TPWKY - Special Episode - Mary Roach

EW: Hi, I am Erin Welsh and this is, this podcast Will Kill You. You are listening to the latest episode in our TPWKY book club series where I get to interview authors of popular science and medicine books about their latest work. We have featured some excellent books so far this season and have a great lineup for the rest of the year. If you'd like to sneak a peek at the books that we'll be reading later this season, as well as check out the ones we've already covered, head over to our website. This podcast will kill you.com. There, under the extras tab, you'll find a link to our bookshop.org affiliate page, which has a bunch of podcast related lists, including one for this book club series. I am always updating this list, so check back in regularly to see what's coming up later this season. As always, we love hearing from you all about these book club episodes as well as our regular episodes. So if you have anything you'd like to share, reach out through the Contact us form on our website. Some of you have sent in some great book recommendations, which I always appreciate. Two last things before moving on to this week's book, and that is to please rate, review and subscribe if you haven't already. It really does help us out. And you can now find full video versions of most of our newer episodes on YouTube. Make sure you're subscribed to exactly right media's YouTube channel so you never miss a new episode drop.

EW: Our human bodies are astoundingly complex, intricate machines that allow us to interact with, exist within, and move about this world. Even at this moment, whether you're driving home from work out for a walk cross stitching on the couch, or just sitting meditatively, your body is performing a whole host of functions. Some of which you might be aware of, like listening to what I'm saying, pumping the brakes or picking up your dog's poop and others that you don't even realize are happening. Like digesting lunch, maintaining balance, or growing hair, one micrometer at a time. When you think about all the things that have to go right every second of every day to keep us healthy and alive and doing what we wanna be doing, it's hard not to be amazed at what our bodies are capable of. In general, they do such a good job of keeping us functional, that when something happens that throws a figurative wrench in our figurative machine slash body, we are often left with only imperfect solutions. The human body is a difficult thing to replace, but that hasn't kept people from attempting to do so for centuries. From the earliest skin grafts to 3D Bioprinting scientists have made incredible strides in developing suitable replacements for our various body parts. And Mary Roach is here to tell you all about it. The ever delightful. Mary Roach joins me to discuss her latest book, replaceable You. Adventures in

human anatomy, which takes readers body part by body part Through the science of regenerative medicine, you'll learn what's so special about a pig's heart, why hair transplants work as well as they do. How to choose an ostomy bag, what it feels like inside an iron lung, and so much more. This journey is alternatively funny, bizarre, revelatory, passionate, and inspirational. In other words, it's a classic Mary Roach. By the end of the book, you're left in awe of the scientists who have accomplished so much to heal those in need. The brave patients who have dared to put their lives in their hands and our bodies themselves, whose stubborn instinct to protect us is often the thing holding a spec from creating a perfect replacement. I am beyond thrilled to get to chat with Mary again. So let's take a quick break and get started.

EW: Mary, it is so great to see you again. Thanks for joining me today. My pleasure. Lovely to be back. I am thrilled to get to chat with you about your newest book, replaceable You. Which takes readers on this frolicking tour through replacement body parts and the challenges in getting them to work the way we want them to. Could you tell me about the journey from the seed of an idea to how this book came to be? Like, was there a certain place or body part where you started?

MR: Yes, in fact, there is, um, when I'm looking for a book idea, uh, I often call people from past books or people who have sort of generalized knowledge and I called this woman, I think partly 'cause I was thinking about fat, like as a book topic. Oh, fat, like, fat as a substance. I didn't end up going there, but I spoke to this woman, uh, Leah Beis, who works with stem cells derived from fat. And we had this wide ranging conversation and one thing she told me had nothing to do with. Fat or stem cells. She mentioned this surgeon who had created, he'd created a replacement penis for a man using his own metal finger. And I, of course, pictured the finger moved as is from the man's hand and just like stitched in place, able to move and like it was pretty penile penis exactly like he could beckon with it. And, and of course that's not the case. It was sort of used as a natural kind of prosthetic implant. Anyways, so like that, I was like, wow, I, I really need to see, I need to visit this person. I need to write about that. And, and so I then started just thinking about replacement parts and prosthetics and ostomies and hair transplants, and of course bioprinting and stem cells. And, and that's kind of where, that's kind of how it happened. It just, it tends, my books tend to happen. There's one chapter and then there's. Another one. And then I think, well, what could be the kind of topic, the umbrella that goes over all of this. So it's never me going, yeah, I'd like to do a wide ranging book on regenerative medicine and prosthetics and which is, you know, not what the book really is, but, um, that's how it goes with me.

EW: I, I love that the theme emerges, uh, which as you just follow your curiosity from, you know, prosthetic penises and beyond, like Yeah, exactly.

MR: That could have been the title

EW: next time. The, the sequel. Yeah. Yeah. You, you talked about how like, you know, there's, we start now with 3D bioprinting, which sounds like this like sci-fi thing, but in reality the history of replacement body parts goes back. Centuries, millennia even, and I know that, you know, hindsight is 2020, but it's hard to understand some of the decisions that certain physicians have made throughout history when it comes to some of these replacement body parts. And one that springs to mind is trying to grow a skin flap through a human dog connection. Which you talk about in your book, but without these attempts, we would not be quite where we are today. And I'm curious if you can take me through some of the, either the early pioneers or some of the, the strangest, most outlandish stories of early skin grafting or any other prosthetics that you came across in your research.

MR: Sure. Well, um, skin grafting is a good one. I mean, that goes back 17 hundreds, 18 hundreds, and physicians. Surgeons were, um, initially there was a belief that when you took a. Someone else. And back then it was animals mostly being used, um, that you needed to keep it attached to a blood supply while it's, you know, getting settled in its new home. So there'd be, it was called a pedicle flap and it was, it was, uh, um, you know, there'd be the piece that's gonna be transferred and then sort of a. Peninsula connecting it to its original owner and what that meant. This going back to the 18 hundreds, uh, Charles eo, I believe his name was, had this, I remember reading about how he had used, he described it, of course it's in French. Oh, DEIS. And I'm thinking, well, I don't know much about Danish dog breeds and I'm picturing something small, but no, you meant a great Dane. So it's this person had to lie. With a Great Dane, uh, for a number of weeks, uh, while the, you know, the keeping the blood supply from the dog. But in fact he terminated the project early because of the continual and excessive movements of the dog. And I'm like, what did you expect?

EW: It's amazing that the project got as far as it did, like into actual execution and not just like in the early stages, like, what are we doing here? What are we doing? Yeah,

MR: there's one, there was one description of a similar. Surgery using a pig and a pig like a, you know, livestock, horses, cows have this ability to move the skin, you know, to discourage and make flies go away that can kind of twitch the skin. So the pig kept doing that, you know, and instead of it being a fly that

it was trying to dislodge, it was an actual human. So, and that, you know, there's a pig in the room. It meant there was manure. It was, uh, quite a, sort of a circus. And at a certain point. Surgeons realize it's gonna work pretty well. Even if you just, you don't keep it connected to it, to the host. You can take a patch and put it, it's kind of a bio dressing. It isn't as though the person becomes part dog or port frog or part chicken, especially with a burn, a big burn. Um, the immune system is suppressed initially and that allows this. Foreign graft to, to sit there and to kind of take for a while, and eventually it'll slough off or the surgeons will remove it and put on a graft from the, um, from the patient themselves, which, um, which works. But as a kind of a bandaid, a bio dressing, they're called zog grafts or xenografts, they do work, you know, it protects it, it keeps it from drying out. It sounds really weird, but it, it did work fairly well. Um, chickens, frogs were used often.

EW: Let's take a quick break and when we get back, there's still so much to discuss.

EW: Welcome back everyone. I've been chatting with Mary Roach about her book, replaceable You Adventures in Human Anatomy. Let's get back into things. Chickens, frogs, why choose animals? I mean, I'm, I'm assuming access was one of the things, but you know, how did we go from chickens, frogs to. Today where we're actually able to use, you know, autograph someone's from someone's own tissue and we'll in the future, people look back and go, I can't believe you used the own tissue. Like we now just print sheets of Right skin from someone's body. Yeah,

MR: yeah, yeah. And in fact, now, um, uh, you can do something called a cultured epithelial. Autograft where you take the person's cells and they're sent off site and they're grown into a very, very, very thin layer of their own cells. And that's nice because you're not taking a graft from another part of the body, you know, frequently, uh, you know, you'll take a graft from the thigh or the back, you know, and, and, and when it's somebody has a really serious burn that's covering, you know, 60% of the body or something, you. You don't have a lot of options. It's not a lot of real estate to be taking those grafts from, so, and you can wait for them to heal and then reuse that space. I mean, it's quite an undertaking. So some of these new newer developments like the spray on skin where you kind of, you know, you take a graft and it's meshed and you kind of fill in the spaces and the mesh with some of the person's own cells sprayed on there.

EW: I love that. Like scaffolding build here. Yeah. This is, this is the real estate that you wanna be. Yeah. Taking, it seems like the early days of replacement

body parts is peppered with the use of animals of all different kinds and all different ways. And you talk in your book about. Milk And how in the hospital you might see like cows or goats or like what, tell me about the use of goats milk in a hospital setting in the 18 hundreds.

MR: Yeah. Um, milk, uh, goats milk, cows milk. There was some disagreement on whose milk was best. It was a blood substitute, basically. It was, uh, because, you know, early on before. Sodium citrate was found to be something that could prevent clotting. Um, clotting was a real issue with, with transfusing blood from one person or one animal to another. So somebody had this idea of to try another miraculous bodily substance. So they tried milk, goats milk, cows milk. I mean, there it was just a lot of very excited. Journal articles going, this is gonna be, this is gonna be huge. Milk transfusions are, we're gonna apply to the hospital to get funding for a cow that, you know, that will keep on the grounds. And very quickly, um, medicine came to its senses and realizes it's just, basically, it's, it's similar to giving someone saline to keep their blood volume up. In the case of a, you know, hemorrhage. If somebody's lost a lot of blood, it prevents going into shock. And, and, and so it's useful in that way. There wasn't something inherent in. Milk, you know, that made it this miraculous substance, but it wasn't an entertaining period. And you think it was like 1878, there was this flurry of milk transfusions.

EW: Milk transfusions. Get 'em here. Did, did people not get sick from this?

MR: Not an ideal, uh, sterile scenario.

EW: No, no. We talked about frog skin and dog skin and chicken skin and all this, but then it goes beyond skin grafts and zog grafts into organs transplanted from animals as well. And sort of like with the frog skin grafts, these are temporary solutions. But I was wondering if you could tell me more about xenotransplantation or zoo transplantation, I guess with pig hearts. When do we use that? How well does it work? How did we get the idea? Just the full story.

MR: Sure. Uh, xenotransplantation, I mean, this work has been going on about 30 years at least, and it is just now over the past. Year, year and a half are actually being used in humans. So pig organs are the ones that are being used. I mean, pigs hearts are, uh, similar, especially a smaller pig, smaller size, kind of a, a good match for the human heart. And by now there are fewer than 10 xenotransplantation into humans. There is one man, Tim Andrews, as far as I know, is, is still alive, the rest of them. Bought them about two months. This is a pig organ. It's a genetic edit so that the, some of the sur, the surface proteins that tell the human immune system like this is really foreign. Get it outta here.

So there's these genetic edits to make this heart more like a human heart to try to fool the immune system. And to prevent hyperacute rejection, which is if you put in a pig heart, like right away, the body's gonna attack it, it's gonna start turning black, it's is not gonna work. So they've managed to get around the hyperacute rejection, but there are still rejection, you know, longer term rejection issues. So it's not thought of at this point. It's not a permanent, like a human transplant, human heart or kidney transplantation. You're buying time. In the hope that you'll make your way up the list and be able to get a human, kidney or heart, whatever it is. So it's a stalling mechanism. It's a way just to buy time for the person, you know, who's otherwise, um, you know, could die. Unfortunately, that means the patients that are getting these hearts are in are not in tip top shape. Uh, and that may be contributing to, to the short survival time. Tim Andrews was in better shape than some of the, um, previous recipients. No one is quite sure, you know, why is it only lasting two months? What do we need to do next? How many more edits are we gonna do? What, or is it something else entirely that's going on? There's also concerns about zoonoses diseases that could go back and forth between the animal and the person. Uh, I mean, it's, it's amazing to think that we can even get two months using something that is that foreign, you know, it's up to pig heart, right? So, you know, in pig valves have been used before, but that's, that's not live cells, you know, that's a sort of extracellular material. So, uh, not quite the same. I visited. A place in China where they're raising these pigs, and so they're super clean. It's a super clean pigsty, which to me was this lovely oxymoron. And I'm like, what do you mean? It's a clean pigsty? But it is, it's, they're tested for 40 bacteria, viruses, fungi, uh, the whole place gets disinfected every few days. The staff are not allowed to leave. They work for three months in the facility and then they're swapped out with someone else. So, uh, very, very strict. Uh, cleanliness and hygiene and sterile protocols for these pigs, you know, and I saw I wasn't allowed to go in. Of course, I went, I go all the way to China thinking, whoa, I'm gonna get in to see the pigs. And they're like, of course you're not going in. You're full of germs. You know, and then they're like, you can see it from across the river there, there's the facility. You know. And then we went over to a, a kind of a control center where I could see them, the pigs that is, uh, on a video screen. In real time there they were. The very clean pigs still pooping on the floor. I mean, they're pigs of course, right? There's no gene edit to make a pig use a toilet.

EW: Not yet. Not yet. Moving away now from animals for now. I guess maybe we'll circle back at some point. Um, and going on to pros. Devices, and you had such a great chapter about this, where you kind of touched on these different misconceptions that I think a lot of the general public has who maybe doesn't have experience with, with prosthetics, um, has in mind about these devices. And also just the bias that there is for wholeness. And it's a really difficult

decision to make, uh, for amputation, especially when it's not medically necessary or when it's a parent that has to make this decision or not for their child. Right. I was wondering what your sort of, did your perspective change or evolve as you worked on that chapter and visited people and talked with, you know, individuals who have different prosthetic or terminal devices?

MR: Yeah. That was, um, a conversation. In fact, that was one of the early, uh, conversations I had that. Sort of cemented my decision to do this book. I heard from a, a, a reader of mine who believed that I should do a book on professional football referees. I don't know why she thought that was a good fit for me.

EW: In your wheelhouse. Yeah.

MR: Yeah. So she's like, you should do this book again. Anyway, we corresponded by email and come to find out she was an amputee, um, below the knee amputee, but specifically, and she had had an elective. Amputation. In other words, she chose to have a healthy foot amputated. Um, it was a healthy foot in that the tissue was fine. There was no, um, gangrene or anything, no reason, no obvious reason why a physician or surgeon would say you should remove this foot. Um, but she had spina bifida and that she had like a tumor on her spine. Think it caused this foot to be twisted to not work well. She had had. A half dozen operations, never getting to the point where she was improving, always getting worse. And she's described watching people out hiking and watching people who had prosthetic limbs, you know, artificial foot, uh, who were able to walk or run or hike and do things that she couldn't do. And she, so they've got a prosthesis and she has a natural foot, and she just decided, I, I don't want this foot, I want this gone. And it was very hard for her. To find a surgeon willing to do that. 'cause you're talking about removing. Healthy in quotes. I mean, it's healthy is just not functional for her. Mm-hmm. Uh, it was very hard to find a surgeon willing to do that. She finally did. She was so much happier. She can do all of those things she would see other people doing. So there is a bias for wholeness. That's part of it, but it's also a surgeon. You know, no one's gonna call a surgeon to task for, let's try another operation. Let's see if we can make this foot work. You know, 'cause cutting a foot off feels. Extreme final, there's no going back. Also, the, they, the surgeon may or may not have experience in amputations and, and may be concerned about, you know, what if there's phantom pain, what if I don't do it right? You know, you need also to convince the insurance people, that's another issue. So, uh, so it's, it's a tricky thing to take off your foot. And as you mentioned, when, when you asked the question, when it's apparent. Trying to make that decision for a child that's really hard to do. Yeah, and I think that, like you said, the, the technology being varied for different limbs is, is part of the equation too. Yes, absolutely. The, the

feet and the legs are, are far better bet than those, you know, it's sort of in its infancy, the hand, 'cause a hand is the, you get fingers and you're doing very fine tuned. Work when you're trying to write or pick something up or whatever it is you're doing with your hand and your fingers, that's a big chore to get a prosthetic to do. Whereas walking is, you know, it's, it's not simple. I mean, a gate is, is not just putting the foot on the floor. There's a lot going on there, but compared to a hand, it's a much more successful thing to replace.

EW: Let's take a quick break here. We'll be back before you know it.

EW: Welcome back everyone. I'm here chatting with the wonderful Mary Roach about her book Replaceable You. Let's get into some more questions. Speaking of difficult things to replace breathing ventilators, it's something that we have various forms of technology, including EVA, which I want to, uh, ask you about because that was something new that I learned. Um, but I also wanted to talk about your experience in the iron lung. Thanks to vaccines. We don't see the iron lung wards these days, but it was a whole. Community, like a whole culture. And so it must have been really incredible to kind of see this, this device and then experience it yourself.

MR: Oh, it was, it's a, it was the one that I spent time in as a functional Emerson iron lung from that era, from the polio era before there was the vaccine when, like you mentioned, there were huge wards, rows, uh, even sometimes stacked iron lungs. And there were a few of 'em still around. And I found, uh, uh, somebody. I was interviewing mentioned that, and I said, do you know anybody who, uh, is still using one? And there were a couple people and she put me in touch with this man whose wife had, uh, recently died. And I. Wrote to him and said, you know, I'm really curious about this. Could I come and spend the night in your wife's iron lung? Which is, is this like a,

EW: like a cold email?

MR: Like, yes. How? Hello? Hello, you don't know me. As it turned out, he did know me from having read one of my books, so that was helpful because I think otherwise you'd be like. You're really weird. Go away. Yeah. Spam. Yeah. Spam. Yeah. Creepy. Um, so yeah, it does sound kind of creepy. Like, I wanna spend the night in the iron lung. So anyways, his name was Mark, and Mark said yes. So I went out and I, um, I didn't know what to expect. I imagined it being a little simpler than it was like I wanted to eat a meal in there. And that was frowned upon because that can be very dangerous because if you have a machine, and I should back up and just say an iron lung is different from a ventilator in a, in a hospital that is a positive pressure ventilator. The, you know,

the, the thing that we're all used to seeing or your, it's kind of inflating your lungs like a party balloon. Mm-hmm. Which is very different. Negative pressure ventilation. That's how we breathe. You have muscles to pull apart your rib cage and pull down your diaphragm, and that lowers the pressure inside the lungs. It pulls air in and then when the muscles let go, it squeezes it out. So it's a very gentle and natural thing that is mimicked by these machines. They create a vacuum in this sealed tube that you are inside. Uh, and that. Opens up the chest, pulls in air, and then it goes back out. That means you're inside there, but your head is outside, so it isn't quite as claustrophobic as you would think it is. Um, uh, a very strange experience to have a machine decide when you will inhale and when you will exhale. And so if you're trying to eat. Say you had chewed some food and you were about to swallow it and the machine decided that's when you're gonna inhale. That could be a serious choking hazard. Or you could get, you could get food inside your lungs, which is, could cause pneumonia. You get bacteria in there. So they're like, no, you won't be, you won't be eating dinner in the iron log. No. That would take some coordination and practice. So we're not gonna do that anyway. So I'd had this idea that I would spend the night in the iron lung and Mark had brought in a couple assistants. It's kind of a. You know, it's kind of an undertaking, kind of looks like a hot water heater lying on its side. Okay. But with a sort of like an MRI, you know where this bed rolls out? Uhhuh. So you get on the, the bed uhhuh and then they roll you in, but then you've gotta get your head out this opening. Yeah. So you get your head out, the opening and then the, the neck needs to be really tight. To keep, 'cause it has to be a sealed Right. Right. Uh, to create the vacuum. It's a little hard to explain without seeing it, but it's gotta be, it's gotta be a seal. So that's like not a comfortable way to sleep, you know? And, uh, to have that tight. And I'm like, I think this is too tight. And they're going, no, it's not quite tight enough. Right. Great. You know, and Mark had said. It's really relaxing. You'll be asleep in no time. So I, um, I lasted about nine minutes in the iron lung. So because the collar is so tight, you have this weird, simultaneous sense of like breathing deeply and as though you're really relaxed, but at the same time it feels like somebody's choking you. So it's, um, it's a strange place to be. You gotta, it's stay on your. Back, it's a big ordeal to move, change position. I don't sleep on my back, so it's, it was not a, for me, not very conducive to sleeping. But for someone, you know, and I've read memoirs of people who'd spent a lot of time in an iron lung, and I expected a description of panic, claustrophobia, anguish. But the, the description of being put into an iron lung across the board, people would describe this. Tremendous relief and relaxation to be able suddenly to breathe calmly and deeply when they'd been struggling to get enough oxygen to live a very different experience than a ventilator that's pushing air down into the lungs.

EW: We've covered a little bit of hospital ventilators are the ones that we, you know, think of today as ventilators. We've covered a little bit of iron lung. Tell me about EVA.

MR: Yes. EVA stands for enteral ventilation via anus. You're basically using the rectum as a third long, kind of, which is amazing. Yes. Okay. So you're, uh, the, there's this stuff perfluorocarbon, if I'm saying it right, it holds oxygen. Well, you, so you put perfluorocarbon. Into the rectum and the body absorbs oxygen that way. I mean, you can feed people via the rectum people, people can absorb things through the mucosa of the rectum, uh, including oxygen. Um, you can also do this by blowing it through. I, I spoke to. Dr. Bartlett at the extra corporeal life support laboratory said, yeah, we tried that. You can sort of blow it through via the stomach and that way this carbon dioxide comes out the anus. And I'm like, so, sort of constantly farting. He goes, yeah, not very attractive.

EW: Just like one continuous fart,

MR: one continuous fart. But EVA, you know, EVA is amazing. You know, the applications are quite specific. If you've got a, a premature. Infant. Um, one of the things that is precarious with them is their breathing. The lungs aren't developed enough to support breathing, so, but if you put them on a positive pressure ventilator, uh, it's, it's a very delicate tissue, the, the lining of the lungs, and you can damage the lungs. So if you could supplement with getting oxygen in through the butt. You know, that could be great. Or if it's a situation, um, a combat situation where you don't have a ventilator available, you don't have the equipment necessary just to get some oxygen in there. So sort of a supplement, um, the anus is happy to provide.

EW: There's, there's really no other way to put it. Is there? I wanna keep us moving through these different replacement body parts because there is so much technology and history with each and every one of them. And one of the ones that has a surprisingly long story is ostomies, which are these surgically created openings on someone's abdomen that allow waste to come out. And along with this long history of ostomies also of course comes with this long history of stigma and also these myths that just abound when it comes to ostomies. You know, with like Napoleon and so on and so forth. Can you give me just like a little tour through the history of ostomies?

MR: Sure. Well this is gonna go back to the 17 hundreds. Um, as long as people have been stabbing each other, there's been kind of natural instances where an opening from the intestines will appear in the skin. It'll like the, the body will heal in a way that the lips of the intestine. I like that this was one of

the surgeons. The lips of the intestine will kind of fuse to the cut the opening, and they'll have this natural kind of artificial. Anus, if you will. Uh, and, and so in 1757 there was this surgeon that said basically, why not take a hint from nature? What if we were to do this in cases where somebody has a, a blockage, whether it's a, a tumor or what's whatever is going on, and that it's this blockage, they've tried all manner of the usual suspects and breaking up the blockage and it's not working, and they haven't released anything in days or weeks, and they're about. To die. 'cause it's gonna break, it's gonna pop soon. So they're, um, they would create an opening to let stuff come out. The opening is called a stoma, and today that is still done. Uh, not so much for blockages, um, although for that as well, but with very serious cases of inflammatory bowel disease, Crohn's or colitis. Uh, things get really. Bad. Uh, you can put an opening and, and, um, a pouch.

EW: And there are so many variations on ostomy bags on ways to collect the waste. How, how does one go about choosing a bag?

MR: Well, I can tell you that because I went to the A 5K fundraiser of the United Ostomy Associations of America. And, uh, one of the things they do if you're, if you're not an ostomate, which I am not. They recommend that you choose one and, and to wear as an empathy pouch, you just, you know, join the crew. And, um, I didn't realize, I didn't read the email very well when the, the guy mentioned to me that I would choose a, an empathy pouch and it's supposed to be full, you know, of, of liquid. I just put an empty one on there. I'm like, yeah, this isn't bad. Um, uh, but anyway, depending on where you're. Stoma is that determines what kind of pouch you might wear. Um, there's some that are, have to be changed more often 'cause the material is more liquid, higher up. Mm-hmm. In the small intestine, further down it's more solid. There's various options. Bigger, smaller, two part, one part, just depending on what, what you need. Then there's, you can sort of. Fart with them. There's venting device. Just like poke a little hole, a little venting device. Yeah. Because you don't want to have a blowout, as they call it. Mm-hmm. So there, there are, uh, like a thousand different pouches and systems for Ostomates. And it was, you know, there was a, a really fun event. Everybody was, you know, I, this woman, when I was choosing my empathy pouch, I just sort of grab this one. She goes, oh, that's a really large pouch. That's just very unsexy. Let me show you my pouch. See this? You know, and I change it three or four times a day and you know, everybody's, it had this kind of, what are you wearing, red carpet buzz, you know, it was fabulous. It was just very fun. And the more we can talk about these things, the less there's a stigma. There's been a lot of good progress made, I think, via TikTok and people with Ostomies just saying, Hey, this is how it works. Here's my pouch, here's how I change it. Here's, you know, just sort of saying here. Here we go.

EW: So far we've, we've mostly touched on things that are medically necessary. Replacement body parts. We're talking about skin grafts. Yeah. Organ transplants, prosthesis, et cetera. But then there's cosmetic surgery. We've come a long way. It's obviously a huge industry these days. Talking about things like early hair transplants, early breast implants. Mm-hmm. You know, what did these things look like? How did people. Begin and how much was maybe the person who was receiving the transplant not necessarily like, thought of their experience, uh, in terms of, for instance, what a breast implant was made of.

MR: Oh yeah. I wish I had the book right in front of me to just read you the list of all the stuff that was injected into women's. Should we read that list? It's kind of an astounding, let's read it. It let's read it. Right, right. Yeah. Hold on, let me get the book. Okay. The filler would need to be thick enough to pass as breast tissue yet thin enough to pass through the opening of a syringe. This is before aspirators, before the arrival. Yeah. In the early 1980s of the liposuction aspirator, the substances injected were not typically fat. They were, it truly seemed whatever fat like substance, some enterprising plastic surgeons gaze happened to land on some took their inspiration in the kitchen, olive oil, vegetable oil, some in the barnyard goats milk, cow collagen, pig collagen, or the forest beeswax tree resin derivatives. Others. In the supply rooms of industry, paraffin, petroleum jelly, various glues and polymers. They were just, they were sticking anything in there.

EW: Uh, love that goat milk makes a second mention there. That's good. Yeah. Someone's gonna keep trying until they find a use medically for goat milk. Yeah. Yeah. Yeah. I, I think the other thing too was, was hair transplants, which I know you tried to see if your hair could grow and then be transplanted. How did that end up all shaking out?

MR: Oh, y yeah. Yeah. I wanted to demonstrate for myself a concept called donor dominance. And this is what makes hair transplants possible. So you take hair from, you know, a man who's losing hair on the top, that's where you lose hair on the top male pattern baldness, uh, you don't lose it. They don't lose it. On the sides and the back. So you can take a certain percentage of these follicles and move them up top and they'll retain the characteristics of their homeland. So they won't be hair that responds to testosterone. It falls out. So you take, you know, a couple thousand hairs from back here and from the sides, and you put it up top. And because of donor dominance, uh, it won't fall out. It won't be hair that falls out. And so I, I was at a hair. Transplant clinic because of another chapter that had to do with growing follicles stem from stem cells. So I, uh, while I was there, I said, will you, can you, uh, transplant a couple hairs from the back of my head, uh, to my leg because I wanted. By the time I went on

book tour, I wanted to have a couple of long, luxurious hairs growing on my legs. So I'd have this demon I could show people, look, this is donor dominance. These hairs came from the back of my head. Unfortunately, uh, they didn't take the legs, get a lot less blood than the head. The scalp gets a very robust, uh, blood supply and the calf, not so much so, um, I'm sad to say I don't have long, luxurious leg hair growing from the spot where they transplanted, uh, couple follicles devastating. Yeah, I know, I know. I really. It, but it, you know, they, but it's kind of amazing how well it does work, uh, to the extent that there's something called pubic alopecia, which can be traumatic for some women. Uh, whether they lose their, they don't have pubic hair, they've lost their pubic hair. And you can take head hair, but the thing is, you then every two months have to trim it.

EW: Oh my gosh. 'cause it just will keep growing to the donor length.

MR: It's head, it's head hair. Yeah.

EW: Amazing.

MR: The opposite is true. You could take pubic hair and this has been done. Transplant it. If you're going bald, you could use chest hair, armpit hair, pubic hair, but it's rarely done. Uh, the surgeon who did a, the largest study on it, pointed out, um, pubic hair. That is, that it is difficult to style,

EW: a difficult to style. That's amazing. I feel like with hair transplant, you know, and donor dominance with, uh, whatever various things people are injecting into breast, breast tissue. But also beyond that, throughout the rest of the, the book where you talk about, you know, xenotransplantation, you talk about skin grafts, the thing that really stands in the way is not will, it's not a lack of skill, it's not knowledge, but it's our immune system that seems to be like this kind of unexpected antagonist that prevents us from achieving all that we want to and replacing whatever body part we, you know, have our, our mind set on what are people working on to solve the issue of rejection while also not destroying our immune system.

MR: Y Yeah, that is, um, that is the challenge. The immune system is very, very good at recognizing something foreign, and that's been a real problem with some of these, um, with hand transplants, face transplants, these are composite tissue allo transplants. In other words, there. Not just one kind of, you know, a liver is fairly uniform, but this is a, you know, a hand, there's, there's muscle, there's tend, there's skin, there's, there's all these various components. There's, there's just a lot going on to upset the immune system and to, uh, create a

reaction and immune reaction and a rejection. So, and that's been an issue. So there, there are folks who've had a face transplant and, and now it's breaking down. It's not. Working as well. It's not supple, it's whatever's going on. In addition to rejection episodes and all the issues of immunosuppression, they're gonna need an a second face or hands are, there's folks who are having hands removed just because the immunosuppression that's necessary to keep the body from rejecting it, it's too problematic. So you know what could be done? Um, there was some work being done with taking some of the donors. Marrow, which has components of the immune system. So you would sort of donate that along with the part being donated. I don't, you know, but it, it, you know, that was going on, you know, this was back when I reported grunt, which, you know, around 2016, I think they were just doing a lot of these. You know, composite tissue transplants, the, the hands, the arms, the faces, uh, and it's kind of, they've backed off of it. Just, it's been very problematic. Even with that, um, marrow, I don't remember the name exactly of the technique, but where you take a little bit of marrow from, from the donor. Um, there's hope that in the future you could genetically, I'm not sure how, but you would. Get the organ itself to secrete an immunosuppressive protein, so it would have lo, you'd have localized immunosuppression, so you wouldn't have to tamp down the whole body immune system. You could just get the organ to do it itself. That, you know, is in the future in terms of stem cells? Uh, you know, right now there are treatments where you, you can take somebody's blood, you can regress it to its very early state, where it's called pluripotency, and then instruct it to become a kind of cell, say, um, a dopamine producing neuron, you know, for somebody with Parkinson's. But that's a bespoke process. So it's, you've gotta take, it's time consuming and very expensive. It has to be the person's own cells, otherwise the body will destroy them. Um, but if you could create what's called stealth cells where, um, they evade the immune system, then you could just buy pluripotent cells off the shelf, kind of, and instruct them to become what you want. Uh, so, so that would be terrific, but that's not. If you're talking about cells that may replicate and, and do what they want, that evade the immune system. So you, that's a scary thing. The FDA is rightfully concerned about that. So, you know, those are two directions things are going, but not quite there yet.

EW: Yeah. Yeah. I mean, and hopefully there will be more progress made in so many of these fronts. I mean, it is, it is amazing how fast pace some of this research is, and even though the headlines might be over-hyping and overstating where things are, but I do feel like it is, it's a really promising area research and that's, that's one thing that I, I really appreciated about your book and, and how all of these areas we've made progress in and progress in one area also means progress in all of these other areas as well.

MR: Yeah. Yes. And, and that's why cuts to the NIH and the NSF cuts to, to laboratory. Funding is so damaging, looking like down the line in terms of just the pipeline of innovators and engineers and work that needs to go on to keep things moving forward. You know, it's bad enough just in terms of what it's doing to, to patients and, and to projects that are underway. But going forward, you know, all the progress that we've made, all of that depends on government funding. So that's been. You know, I have an epilogue in the book because where the book was, I was going to the, you know, into production just as the doge cuts were happening. Mm. And we, so we added an epilogue about that, and it's really sad.

EW: Yeah. Yeah. The costs when calculated, the cost will be, I mean, and when we can actually calculate is a big question, but it'll be incomprehensible, I feel like. Yeah. But, well, yeah. Well, um, sorry to end, not to end on a bummer on a sad note, but, but it, it, um, you know, a, aside from the necessary reflection on, on the state of, of funding today and science, science funding today. It has been such a joy chatting with you As always, thank you so much for taking the time to chat about your book.

MR: Oh, my pleasure. I always enjoy being on the podcast. Thanks so much, Erin.

EW: A big thank you again to Mary Roach for taking the time to chat with me. It is just so surreal to get to talk with one of my scicomm heroes. If you enjoyed today's episode and would like to learn more, check out our website. This podcast will kill you.com, where I'll post a link to where you can find replaceable you adventures in human anatomy, as well as a link to Mary's website where you can find her other incredible work. And don't forget. You can check out our website for all sorts of other cool things, including but not limited to transcripts, quarantining, and placeborita. Recipes show notes and references for all of our episodes. Links to merch our bookshop.org affiliate account, our good reads list of firsthand account form and music by blood mobile. Speaking of which, thank you to Blood Mobile for providing the music for this episode and all of our episodes. Thank you to Lianna Squillache and Tom Breyfogle for our audio mixing. And thanks to you listeners for listening. I hope you liked this episode and our loving being part of the T-P-W-K-Y Book Club, a special thank you as always to our fantastic patrons. We appreciate your support so very much. Well, until next time, keep washing those hands.