DOPE LABS

Transcript of Lab 056: The Right Match: Organ Transplants

Zakiya I don't know if I told you about this show. It's called Raised by Wolves, but the second season of it just came out, it's Raised by Wolves 2.

Titi Is it a movie?

Zakiya No, it's a series. OK, but it's basically living in 3099. OK. It's very different, and it really made me think like all the stuff that they're doing in that show, I'm like, Could this really be possible?

Titi What are they doing?

Zakiya They're using like droid robot things, but they look like people and they're able to do all of these biological functions. And it reminded me of where we saw that pig heart transplant story a couple of weeks ago. Do you remember?

Titi Yes, I do remember. And that kind of blew me away because I remember back in the day when they put the ear on the back of the rat, and that was really big.

Zakiya Yes, that was in all the textbooks.

Titi Yes. But putting a pig heart into a Homo sapien?

Zakiya Right, a human?

Titi I was like, Man, we are really making leaps and bounds in our lifetime.

Zakiya I thought Raised by Wolves was 3099 but maybe it's 2099. Maybe it's closer than I thought.

Titi Welcome to Dope Labs, a weekly podcast that mixes hardcore science, pop culture and a healthy dose of friendship.

Zakiya Titi, I know I mentioned that I saw a pig heart transplant and that it feels like we are living in the year 3000, that sci fi is upon us, but I feel like I'm really blown away. Like, how did we get here with all these new transplants and all this technology? That wasn't the only one I saw. That's the only one I can remember right now. I think we got to get to the bottom of it.

Titi Absolutely.

Zakiya This week we're talking about organ transplants. Specifically, we really want to know more about the process of getting approved for transplant and how transplants actually work. Let's get into the recitation. So let's start with what we know.

Titi I feel like everything that I know about transplant is based off of what I've seen in movies and television.

Zakiya I think that's fine.

Titi Is it?

Zakiya I think that's an ok starting point, because then we can figure it out.

Titi Well, now I feel empowered. I think one of the things that I think I know is that getting a transplant is not as easy as saying that I need this new organ. There is a process. You have to see a number of doctors and then be put on a list.

Zakiya Mm-Hmm. I think considering that list, sometimes getting a transplant is easy, though some people get it from family members, but some people can't match with their family member. So I don't know a lot about the matching process. I know sometimes it's easier, you know, if you have family members who match with you. But I got to save this for the next section because I don't know how you match.

Titi One of the things that I know is that not all transplants are created equal. And so getting a heart transplant and getting a kidney transplant are two very different beasts.

Zakiya The other thing I know is that there are a lot of rumors about transplants and the medical system. I think one of the most damaging things that has happened when it comes to organ transplants is the myth and rumor that went around that if you put that you were an organ donor on your driver's license, that the paramedics wouldn't try to save you, do you remember that?

Titi Yes, I remember this, and I hate to say it, friend, but I was actually one of those people who believed it for a little while.

Zakiya That's all right. You were not alone. But it is just that is a myth. You know, I'm looking at this page from Penn Medicine, so the University of Pennsylvania Perelman School of Medicine, and they're saying that you would have to be in the hospital on a ventilator and then pronounced brain dead in order to donate your organs. So it's not even that your organs are harvested. If you're in a car accident, you know what I mean. That myth plays on people's fears of not having adequate care. But there are so many additional steps before you get to the donation of your organs. Another myth is that your family will be charged if you donate organs.

Titi I've never heard that one, but I can understand why people would think that.

Zakiya Because it's an additional process, right?

Titi Absolutely. In the medical care system, it feels like a black box. Sometimes you go to the doctor or you have to rush to the hospital, and next thing you know, you have this huge bill and you don't know where these charges came from. You don't know how you're going to pay for it. So I can definitely understand where that confusion comes from.

Zakiya So what do we want to know, though?

Titi What I want to know is how do they determine whether or not somebody is able to receive a transplant? Because I know I mean, I don't know a lot about this stuff, but I see on TV that there are some folks who, you know, they get a transplant and their body rejects it or something like that. I want to know what are the criteria that doctors are looking for to determine whether or not someone is able to get a transplant?

Zakiya Yes. And along those same lines are those criteria the reason the waiting lists are so long? Why are there 90,000 people waiting for a kidney, but then a little over 10,000 for other organs? Is it related to like the difficulty of replacing the organ, the surgery, the tools that are required, the cost? I'm just curious about like why the lists are so long and were they always this long? Or is this this like a backup from, you know, delays in our medical system?

Titi Right? That's a good question. I think another thing that we're both curious about is because we always are interested in and that is new technology. So what is a new technology and innovations in transplant sciences?

Zakiya Yeah, I'm sure they're not doing it the way they always used to.

Titi No, they can't be.

Zakiya Everything I know about how transplants work is pretty much based on John Q. You remember that movie?

Titi Yes, that's all I know. And I know it's I don't know if it was accurate, but that's what I feel like.

Zakiya Denzel was young in that movie, so young, Denzel, I'm expecting some changes.

Titi That ages us. Let's jump into the dissection.

Zakiya Our guest for today's lab is Dr. Dave Lowe.

Dave Lowe Hi, my name is Dave Lowe, and I work for Thermo Fisher Scientific and I am Head of Research and Development in our transplant diagnostics business.

Titi Thermo Fisher is a supplier of laboratory equipment and supplies. Me and Zakiya know them very well from all of our years in the lab. Their transplant diagnostics business focuses on developing and producing products with applications in both the clinical and the research side of organ transplants.

Zakiya Dr. Lowe's specialty is in histocompatibility, which is a word that isn't typically used. So we asked him to explain what it means.

Dave Lowe It's a hell of a mouthful, isn't it? If you've ever watched our medical drama on TV and somebody needs a transplant and they run around and they say, OK, we've got a match, then that's kind of the histocompatibility bit right there.

Titi Histocompatibility means tissue matching that the tissues of different individuals will be compatible and by compatible, we mean that fusing tissues from two different people, so your donor and your recipient won't trigger a reaction from the immune system.

Zakiya I think it's important for people to remember when we talk about tissues, tissues are just super structures of cells. We can think about individual cells, but tissues are just a conglomerate of individual cells. And so at a cell to cell level, if those cells are not going to be compatible, then definitely those tissues aren't going to be compatible. And the thing that brings those tissues, the nutrients that they need and the oxygen, that they need to stay alive, that's the blood system. So you need your blood to match between your donor and your recipient. All of these things are physically interacting. You also need your tissues or the cells that make up the tissues to match between the donor and recipient to. And once you have all those things in your body, your immune system may recognize that donor tissue and in the case of a transfusion, donor blood and say, OK, I'm not going to attack it. Essentially, that's what histocompatibility is. They get together and they get along.

Titi Dr Lowe's laboratory essentially develops and provides the tools that labs use to figure out how risky a transplant would be for each patient and how easy it would be to get them a transplant.

Zakiya So histocompatibility has multiple components, and one way that we already think about compatibility is in blood type. So A,B,O and then A, B, and O can be positive or negative. Blood type compatibility is certainly important for transplants, but there is a lot more to it with transplants, compatibility or being a match is really framed in the context of the HLA system or a human leukocyte antigens. And that's all about tissue matching.

Dave Lowe When hear people talk about getting a match or not being a match. We're really talking about these specific antigens and what they are are proteins that are present on pretty much all of our cells and tissues, but they're highly diverse. Some of them are very common and some of them are incredibly rare. So if a patient is unfortunate enough to have an incredibly rare tissue type, it's going to be much more difficult to get that patient a donor.

Zakiya Another main factor in histocompatibility is antibodies, and we've talked a lot about antibodies before in various different contexts. Most recently, we talked about it in Lab 47 when we explored the immune system. And in that context, we talked about antibodies really being these protectors to shield our bodies from invaders and foreign particles. That's generally a good thing, but in the context of transplantation and histocompatibility antibodies can be a huge problem.

Dave Lowe Oh no, everything I thought I knew out the window.

Zakiya They're part of your immune system and they can trigger symptoms we would generally categorize a sickness. That's just your immune system responding, right? So if you have a lot of antibodies, they can recognize a lot of different things. That means they might recognize your donor tissue and give you a pretty bad reaction.

Titi So they're like, Aht, aht, aht, this was not here before. Yes, that is not us. Attack!

Zakiya Yeah, you know what this reminds me of?

Titi What?

Zakiya In The Matrix where like the Mr. Smith agents like? They're checking constantly for your signature.

Titi Yes, this is so good.

Zakiya So if you come back in like the same doors that they're constantly looking fo you, like they were consciously looking for Neo in The Matrix.

Titi That specific part of The Matrix scared me. That was terrifying. Mr. Smith, always in the same spots, just constantly looking for you. It was like a horror film, but that sounds exactly like what's happening in our immune system. Like, those antibodies are just like. tetetetet.

Zakiya Right? But it really is great for your body if you have a foreign invader, a low level of virus or a low level of bacteria. Mr. Smith, the immune system, is constantly looking, constantly finding and reading those green little characters scrolling down through your blood system. OK? It is great to have antibodies looking for things on the surface of a bacterial cell or things on the surface of a virus. Not so great if those things appear on the surface of a donor tissue, right? Right. They don't know those antigens, so they're like, Yo, we got to get them out of here

Titi And your antigens are defenseless, essentially.

Zakiya Yeah, they're just things that they don't recognize. They say, Hey, this is not part of the code.

Titi So the antigens, they can't even do the matrix thing that Neo was doing.

Zakiya Yeah, they can't do the Ciare. You know, Ciara was able to go back like that to do the Neo and break your back. She was the only one. Those antigens are not doing that right.

Titi I remember trying to do that in high school. I was close.

Zakiya Really?

Titi I was a different human being back then? Not so different. Just different mobility.

Dave Lowe That's one thing that we find is on our transplant waiting lists, the more antibodies you have, the harder it is for you to get a transplant. And usually that means you will wait longer.

Titi So why would somebody have more antibodies than someone else? How do we even get the antibodies? We asked Dr. Lowe how people who are on the waiting list for a

transplant got so many antibodies that made them have to be on the waiting list for so long? Dr. Lowe says that there are three main ways.

Dave Lowe And the first is if you have a previous transplant and quite often our patients, when they have these previous transplants, they will form antibodies against some of those HLA and then the antibodies persist basically almost for the rest of that patient's life. So if you're then faced with a patient who has antibodies to HLA, all it does is it further reduces the number of potential donors for that patient.

Zakiya So if you have a previous transplant, remember there's cells that make up multiple different structures and that forms a tissue that previous transplant will have antigens from the donor. And so your body, naturally, your immune system will make antibodies to that transplant. So now you have the antibodies that you already had that were part of your immune system, plus a new subset that have developed in response to your first transplant. So when it's time to get another transplant, you have an expanded set of antibodies, which could increase the likelihood that you would have a reaction.

Titi So is there a critical mass of antibodies where once it gets to that amount that your body automatically starts to react?

Zakiya I think that's a very good question, Titi. It is, I think, two things. So it is volume of antibody and type of antibody. So you could have a variety of different types of antibodies, but if some of them are lower in number is less likely that you will have a strong immune reaction. OK. Does that make sense?

Titi Yeah, that makes sense. The next problem that some patients may run into that will cause them to have more antibodies, which makes it difficult for them to receive a transplant is if they've had a blood transfusion.

Dave Lowe A lot of transplant patients get transfused quite a lot, and if there are cells in the transfused units that express HLA, that is different, then there's a possibility. In that way, they can form antibodies as well.

Zakiya So a transfusion is having blood from a donor and putting it into a recipient. You know, when we think about blood, you may just think, Oh, red liquid, but it's not. It has cells in it in those cells have antigens on their surface. So if I am a recipient and I initially didn't have antibodies that would react to those antigens that are on the surface of those cells in my transfusion, there are components of my immune system that will recognize those antigens and begin to make antibodies. So now my antibody profile is expanded because my immune system has detected these other antigens, and now I have antibodies against those antigens, plus whatever antibodies I initially had.

Titi Another way that folks can acquire antibodies that might keep them from being able to receive an organ transplant is a really tricky reason, and that is because your antibody profile can expand through giving birth.

Zakiya That sounds really wild, right? Yes, but basically you have to think of when a baby is born.

Titi Magical times.

Zakiya Yeah. If a baby is born, the baby is not your clone. So it's going to have half the genetic information from the other parent. And if that genetic signature causes the baby to express antigens that the birthing parent doesn't already have as soon as that parent is given birth their skin, their womb, all of that is in contact with new antigens. We talked about that, right? And so then that immune system is like, Hey, here's some foreign particles I've never seen. This wasn't with me before. And so at that moment, the birthing parent's immune system makes antibodies to those antigens that are on the baby that came from the father that don't match with the birth and parents antigens that they already had. Now let's go back to early genetics. We know that when a parent births a child, it is not a clone. The other thing we know is that siblings are not clones. So every time there's a new birth, there's a new possibility of the birthing parent generating antibodies in response to the baby. So let's say you are a parent of three. You've birth three children. You are going up for a kidney transplant and they may say, Have you ever had a blood transfusion? No. Have you ever had a previous transplant? No. Have you ever had kids? And it's like, Whoa, you know, your antibody profile could be off the charts because you've been exposed.

Titi That's so tough. Wow.

Zakiya So it's really tricky, you know? So if you think about that, that feels like that can really increase your antibody profile. Now, here's the good news. This only happens about 30 percent of the time, so only 30 percent of the time do we see this type of antibody response after birth? But it's good to know. Yeah, it's good to know about that.

Titi Is this something that we should be testing ourselves for getting tested for? Or is that

Zakiya like, not until it's time to have a transplant?

Titi Okay, so we've talked about three main ways someone can get antibodies that makes it harder for them to match with a donor like previous transplants. Blood transfusion and giving birth. But Dr. Lowe told us about an even more unusual case

Dave Lowe A patient many years ago who came for transplant and it was a male. He was a really big guy, actually, and he'd never had a previous transplant and he'd never had a transfusion, either. So we were really confused because he had a ton of antibodies. So we were trying to work out where he could have got these from, and it was only just one day that he told us that he used to be a bare knuckle cage fighter. So he'd been fighting for years and exchanging blood, which, you know, sounds horrible, that he'd been exchanging blood and other fluids, I guess, with his opponents. And he'd had a lot of antibodies. So don't do cage fighting if you ever want to get a kidney.

Zakiya I think these are things they don't tell you on Fight Club.

Titi Tyler Durden didn't say this. So after the tissue type has been identified correctly in the antibodies confirm, the last step in checking a patient for histocompatibility is a cross-match.

Dave Lowe You would get material from the donor so you would get cells and tissue, and you would test for reactivity from your patient. And if it's positive, then that usually means you don't go ahead. So I would often be performing these cross matches, and it usually

turned out to be at 3 a.m. because often transplantation happens when you can. When you have the donor, the cross-match is absolutely crucial.

Zakiya OK, so it seems like initially we're just looking at small things like the antibodies. Now we're pulling clumps of cells, so tissues, and saying, "All right, are y'all gon play well together? On paper you look good together, but are y'all gon play well together in that cross-matches where things can really start to look up, right? The question is, you know, are you two gonna play well together? And so, I think a cross-match physically puttin' those tissues together is so important because if somebody made a mistake at the early stages of the antibody panel, or if there is something that wasn't detected, if you were to have moved forward with that transplant and they are not a good match, instantly the body will reject it. Like within minutes, seconds even, the organ begins to turn black. That's just how strong the immune response is in the body.

Titi OK, let's take a quick break, and when we get back, we'll get into another important part of organ transplants with Dr Lowe, and that's immunosuppression. We're back and we've been talking with Dr. Dave Lowe all about organ transplants and how important the cross-match is to make sure tissues will be compatible in an organ transplant.

Zakiya And I think that really gets us to the importance of another component of transplants, and that's immunosuppression.

Titi When a transplanted organ is rejected by the body, it's because of a really strong immune response. And this is the worst case scenario.

Dave Lowe So when you have that antibody response that sort of floods on to that organ, the downstream effects of that antibody are there are many different ways that that could lead to tissue damage. One of them is complement activation, so those antibodies bind to that target. If you like that, that foreign, kidney or heart, whatever it may be, and they kind of group together and they start this insane immunological cascade, they recruit lots of other proteins, and it ultimately forms a complex called the membrane attack complex, which basically just pumps holes in the tissues.

Zakiya And even though there's all of this testing that we talked about earlier for histocompatibility, most patients who end up receiving a transplant are not fully matched. They're compatible, but there is some degree of mismatching, which is usually OK.

Dave Lowe So we need to dampen down any potential immune response to help to make sure that that kidney or heart doesn't reject, but the immune system usually finds a way. So quite often, the immunosuppression that is administered is really there to prevent the patient's T-cells. The T-cells are the kind of conductor of the immune response, so a lot of the immunosuppression is tailored to targeting those cells, and that enables you to transplant safely. It is effective in preventing the organ being rejected

Zakiya And something I didn't realize, is that once you receive a transplant, immunosuppression can be a lifelong commitment. Most patients continue on immunosuppressants for their whole lives.

Dave Lowe The holy grail is to achieve what we would term "tolerance." So if you can get to a point where you can remove yourself from, [00:22:31]both [0.0s] help so all your

immunosuppression is taken away and your immune system is tolerant of that graft, that's extremely difficult to achieve.

Zakiya Once you receive a transplant, immunosuppression is a lifelong commitment, and there's a lot that comes along with that. You're taking a ton of medicine, and when you're taking that medicine, that means it can make you more susceptible because you're suppressing your immune system. It means it can make you more susceptible to colds. It can make you more susceptible to getting really sick from common exposures that wouldn't disturb most people.

Titi So it changes your quality of life?

Zakiya It changes your quality of life. And if you're not having issues with your transplant, it may be easy to think like, OK, maybe it's alright if I skip this for a day, or even just because it's difficult to keep up this type of regimen, you may unintentionally miss a day, right? You know how many times I miss my allergy medicine, even though I know how awful I'm gonna feel? It's not intentional. And so can you imagine missing one pill in your, you know, routine and then having these things that you also can't see. We know just human behavior. We delay things we can't see. We don't put as much importance on things that we can't see. And so it may not feel like there's gonna to be immediate action, but that immune system is quick.

Dave Lowe And we see there's a lot of studies that have shown that actually sort of stopping taking the immunosuppression - really a leading cause of transplant failure. Especially in younger people, I think that's something to just sort of consider is that a lot of the immunosuppressive drugs out there, they're quite powerful and they have a number of side effects that could be seen as quite undesirable, you know like excess weight being gained and hair growth and things like that.

Titi This whole process might seem like a lot, and it is. It used to take weeks to determine histocompatibility, but Dr Lowe was telling us that their technology has improved and what used to take weeks can now be done in a matter of hours.

Dave Lowe And in those cases where it's a deceased donor, you've usually got much less time because as soon as the organ is retrieved from the donor and placed on ice, then the clock is ticking. We have this thing called cold ischemic time, which is used to describe the number of hours that the organ is placed on ice before we can implant into the recipient. So part of what we do is to make these tests as rapid as we possibly can.

Zakiya Both of those points Dr Lowe made are really important. That time frame for determining compatibility and the ability to leverage more deceased donors - those are both really important because the demand for organ transplants is still very.

Titi Right, according to organdonor.gov over 100,000 people are currently on the national transplant waiting list.

Zakiya and the bulk of these folks are waiting for kidney transplants. Currently, there are 90,000 candidates on the kidney transplant list,

Titi and the statistic that really got me is that every day in the U.S., 17 people die waiting for an organ transplant.

Zakiya And so when you consider all of this, you know, we talked earlier in the dissection about compatibility and how that can be one of the biggest obstacles to getting a transplant. But we both wanted to know if that was the major cause of the long waiting list that we're seeing or if there's like some other issue that we've seen in other places like, you know, specific types of demand for different organs.

Dave Lowe I think supply and demand is a good way to put it. You know, the number of people waiting on the list - Generally speaking, they outnumber the number of available organs. And then there are the reasons that we've talked about why some patients may wait longer than others. So the patients with a lot of antibodies, they're going to struggle to get a donor from the waiting list so they're waiting for deceased donors. So I think that's important to talk about as well, that in some organs like kidney, a large proportion of the transplantation is taken from live donors. So quite often it could be family members a brother or sister, mother, father, child, the people on the transplant waitlist, you know, maybe they don't have a potential live donor.

Titi These challenges of supply not meeting the demand mean that scientists and doctors have to think a little more creatively about different ways to get patients transplanted successfully.

Dave Lowe So when I talked before about a lot of patients on the list have a lot of antibodies and disproportionately high numbers of female patients that you have to get a little bit creative. And how are you going to get patients like this to have a transplant? And there are things you can do that I think they're really quite clever. One is paired donation. So you know, you might have a patient and they might have a lot of antibodies and their wife or sister or brother is willing to donate. But because of the antibodies, they're not compatible. So what often happens is they will enter into a paired donation scheme. So what they'll say is that, OK, my brother can't give an organ to me, but we're going to go into this pool of people, of patients and donors, and we're going to find out maybe there's a patient in there that he is compatible with and maybe there's a donor in there that the patient is compatible with. So in its simplest form, they literally just swap donors and then everybody gets what they need. And if the patient is willing to accept a risk, you can do some more high risk transplants where you have a donor and they've got antibodies against them, but you use that donor anyway. And what you can do is you can do what's called desensitization therapy. So we will treat the patients and remove their antibodies. So usually we'll do it by plasmapheresis. So we'll essentially hook them up to a machine and remove components of the blood and get the antibodies down to a level where we think, OK, we're not gonna have a hyper acute rejection. The immunosuppression is gonnna to be enough to stop that happening.

Zakiya But once again, it's really important to note that for a procedure like plasmapheresis, they are removing all the antibodies, which, as we know from Lab 47, means a much, much weaker immune system.

Dave Lowe That's one of the downsides is you're going to remove antibodies that - the kind that the patient needs. There's antibodies that protect you against bacteria, virus, whatever it might be. So you kind of run the risk of leaving your patient a little bit extra vulnerable and then you're going to give them immunosuppression as well so you can be double vulnerable.

Titi This is such a great point, and this is part of why it's so important that those patients who've received transplants have regular monitoring. For example, doctors may wanna periodically screen patients to make sure that they aren't developing antibodies that might reject the transplanted organ. Whether it's regular clinic visits or a new technology that allows patients to take these samples at home, being a transplant recipient is really a lifelong commitment. And in order to make this lifelong commitment more bearable, there's a lot of technological advances that scientists are trying to pour into so that it makes that commitment less of a burden. So we asked Dr. Lowe about some of the advances in transplant technology.

Dave Lowe There's been great advances over the last few years as we've gone from sort of the cells, right through to various PCR techniques, and now we're on to next generation sequencing, and that gives you that deep level of understanding of the tissue so that we can have more information. We can match to a higher and higher level. And this is amazing. And now we're trying to say, OK, we can do it. But a lot of the time some of these workflows take two or three days. So it's how can we speed it up? What can we do to speed it up? And I think that's some of the really exciting stuff that's going on right now is that, you know, there's lots of us working on getting that deep level of resolution as quickly as possible. So it's kind of a race where everyone's working on it.

Zakiya So Titi, when we consider it like that article that we saw about the pig heart transplant, the recipient recently passed away. Yeah, I saw that. But they're also saying they don't know what the cause is. And one thing that we do know is when you have those types of transplants that you're taking a lot of immunosuppressants, so it could be anything. This was really groundbreaking technology, but it was kind of a one off, right?

Titi Yeah. I think it's a really great start when we're thinking about the future of organ transplant.

Zakiya And so we asked Dr. Lowe, what does he feel is possible in the coming years? Is this the future of transplant technology?

Dave Lowe Yeah. I mean, I don't know if I'll be anything like accurate. I guess we can meet in 10 years or something and see, but xenotransplantation. So using an organ from another species is it's been around for quite a long time. There's been a number of high profile cases that have come up recently, and that's got us really interested. And what I've seen from some of these organs that have been used is that they've knocked out genes that express proteins that are thought to be important in the immune response. And they've engineered those genes out to presumably and hopefully make things safer. And they've engineered in certain human genes. So let's try and make that pig, kidney or heart more closely resemble the recipient. So it's science fiction, but it's coming. It's here and it's, you know, it's really crazy. So I'll be really interested to see how these transplants go. Longer term, I think there's a lot we need to learn about how that immune response to that pig organ differs from a human and what challenges we might have. I know that in these cases, these recipients are extremely heavily immunosuppressed, so it's not easy. I think there's a long way to go, and there's going to need to be a lot of large human trials.

Zakiya Immunology is everywhere.

Titi Yeah. I don't know much about immunology, but I feel a lot smarter after all of this, and I feel like the future looks bright for organ transplant science.

Zakiya I think it's really exciting. Like you said, it's bright, but I also am cautious. I think a lot of times we have the technology moving and it's divorced of this social context. And so I'm like, What does it mean for transplant technology? You know, as we start thinking about this new tech and until it's readily available for everybody, how are people going to decide who gets what. It feels like this technology and the implementation of it is ripe for abuse, you know, right? Or more of the same where we see people with the most money get these things. And so how can we do this better than we've had some of the other aspects of health care? Yeah, but I feel excited about it, like you said. What was it? The ear on the back of the mouse? It's time to update the text book photos. That's right. It's the genetically altered pig heart now. Well, what's your one thing, Titi?

Titi My one thing this week is a Dope Labs live show that is happening on April 14th at the Boston Museum of Science. We did a live show in Minnesota, and so many people were like, Oh man, I wish I had known I would have come out to see you. So now, you know, tickets are free 99. You can come April 14th at the Boston Museum of Science at seven p.m. There'll be a link in the show notes so that you can reserve your ticket.

Zakiya My one thing this week is the Citizen Science Project. I don't know if you remember the earthquake back in Haiti and what we consider seismology and how do we track all of these events? There's a system called Raspberry Shake, which are these small computers that allow you to track seismic activity at a smaller level. So there's a network of all these little computers giving us a world view and just regular citizens, you know, not institutions are tracking this information and sending it to this hub. It's rasberryshake.org. You can see all the different stations and track the most recent events. Even really small events at stationview.raspbery.org. It's kind of cool. That's it for lab 056. Call us at 202-567-7028, and tell us what you thought. Or you can give us an idea for a lab you think we should do. Either way, we love hearing from you. That's 202-567-7028.

Titi And don't forget, there's so much more for you to dig into on our website. There'll be a cheat sheet there for today's lab and additional links and resources in the show notes. Plus, you can sign up for our newsletter, so check it out at dopelabspodcast.com. Special thanks to today's guest expert, Dr. Dave Lowe.

Zakiya You can find more information about Dave Lowe's work with organ transplantation on LinkedIn at One Lambda Inc..

Titi You can find us on Twitter and Instagram @DopeLabspodcast.

Zakiya And Titi's on Twitter and Instagram @dr_tsho.

Titi You can find Zakiya on Twitter and Instagram @zsaidso. Dope Labs is a Spotify original production from MEGAOHM Media Group.

Zakiya Our producers are Jenny Radelet Mast and Lydia Smith of Wave Runner Studios.

Titi Editing and Sound Design by Rob Marczak.

Zakiya Mixing by Hannis Brown.

Titi Original Music composed and produced by Taka Yasuzawa and AlexSugiura from Spotify. Creative producers Candice Manriquez Wrenn and Corinne Gilliard. Special thanks to Shirley Ramos, Yasmeen Afifi, Kimu Elolia, Teal Kratky and Brian Marquis.

Zakiya Executive producers for MegaOhm Media Group are us.

Zakiya Titi Shodiya.

Zakiya And Zakiya Watley.