolution granted us the temperature control jackpot when we got eccrine sweat glands, those are the glands that help us cool down. And effectively when our body heat rises, we dispatch sweat to our skin and it's the evaporation of that sweat using our body heat that cools us down. And so effectively that evaporated sweat, the evaporated water whisks the heat away from our bodies. And this is a super useful technique for cooling down and it's one that helped humans do all sorts of things. But in particular it allows us to stay cool while we're physically active.

What's amazing about that is if you can think of like the heady days of our evolution when we are chasing prey, so they are running away from us and they certainly can run faster than us. But the thing is they have to stop to cool down, whereas we have a cooling down system embedded in our own skin. And so we can cool down as we're on the run. And so effectively what happens is we would chase our prey, they would zoop away from us very quickly, then they'd have to stop to cool down and we could catch up, forcing them to run again and run again and run again. And effectively making it easy for us to kill them because heat stroke is a terrible, terrible thing. So we could either get our prey that way or by catching them and making it easy to kill them.

And so our sweat glands help us stay cool no matter what. And part of the evolutionary amazingness of humans is we're the naked ape. And as you can imagine, it's easier to evaporate away sweat when you've got skin as opposed to fur. And so part and parcel of being the naked ape is having this enormous amount of real estate off of which we can cool at any given time. And if you compare it to say a dog that cools by panting, they're cooling by panting because they're evaporating water off their tongue. That's their only naked part. And we've got our whole skin, our whole body as a platform for cooling. And so that's how come it's an evolutionary superpower because we just have so much more ability to stay cool than other animals.

In terms of why apocrine glands evolved, that's a question that's not quite as clear. So apocrine glands in other mammals are involved in chemical communication. Our apocrine glands become active at puberty, right when we reach sexual maturity. And so there's been a lot of searching for pheromones, sexual pheromones and other molecules that might be communicating messages to other people through those apocrine odors. Now the question is are we still using them? Or are we still using that line of communication? Because we use so much deodorant and antiperspirants we are not as close to each other. And when was the last time you truly sniffed another person when you met them like dogs do or other animals?

That being said, when humans meet, at least before COVID, we often have ceremonies, ceremonial greetings that involve getting pretty close to some other person, whether it's bowing towards them, giving them a kiss on cheeks, giving them a hug, shaking their hand, right, getting us close enough that we can take a sniff if we want. And one of my favorite pieces of research on this was a study that surreptitiously videotaped people meeting for the first time and found that after people would shake hands with a new individual, within a minute or so they would sniff their hands. And what was so fascinating about that is when the study subjects saw the videos, they accused the scientists of creating deep fake videos because they just couldn't believe it. So yeah, it makes going to conferences pretty fascinating for me because I just sit at the sidelines and watch people shake and sniff.

Erin Welsh

I could not believe that. And now I will never be able to forget it. And I need to go to a conference right now to watch and observe and I'm going to be very self conscious about my own handshaking and sniffing afterwards. So I have another why that I'm sure so many people wonder about. I always feel like I sweat more than the average person, I don't know if that's true or not. But why do some people sweat more than others?

Sarah Everts

Sure. It's actually a mixture of nature and nurture, as many things are. So clearly there's a genetic component. Some people come from sweatier families. My family is really sweaty, we all sweat pretty fast and pretty quick. But in terms of what does that mean on a practical level, people have a wide range of sweat glands, so between 1.5 million to 5 million sweat glands on their skin. So some people just have more glands than others. And then there's also quite a large differential in the rate of those sweat glands, how fast the sweat comes out. And so what's interesting is so if you can imagine all the humans in the world stepping into a sauna simultaneously, we would produce enough sweat that it would be probably equivalent to Niagara Falls, the water flowing over Niagara Falls on a summer's day. And that's if we're all in the very middle of the sweat rates and the sweat gland numbers.

If everybody were super sweaters like perhaps you and I, it would be like about four Niagara Falls on a summer's day. And yes I did call Niagara Falls Parks and got help from a federal employee who was very amused to talk to me. But yeah, so there's this large genetic range that we have. But there's also this influence of nurture, of the environment. So our sweat glands, although we're born with our entire complement of them, they don't become active until our toddler years, fully active, they start to become active. But that level of activity is dependent on where we spend those early years. And so what researchers are currently trying to figure out is what does the temperature of the climate of the place that you spent your toddler years in, how does that affect how you sweat? Because there's clearly a connection but they're trying to sort out what that is. But the take home message is that you can blame your parents either by genetics or by virtue of where they made you grow up.

Erin Welsh

Good to know. So you mentioned dogs panting as one of the ways that other animals control their body temperature or to give off heat, to offload heat. Can you tell me some of the other ways that other animals control their body temperature that may make us as humans grateful that we sweat rather than do like what vultures do, for example.

Sarah Everts

Yeah. Vultures really did not win the evolutionary jackpot. So vultures have very liquidy poop and they poop on their own legs as a way to cool down. And why you might ask would evolution bequeath that? Well the best way to cool down is through this evaporation of water off a hot surface. And so for vultures, the most naked skinny part of their bodies is their legs. And so they poop wet poop onto their legs and it's the evaporation of the water off of their skin that cools them down. And a lot of animals use saliva either by panting or by licking themselves. Seals use urine, another kind of bodily fluid to cool themselves down when they are being territorial about rocks and don't want to plunge into the sea to cool down that way, they urinate on their fins. Honey bees vomit on themselves as a way to stay cool.

And so animals use whatever bodily fluids they have at their disposal and they dispatch that to their skin as the way to have some liquid to evaporate away the heat. Meanwhile humans, you gotta think compared to urine, vomit, poop, and saliva, sweat is pretty much a better option. And we not only have a lot of real estate, our skin, but we have glands that are specifically devoted to dispatching liquid in a very controlled manner when we overheat. So we don't even need to forcibly puke or pee, our body just automatically goes into cool down mode.

Erin Welsh

It does make me appreciate sweat so much more, especially compared to these other options.

Sarah Everts

Right? Can you imagine taking the subway on a hot day and it's gross enough to be sweating in a hot place but what if everybody was releasing all sorts of other bodily fluids as a way to stay cool? Because you don't want to die of heat stroke, heat stroke is a terrible way to die. So we do need to do something and sweat is comparatively a lot less gross than other options.

Erin Welsh

It certainly is. And one of the things that I found so interesting that you mentioned was how you talked about body odor as possibly playing a role in attraction or compatibility or some sort of messaging between humans to signal something that we don't quite know but possibly like mating. And you brought this up in the context of the wild world of sweat dating. Can you tell me about this incredible idea of sweat dating and what your experience at one of these events was like? And I especially want to know whether you ever found out who number 15 was.

Sarah Everts

Yeah, sweat dating is a very strange subculture but also kind of a delightful one. So the premise is this. We find people attractive for all sorts of reasons, right? How they look, whether we have shared hobbies, sense of humor, all of that stuff. But ultimately when you're trying to find a partner or even a hot date, ultimately body odor is going to make or break the moment. And so the premise of sweat dating is instead of triaging based on these other very legitimate characteristics of potential mates or partners, why not cut to the chase and just figure out whether the smells match as a first past the post strategy. And so what that actually means in practice is that you show up to one of these sweat dating events, and I went to one in Moscow about four years ago but they have these events happening all over the world. They've had them in New York and Berlin, in Rio de Janeiro, in London.

So you show up at one of these events and the first thing you do is you're given a wet wipe to take away any products that you've put on, either perfume or anti-sweat products to effectively kind of turn your body odor down to zero. And then you're taken through a sequence of calisthenics, high intensity interval training. Burpees, squat jumps, pushups, all the things so that you effectively start to sweat. Then you're given a pad, a cotton pad to dab yourself in all your parts that might get stinky. And you put that cotton pad into a glass jar and the jar is numbered and only you know the number and the organizers know the number. Then those jars are placed on a table and everybody sniffs through them and you're supposed to pick your top five. And it kind of works like dating apps work. If I find your BO attractive or in my top five and I list your number down and you find mine attractive and you list my number down, then it's a match.

And in this part particular case, a match included a VIP bracelet to an all you can drink vodka cocktail lounge so that you could check out whether the other characteristics like optics and a shared love of, I don't know, taxidermy or soccer, I don't know what, was also a draw. And yeah, it was totally surreal, it was kind of nerve wracking. It was really fascinate because some of the BO that you sniff, I will be honest, I was just like no thank you. And others it was just like either kind of pleasant and nostalgic or like hello! And you're refusing to jar number 15 where it just was like such a potent reminder that there are really lovely things that you can do in a bed. And what's really funny about that is that it wasn't like it turned me into some sex desiring automaton, but it was just like oh yeah. And it was so much so that I devoted my entire reporter's notebook sheet of paper to just 15 with a big exclamation mark.

Then I turned the page and started taking other notes but I was just like yes! And what's tragically painful to me is that ultimately I did match with somebody but it wasn't with number 15. And I did not find who number 15 was. But clearly, right, and this happens in all sorts of other ways too, right. You end up meeting people that you find enormously attractive and they're like meh. Not in a cruel way but they're just not that into you. So yeah, it was really funny though. I loved it. It was also incredibly raw and nerve wracking. And yeah, I highly encourage anybody who's kind of interested in this sort of thing to try one out.

Erin Welsh

We don't just smell different from one another of course, our own body odor can change from time to time. What are some of the reasons why that happens and why does anxiety sweat smell different from regular sweat?

Sarah Everts

Yeah. So most people when they think about the chemical communication or like the things you can learn from sweat, they fantasize about finding the love of their life or something like that. But actually body odor has so many other informational cues that we are capable of smelling off of each other. And anxiety is one of the most interesting areas. And so a study was done where people were told to watch two kinds of videos. One was like a nature documentary of I think it was like Yellowstone National Park. And then the other one was a scary film. And people just sweat into those T-shirts and then when women were told to smell the T-shirts, they could distinguish whether a person was sweating out of fear or it was just normal BO. And that was people who had never met the individuals who donated the sweat, it was complete strangers.

And so this and other studies has kind of led scientists to postulate that we produce some kind of molecule when we are afraid that does come out in our sweat. And what's interesting about that is law enforcement was like yeah, totes, we know that. Because they had long noticed that when you bring in somebody for questioning, people just come in smelling like themselves. But when questioning is over, often everybody smells the same, like there's this top note of fear that humans produce.

And one of the industries interested in learning most about this is the military actually, the US military has funded quite a bit of study on this because you can imagine that in a situation where war is afoot, say people are in a tank, that's a very small space. And if there's a team of a couple of people and I am there and I'm terrified and I'm starting to produce this odor of anxiety, that odor could be detected by other humans and perhaps compromise the mission by making everybody very much afraid. And so there's been a lot of interest in A) identifying what that top note is and finding a way to capture it, kind of like you capture a poison gas with a gas mask or maybe even CO2, we're all trying to capture CO2 out of the atmosphere. And so there would be this idea to do that. The problem is that humans produce hundreds of molecules in their armpits. And it's been really hard for chemists to pull out the very specific one connected to this odor of anxiety. And so people are still searching for it but that remains elusive.

Erin Welsh

I'm so glad that you brought up one of these industries related to sweat because there were so many more that I had no idea that were kind of up and coming. And so that's kind of what I want to shift to talking about now, the uses of sweat from a practical perspective. Our body odor, the quantity of our sweat, and the contents of our sweat change over both short and long timescales. And so what are some of the other ways besides the potential militarization of the anxiety sweat molecule that people are seeking to use this dynamic quality of sweat to monitor health, for example?

Sarah Everts

So there's kind of two aspects of sweat that you can be interested in. You can be keen on studying the odor, the odors that we produce, and/or studying the actual chemical constituents of what's coming out of our pores. So let's start with the first one, the odor. So a lot of researchers are particularly interested in the potential that humans might be communicating levels of infection or disease to other people. There is the case of Joy Milne who was able to sniff out Parkinson's disease not only in her husband but in other people. So there are some conditions where there's clearly biological molecules that are coming out in our sweat and they are not only just coming out in our sweat but they're vaporizing out, they're evaporating out into the air so that we can detect them in our noses.

And there's researchers trying to figure out whether you can for example detect ovarian cancer through human body odor, they're using dogs in that situation. And then there's also researchers who are investigating the possibility that humans can sniff out infection in other people. So for example, a really fascinating study was done where the study subjects were injected with a component of E. coli, I believe, that effectively activates the immune system to freak out and be like oh my gosh, you have an infection. And what's interesting is that the people who were given this, and it wasn't actually an infection, it was just a molecule that gets your immune system activated. When sweat was collected off their shirts and given to people to sniff compared to folks who are just again sweating normally, the people who were sniffing these T-shirts could distinguish the ones that were produced by people who had active immune systems. And your immune system gets active when it's fighting viruses, when it's fighting bacteria.

So it makes a lot of sense because for most of human history, our major foes have been microbials, either plagues or even just bacterial infections from a cut. And so if we were able to sniff out when another person was fighting an infection, that might make us avoid them and obviously not get whatever disease they had, whatever pathogen they had. So there's that kind of interesting way that researchers are also looking at what comes out in our sweat that other people can sniff. But there's this whole other super fascinating area of sweat detection and that's based on the premise, and the first one is based on the premise too that everything that's circulating in our blood that's a tiny molecule like hormones and other small biomolecules, that comes along for the ride with sweat. Because remember, sweat is just the liquidy parts of blood minus like the really big things like cells.

And so you can detect all sorts of fascinating bits of information from people by analyzing their sweat. And sweat electronics is a hot area for all sorts of reasons. Alcohol for example, you can imagine if you have a little Band-Aid sweat patch that can determine alcohol that's coming out in your sweat, if you have perhaps a sweat patch that's connected to your phone sending push alerts when the alcohol coming out in your sweat rises above a certain level, you can get a little alert on your phone saying hey Sarah, probably best to take a cab home tonight instead of driving home. Or maybe that will be an add-on to the smartwatches that we all have because those watches are in direct contact with our skin. And all sorts of fascinating things are coming out with sweat.

	So for example also, I know that there are sports researchers that are interested in things like stress hormones. So say you have a team that's playing a really important match, maybe everyone's wearing a little monitor that analyzes the chemistry of their sweat and those little monitors are pinging back to a coach on the sidelines who can keep track of the players and note when stress hormones are being produced in a player's sweat. And that might be a good time to switch them out because probably their performance is starting to wane.
	So there's all sorts of really fascinating ways that we can perhaps monitor our own sweat. But of course there's the dark side of that, right, which is surveillance. For example, fingerprints. Effectively a fingerprint is inked in sweat. And that means that whenever you touch a surface and leave behind a fingerprint, you are leaving behind a little bit of sweat. And most of forensic science when it looks at fingerprints has just looked at the kind of physical way a fingerprint looks, the whirls and swirls, because that is identifying. But now analytical chemistry is so sophisticated that not only can you look at how the whirls and swirls just look but what are they chemically? And what was the person who left that fingerprint doing? What was in their body?
	So I went and got my fingerprints tested with a forensic chemist and she could tell that I had had caffeine because caffeine metabolites were coming out in my sweat and being left behind in a single fingerprint from my index finger. Had I put a little bit of brandy or Baileys in my coffee, she could have also detected alcohol metabolites. And in fact in some proof of principle work that she's done, they lifted a fingerprint off a windowsill from a person who was a stalker. And from that single fingerprint they found that the person had cocaine and alcohol in their blood, just from a single fingerprint. Because that tiny little trace amount of sweat left behind is chock full of information about what's circulating around in your blood.
Erin Welsh	We are going to take a quick break here but don't worry, when we get back there is still plenty to talk about in the world of sweat.
TPWKY	(transition theme)
Erin Welsh	Welcome back everyone, let's jump right back in. It's amazing how much we seem to be able to tell from chemical analysis of a fingerprint and it did make me think a lot about some of these ethical concerns that we could see in the future. So what do you see as the biggest potential for ethical problems? And do you feel like there will be laws or policies that will come in before these things become an issue?
Sarah Everts	So the first thing you need to know about me is I am not an optimist but I am an aspirational optimist. So I really hope policies come into place. But the things I'm worried about in terms of surveillance and the ethics of this are kind of two parts. One is something called surreptitious surveillance. And we've seen the problem of this with DNA analysis. So if for example law enforcement is worried about or thinks that somebody might be the perpetrator of a crime and they have DNA from that crime scene, then they want to match it to the suspect. And all they need to do is follow the suspect around and pick up abandoned DNA, whether that is a hair or a piece of gum or a cigarette butt or a snotty Kleenex. Actually one of my favorite cases in Canada was law enforcement made a sting operation where they knew a suspect would go to this garage, this gas station, and they set up a table with a gum taste test and got the person to try one piece of gum and then try the other kind of gum, meaning that they had a piece of gum with their saliva in it.

Anyway, so this is a gray zone in North America as to whether this is legal. It's ripe for a Supreme Court case. For somebody to track somebody's telephone conversations you need a judge to sign off on that and yet we're in a situation where just DNA is capable of being picked up. And so you can imagine we probably arguably leave more fingerprints around than we leave hair. And although this fingerprint forensic analysis is in its early stages, it's like decades behind DNA analysis, you can imagine that once this hits the mainstream it's very easy for law enforcement to pick up a fingerprint of a random citizen and figure out whether they are high on cocaine or meth or have been drinking or whatever.

And you can also imagine that this sort of surreptitious surveillance might be done in workplace scenarios too where HR is like a little bit skeptical of you and picks up your fingerprints from your cubicle. Or you can imagine because so many other biomolecules come out in sweat, including biomarkers of disease, also drugs that we take that are pharmaceutical drugs come out. So Zoloft or some other antidepressant. Oh, she's on an antidepressant. Does that make her a good person to hire because she's got these mental health issues? Or maybe other drugs that somebody is taking for a very reasonable reason. Or is that person coming into work slightly intoxicated?

So there's this aspect of surreptitious surveillance that that makes me nervous and there are not rules in place currently that are very clear on this kind of biological surveillance. So that's one thing I'm worried about. The other thing I'm worried about is the stuff that we will share with tech companies once all of these sorts of add-ons are part of our smartwatches, right. So it's not very long before you'll be able to buy an add-on to your smartwatch that sends you that ping alert saying yeah, you had one too many, maybe you should go home by cab.

Well all of that information is being stored somewhere presumably in a cloud and what does that tech company want to do with not only how much you drink but what are the other drugs you take? What is your health status? All of these sorts of things are going to be stored somewhere. And even tech companies that aren't selling this so that you can get a little ad on your social media that suggests, I don't know, that you might wanna stop drinking so much or do something else based on the information that the tech company has sold, even if they're not infringing your privacy, even if they're not selling your information to advertisers, what if there's a hack, right? Or what if a company gets sold? It's all this sort of thing that makes me super nervous.

Erin Welsh

Absolutely. And although you mentioned these sweat monitoring devices that we may soon see on every arm or incorporated into the devices we already wear on our arms, for now it seems that the sweat market is pretty much dominated by deodorants and antiperspirants. How long have humans been trying to cover up our body odor and what were the earliest perfumes like?

Sarah Everts

Humans have been worried about sweat for a very, very long time. I mean we have evidence that we were creating perfumes many thousands of years ago. But one of the most amusing examples of how long we've been worried about BO comes courtesy of the Roman poet Catullus to his friend and then nemesis Rufus. This is the classical Roman poet Catullus and he said to his friend, "Wonder not, Rufus, why none of the opposite sex wishes to place her dainty thighs beneath you, not even if you undermine her virtue with gifts of choice silk or the enticement of a pellucid gem. You are being hurt by an ugly rumor which asserts that beneath your armpits dwells a ferocious goat. This they fear, and no wonder; for it's a right rank beast that no pretty girl will go to bed with. So either get rid of this painful affront to the nostrils or cease to wonder why the ladies flee."

Erin Welsh

That's incredible.

Sarah Everts

Right? We've been worried about stinking for a while but for most of human history we've dealt with it by a mix of either washing our bodies and/or applying perfume. And so it's only in the last 100 plus years that we've started using anti-sweat products.

Erin Welsh

I love the story of Edna Murphy and Odorono. I think it's so interesting the way that these changing perceptions of personal hygiene in this larger historical context but also marketing, how these played a role in the success of Odorono. So can you tell me a bit about that story?

Sarah Everts

I would love to. The first thing I need to tell you though is the difference between deodorants and antiperspirants because it plays an important role as a side character. So the reason we stink in the first place is because our apocrine glands are releasing this little waxy fluid. But actually that waxy fluid isn't stinky at all. What makes it stinky are the bacteria living in our armpits. And our human microbiome does all sorts of wonderful things for us but it also is responsible for BO. And so the bacteria, particularly Corynebacteria, that live in most people's armpits eat this waxy sweat which isn't smelly and they metabolize it, effectively making microbial poop. And it's that that stinks, right. It's after they've eaten our sweat and metabolized it that they produce our BO. Okay.

So the way that deodorants work is they are effectively disinfectants for our armpits, they kill the bacteria living there, destroying the microbes that would eat our sweat and make us stinky. Antiperspirants have a different strategy. They actively block our pores. And so what happens there is you block the buffet of sweat to the bacteria living in your armpits so that they starve and can't eat your sweat and make you stinky. So there's these two kind of strategies. And around the time that disinfectants were discovered sort of in the mid 1800s and onwards, doctors were realizing oh, this stuff is great, you can disinfect medical equipment. And that's when people start thinking oh, bacteria make equipment stinky, bacteria might be making our armpits stinky. Let's put these things in our armpits and they won't be stinky anymore.

And so the first deodorants and the very first antiperspirants were actually around in the late 1800s. But the problem was nobody wanted to buy them. And partly it was a mix of the Victorian era where people were just kind of embarrassed to talk about bodily fluids and such things as BO but partly people just didn't think they needed it. Which brings us to Edna Murphy and her product Odorono. And she was a teenager in Cincinnati at the turn of the century and so she kind of comes on the scene around 1912. And her dad is a surgeon and he's got really sweaty hands. And so he is worried about having the knife slip when he's in the middle of a surgery and so he invents this product where if he puts it on his hands, his hands won't sweat. And she's like this is fabulous, let's try it in armpits! And so it's an antiperspirant.

And so she borrows money from her grandfather, goes to Atlantic City, she's trying to sell Odorono as a product for armpits. But nobody's really buying it. I mean she does get some uptick but she has a lot of problems. And so she goes to J. Walter Thompson, which is a marketing company, and hires them. And they sent her a guy named James Webb who was formerly a traveling Bible salesman, so had some skill sets in selling, and gets him to start making advertisements for Odorono. And initially his strategy is to present sweat as a medical condition that needs to be cured, right. And this was the strategy for most of the products at the time, right. You have excessive perspiration, solve it with our product! Well the problem was that most women didn't think, because they were targeting women by the way, not men, they're targeting women, most women didn't think that they had an excessive perspiration problem.

And so this is where things dramatically change and this is why you and I probably are wearing sweat products today. He comes up with this brilliant strategy of changing the narrative and instead of presenting sweat as a medical condition, he presents it as a social faux pas that will interfere with your social life and ultimately your happiness and presents it as a thing that will interfere with you getting a husband. And he has this very famous ad that came out in Ladies' Home Journal and it was a picture of a beautiful woman's back dancing with a man. And it says within a curve of a woman's arm, it goes on to say it's a place that should be beautiful and dainty and yet it is not. And the argument is that not only are you stinking but you don't realize you're stinking and other people are talking about your stinking and it's going to interfere with you getting a man. It is the early 1900s.

And so so many people were inordinately offended by this ad in Ladies' Home Journal that many people stopped their subscription. But so many more people were hit head on with a sledgehammer and they were like crap, maybe this is why I'm having problems in my life and love situation. And that's when Odorono's sales just started to skyrocket. And what's really interesting is that all these other products who preceded Odorono realized just how successful that shaming social anxiety argument was and they start borrowing it and soon everybody is using it and we're seeing adverts like a picture of a beautiful woman and the tagline is 'Beautiful but dumb, she's never learned the secret to long lasting charm' which is a deodorant and things like that. So yeah, that's how we all ended up getting hoodwinked into being embarrassed by our BO.

Erin Welsh

Gosh, I feel like there are so many things that follow that trend, that horrible but effective marketing. Body hair for instance. So many or even most antiperspirants these days and historically contain aluminum to decrease sweat production. And that has led to a great deal of discussion about the potential health effects of the inclusion of aluminum. Why was or is there concern and what seems to be the consensus these days on whether aluminum in antiperspirants poses a health risk?

Sarah Everts

Yeah. It's a sticky problem because a lot of people are worried about it. The first thing I'd say is that if there is a product that you are using that stops sweating, like your armpits are drier, it's got aluminum in it. There is no other way of stopping sweat. And so there's all these natural faux products that claim to be free of aluminum chlorohydrate, which is the form of aluminum that's in most antiperspirants on store shelves today, they claim to be free of that and yet they are all aluminum. So these things called crystal rocks, if you turn them around and look at their ingredients, they're just 100% potassium alum, which is all aluminum. So no matter whether it's some so-called natural product that you're trying to use to stop sweating or something you buy on the pharmacy shelf, if it is interfering with sweat coming out of your pores in your armpits, it's got aluminum in it. Okay.

And aluminum is kind of not the best metal but it's also a metal that is everywhere on earth. So I believe it's one of if not the most prominent metal in the earth's mantle. And so we have evolved trying to get rid of aluminum out of our system because quite honestly we end up eating a lot of fruits and vegetables that contain aluminum because it is in the soil, because it is in our water systems. And aluminum is a neurotoxin. So if you take too much aluminum, you have all sorts of neurological problems. I will say that folks have researched heavily this connection, purported connection between Alzheimer's and aluminum and generally all the major associations out there have found that when you compare it, it is not a causative agent of Alzheimer's disease. But it's still not a great metal to have in your body. And so regulators have spent a long time figuring out what is a safe amount of aluminum to consume. And by that I mean in the food because aluminum it turns out is a lot in spinach, it's a lot in sesame seeds.

And so they've created these limits of how much aluminum you can eat. And then they universally applied those limits and assumptions about those limits to antiperspirants. The difference is that when you consume aluminum in the food that you eat, it's getting absorbed and passing through your system through your digestive tract. And that's a very different situation than over skin. And actually there has not been very much actual research about how much aluminum goes through your skin and into your blood system from antiperspirants applied on skin. And quite honestly a couple of years ago the European Union, their regulatory bodies were so concerned about this that they went to the cosmetic care industry and said hey folks, you need to do some studies. You need to actually show how much aluminum is passing through and whether this is of concern.

And that just came out a couple of years ago, those studies, and effectively they found that there is some aluminum that gets absorbed but it's not an amount that is of concern when you look at the levels of aluminum in our bodies, this body burden, that we worry about. Because we are going to be absorbing aluminum all the time through food, through other ways because it's everywhere around us. It's just not at levels that should be concerned. That being said, I guess what I would say is I approach antiperspirants with the care that I approach drinking whiskey, right. There's all sorts of trace amounts of carcinogens in whiskey. I really like whiskey and I drink it sometimes, I do not drink it every day. And that's kind of how I approach antiperspirants. On days when I have to be doing something in public and I know I'm going to be nervous and maybe really sweaty, yeah, I'll wear an antiperspirant. But do you need to wear it all the time? Not necessarily. But ultimately I'm not super worried about it.

Erin Welsh

So while researching for this book you experienced so many incredible and unusual things from sweat dating to the World Sauna Theater Championship to getting your armpits sniffed by a professional sniffer and visiting an archive of historical perfumes. Can you share your favorite or most memorable experience?

Sarah Everts

Oh lord, there's a lot. I think having my armpit sniffed by a professional nose was quite possibly the most terrifying but also the most delightful. I mean the fact that professional noses exists just makes me happy. Like these are people who sniff things for a living, whether it's like the odor profile of a new coffee grind or whether they're sniffing diapers to see if new odor trapping technology is actually working. And what's amazing is that there's people who sniff armpits for a living so as to be the kind of science behind when deodorant and antiperspirant companies claim 24 hour effectiveness or 48 hour effectiveness. They do that because they've gotten some people to first of all become subjects, and that's funny enough as it is because first off to be a study subject is a challenge. You have to have some BO but not too much BO, your armpits have to be producing the same amount of body odor because ultimately the great thing about armpits is we have two and the great thing about science or rigorous science is you always need a control.

And so effectively you need people as subjects who have equally stinky armpits so as to have one to sniff with the control and one to sniff with the product. And when it gets down to actually trying out these products, the rigor of how people sniff is kind of hilarious. You're supposed to get within... So first what happens is if you're the person who has donated your armpit to science and you're now going to be sniffed, you take your hand and you put it behind your head, kind of raising your armpit, opening it up to the world, right. And then the sniffer comes in and they've got this little cone and the little cone is like imagine those water cones that you get that are made of paper that look like a dog cone but they've just had the bottom snipped out and normally you would drink water out of them but now they've got the bottom snipped out.

	And they have the tiny part near their nose and they have the large opening part approaching your armpit. And they get to exactly 6 inches away and then they sniff. And they're supposed to take three short bunny sniffs and bunny sniffs is the technical term. You're supposed to take a small sniff so that if the BO is super strong you don't overpower the sensor that is the nose. So you take these bunny sniffs and then you step back, you clear your nostrils, and then you sniff the other armpit. And anyway, this was one of the most... I don't think I've ever been so vulnerable and worried. And yeah, it was deeply fascinating and also kind of absurd. And honestly if I had to redo my life, maybe I would be a professional nose for a living because it was actually also really interesting. I really like smelling things for a living.
Erin Welsh	It's so cool, yeah. So what was the verdict? Can you remind me of the verdict on your armpit?
Sarah Everts	Well I had been a very naughty subject. So I had put on deodorant that day and I had actually put on deodorant in both my armpits. So she was just showing me how it works. And she was like wow, there's a lot of citrus in here because oddly enough I have kind of like a lemongrass product that I like to use. So she was mostly kind of taking me through the protocols. But she did point out that I did apply a lot of deodorant. And what's funny about that is I did. So I had taken the train out to New Jersey from New York City where I was staying and I was waiting in the room for her to come and get me.
	I had to pee and so I went to the bathroom and then I'm starting to panic and I'm like do I stink? This is a professional nose. So I lathered on a whole bunch more deodorant than I probably needed to. Yeah, which I think speaks to what you started off by saying, like why do you call it 'The Joy of Sweat' when you clearly have anxiety? And I guess coming out of it that experience and other experiences just made me think okay, we all need a perspiration pep talk, like we all stink, many of us were products and we're going to have product meltdowns at times. But this is this thing that's keeping us alive and maybe we should learn to live with it and not stigmatize it.
TPWKY	(transition theme)
Erin Welsh	So, so amazing. Sarah, I had such a fantastic time chatting with you about all things sweat related. I never imagined that someday I would have an hour long conversation about sweat and body odor but I'm so glad I did. If you also loved hearing about perspiration and want to learn more, check out our website thispodcastwillkillyou.com where I'll post a link to where you can get 'The Joy of Sweat: The Strange Science of Perspiration'. And don't forget you can check out our website for all sorts of other cool things including but not limited to transcripts, quarantini and placeborita recipes, show notes and references for all of our episodes, links to merch, our bookshop.org affiliate account, our Goodreads list, a firsthand account form, and music by Bloodmobile. Speaking of which, thank you to Bloodmobile for providing the music for this episode and all of our episodes. Thank you to Lianna Squillace for audio mixing and thanks to you, listeners, for listening. I hope you liked this bonus episode and are now psyched to be part of the TPWKY Book Club. A special thank you as always to our fantastic patrons. We appreciate your support so very much, it really means the world to us. Until next time, keep washing those hands.