

Getting Curious with Jonathan Van Ness & Dr. Keely Muscatell

JVN: Hey, curious people, I'm Jonathan Van Ness and welcome back to Getting Curious. You guys, what happens when we actually get sick? The person's next to you on the airplane coughin' in your mouth. You're in the public restroom and you're washing your hands and you see some guy take a violent bathroom break in the stall and walks out of there without washing his hands. There's ecoli everywhere, there's norovirus in the air. What actually happens when we get sick? Like if I breathe, like what is literally happening on the molecular level in the moment that you get sick? Can one tell that exact moment? Like do we even know? But to talk about like the moment of sickness we're bringing in Doctor Keely Muscatell to ask what happens when we get sick. Doctor Keely A Muscatel is a social neuroscientist and psychologist from the University of North Carolina at Chapel Hill. Go tar heels?

DR. KEELY MUSCATELL: Go tar heels!

JVN: Yeah! Um Her research explores how social experiences impact physical health. She's also the director of the Social Neuroscience and Health Laboratory at UNC Chapel Hill. Keely, welcome to Getting Curious. How are you?

DR. KEELY MUSCATELL: I'm so excited to be here. I really feel like curiosity is something we need more of in the world. So thank you for bringing it out in people.

JVN: I could not agree more. Also sidebar: I love your shag so fucking much.

DR. KEELY MUSCATELL: Thank you.

JVN: OK. So I was saying to everyone before in our little intro, like on the like, you know, like microscopic level, like what's happening when we actually get sick because obviously there's like little bits of like, you know, microscopic but then there's like your whole ass self. Um and I think COVID for so many people was their first thing of like, oh when did I actually get sick? For me, it was like HIV, like, like when I started learning about HIV, I was like that seroconversion, I got to understand how all this shit works. But all the, but they're all different and like how come some people get exposed to some things that they don't actually like test positive or whatever? And so I just have so many questions about like, when is the moment in which in which we get sick? Um so what is, what is the moment? And also not to ask you 19 questions at once, but have you seen on um like TikTok when those like there, there's this one lady in my algorithm who takes like fruits and like random things and she takes like a little smear and then puts it on a like microscope slide and like, she was, like, pineapple and, like, all this other stuff on, like, is that what viruses and, like, sicknesses are, like, does it really happen like, that little, like, you could see, like, a little Ebola, like, into your stuff and, and that's how it works?

DR. KEELY MUSCATELL: Yeah, I mean, kind of. Um, there were maybe 19 questions there but I'm going to try my best to remember them and take you through them. Ok. So how do we actually get sick? And when is the moment that we get sick is kind of a complicated question to answer in a lot of ways. In part, because there can be a difference between being exposed to something, being infected with something and having symptoms of something. And I think you're absolutely right, that COVID really brought this to the forefront

of a lot of people's minds because some people, right, actually would test positive and have no symptoms. I don't know who those people are. I was not one of them. I definitely had had symptoms. It's a fascinating question. Um and, and then, you know, other people had really extreme symptoms and then other people would have exposures and have neither. So your body has a lot of different ways of protecting you from—even if you get exposed to something—not letting it get in there and turn into the pineapple invading your tissues or whatever, right. So, like the biggest one that I always think about is your biggest immune organ is skin. Skin is going to keep a lot of things from, from getting in there. And like, you know, viruses and other pathogens have to find a way in. Um, this is why we have like mucus and you know, those sorts of things that are going to try to like, push things potentially out. But assuming something does get in there and then there is this moment where, um, your innate immune system is going to activate and try to fight it off. So one thing I think is really important to emphasize is that when we think about the immune system, I think we tend to think of what's called the adaptive branch of the immune system. So that's like, you know, your T cells and your B cells and the memory cells. That's what we're trying to like...make.

JVN: Is that your CD4 cells too, your helper cells, are they in your adaptive?

DR. KEELY MUSCATELL: Yup CD4, you got it. Yep. Exactly. They're in your adaptive.

JVN: I'm literally, I'm taking notes. Um so adaptive branch. Is that what you said?

DR. KEELY MUSCATELL: Adaptive. Exactly. Yeah.

JVN: Branch though, of your immune system? So there's branches?

DR. KEELY MUSCATELL: There's branches, you got it. There are two, well, yeah, and there are two main ones. So adaptive is, I think again, what we're most, the adaptive branch is what we're most used to thinking about. It's like your memory cells; um those good things, the things that we're trying to create when we give people vaccines. Um and those um those cells in that process is incredible. It is like one of the most beautifully orchestrated, I think physiological processes, but it's super slow because it's really specific. So you need like the right antibody or the right memory cell to like find the exact, you know, pathogen that it remembers. And that takes like days to weeks and we want something else that can do things in the short term. So we got this other branch called the innate immune system, um, or the innate branch of the immune system. And um, that branch is way faster acting, um, like minutes to hours of encountering something weird in the body. Um, but super non-specific. So it doesn't have this like careful memory or careful knowledge about different, you know, pathogens or different viruses or bacteria. It's just kind of like this general like, ah, let's do whatever we can to like, you know, stave this off in the short term, so that adaptive branch can kick in. Um, and that process is uh coordinated through an inflammatory response or inflammation. And that's, I think what you might be very curious about, if I could guess.

JVN: Not to be that basic girl who's like, that's what everyone thinks about, and then I have all these questions about it. So basically, that's the idea that like if you got exposed, like if you actually got infected with COVID and then recovered from COVID, you would have like some cells in your system that like, remember that and would know how to fight off COVID if you were exposed again?

DR. KEELY MUSCATELL: You got it. Beautifully said.

JVN: But those, and would those things that like, remember the COVID or the RSV or whatever um and okay oh, I had so many questions... Whooo we're going to med school today honey. What type of cells remember the virus and then we'll go attack them in the adaptive branch. Like what type of cell is that?

DR. KEELY MUSCATELL: Yeah, you have like a lot, a lot of different... So you mentioned CD4, you have lots of different white blood cells that are able to form these kind of memories. So um you got those memory T cells, you have B cells, you have neutrophils. Um so lots of different um types of cells and then you also have um you know, antibodies that are only around kind of more in the short term. Um but the memory cells stick around much longer. Um and so if you get reinfected and with something over a longer term, that's probably what's what's kicking in there to fight those things off.

JVN: Most of the type of cells that remember a virus are like a type of white blood cell. Is that fair to say?

DR. KEELY MUSCATELL: Yes.

JVN: And then um antibodies, our body makes an antibody, but only when you have like the infection in your immune system is like working?

DR. KEELY MUSCATELL: Exactly. And they stick around for like a little while afterward. Um but, but not forever and their potency kind of declines over time. Um and so that's why, you know, you get reinfected with something um In the short term, you might have those antibodies to be there to fight it off. But over the longer term, it's going to be more likely to be those white blood cells that kick in to do the fighting off.

JVN: OK. OK. Oh Fucking K. All right. I got it. So then when like people were first getting COVID and like their bodies were like going like just having those like like the multisystem organ failure and like they were turning them on their stomachs and stuff like is like what, what was that thing called when people were getting just like massive, like just like your whole, it's like see something and like your whole body just like fucking freaks out.

DR. KEELY MUSCATELL: Yeah like cytokine storm?

JVN: Yes!

DR. KEELY MUSCATELL: Yeah. Yeah. Yes. That is, that is the inflammatory response, that is inflammation.

JVN: So is that your innate immune system just like being like, what the fuck?

DR. KEELY MUSCATELL: Yes. That is exactly what is going on there 100% or maybe it's not going what the fuck it's going like...

JVN: "I'm going to kill you."

DR. KEELY MUSCATELL: "Holy fuck. There is a problem here. All hands on deck, everyone on board. Let's figure out how to solve this problem." I feel like is, is kind of more along the lines of what it's doing. And it's also being like, "What can I do in the short term to try to induce symptoms that will make you well feel shitty, but actually, like maybe behave in ways that are going to help you fight this thing off." So that is one of the big functions of the

inflammatory response is again, it's like that, that is what's causing the symptoms that we tend to associate with sickness. It's not like the pathogen itself. It's not the virus, it's not COVID, it's the actual immune response to being infected with one of those things. And the idea is like the those inflammatory molecules, those cytokines are sending signals to your brain to make you sort of tired and lethargic to give you things like fever and headache to get you to like stay at home in bed. A lot of the work that, that I'm really interested in focuses on the effects that that inflammation has on your social behavior. Like how much do you want to go out and see people versus how much do you want to stay at home? And the idea is basically like, because we want to be pouring all of our energy into ramping up that adaptive immune response and fighting off this thing, we want to have mechanisms in place so that we don't go out and like expend energy, doing other random stuff that is going to sort of take away from our body's ability to fight something off.

JVN: So into the symptoms: like, once you're infected and you have symptoms, like, and obviously every illness has, like, all sorts of different symptoms but, like, is a runny nose, a fever, a headache uh, you know, the white pockets on your throat or, like, you know, is that like, is that the innate immune system, the innate branch's response to those things?

DR. KEELY MUSCATELL: Exactly. Exactly. Some of the more kind of specific ones may vary a little bit. But there's this class of, of, um, symptoms that in psychoneuroimmunology research are called sickness behaviors. And they tend to be active whenever you kind of mount an inflammatory response or you have this increase in cytokines and those are things like fever, fatigue, pain sensitivity. Um and then some of those social things that I mentioned like social withdrawal and depressed mood, um anhedonia, like not, not getting joy or pleasure from things. So that some of the more like specific ones you mentioned like vomiting, diarrhea, um you know, respiratory symptoms, those can vary depending on the specific thing that you've been infected with. But you have this kind of general class of sickness behaviors that tend to occur um, anytime the immune system is activated, the immune system.

JVN: Let's say like I'm stressed, I've like just been living on coffee, maybe I'm dehydrated or something. I'm on the plane. I don't have a mask and the person next to me sneezes in my fucking face, like just right in eyes, nose, throat; direct hit. They got something, honey, they got, they got either flu, cold or they got something. Like what happens to my shit when I go from being like flu negative to flu positive or like cold negative to like cold positive? Like what happens in my mucosal? Is it my mucosal membranes? Is it like in my throat? Is it in there where it starts?

DR. KEELY MUSCATELL: Well those things are like, kind of trying to, even though it's like, you know, if it, if it has like, sort of gotten in there, are you still, you even then, you know, you still have mucus, you have tears, you have saliva, you have lots of things that are still going to try to do whatever they can to prevent it from getting any deeper kind of into the bloodstream and then like, its ability to kind of like, swim around and like, really kind of, um, affect you sort of systemically. So even if someone does, uh, cough and sneeze in your face, it's still like, not a guarantee necessarily that you're going to get what they have. It also really depends a lot on how transmissible whatever they have is right. This was part of what was scary about COVID was like, it was super contagious.

JVN: Because of the R0's.

DR. KEELY MUSCATELL: Yeah. Yeah, exactly.

JVN: It's like, what's are R0's again, will you tell us, do you know about that?

DR. KEELY MUSCATELL: Only a little bit you should also have a, you should also have a, a more expert on for that.

JVN: But isn't it like the average? But just tell us, like, for the, like, just for us, like basic hoes because that's what I am like, isn't it just like how many people on average that illness get sick?

DR. KEELY MUSCATELL: Exactly.

JVN: Like based on each person who gets it? Because if you haven't seen *Contagion* with Gwyneth Paltrow, honey. I watched it on March 5th, 2020. I just had my four year anniversary.

DR. KEELY MUSCATELL: Me too!

JVN: It was number one. It is like, I still think about that. I really think about her face like her dead mannequin face that they gave her. It was very *The Ring*-esque it was very like, why did they make her mouth like that? And also like if I cheated on my husband with my old flame and then killed my old flame and also killed myself from it like god damn, who wrote that shit? Like seriously? Like I need to know who wrote...Chris, we got to write it down. I am curious about that now, like who wrote that movie? Because like what did they know? But anyway, back to my immune system. I'm on the plane. I don't have a mask. What's like worst case scenario? Like let's say the person's got like flu A and I didn't get vaccinated or something. What's like the worst case? Like what happens when you, what happens?

DR. KEELY MUSCATELL: Yeah. Yeah. Ok. So I mean typically you know, if it does end up whatever, whatever the person had and like you do end up getting, it does end up like getting in there, then what's going to happen is sort of what we've been kind of laying out. So first your, um, your cytokines, which are those like chemical messengers of the innate immune system; they are going to identify that there is some non-self in your body, there's some foreign, you know, invader here. We need to try to, you know, momentarily like deal with this. Um so that, you know, hopefully we can like sort of contain it or kill it on our own. And if not, we give time for that adaptive immune system to kick in. But in doing that, you're going to develop most likely—um and again, even this kind of varies a little bit from person to person and infection to infection—some of those symptoms that, that innate immune kind of cytokine storm is going to cause. So maybe you get a fever or you get a headache, you're really pain sensitive, you feel a little depressed, a little withdrawn. Um and again, that's really those cytokines signaling to the innate immune cells to try to like deal with this non cell thing that we've identified in the short term.

JVN: Is the point of the immune system like once it sends the inflammation response of the innate and then they're like, girl, we got flu A over here, do we have any of our adaptive memory cells? And then they're like, it's Titanic, that shit sinking. They are sending up the boats or like, and we do have enough life boats, hopefully. But you know, we're gonna see. So they're, they're sending up the things and is that too contain the infection where it is so that it doesn't get into the bloodstream? Because then if it does, if like if the flu or like cold, like, like some sort of virus gets in your bloodstream, is that where like, it could replicate, replicate, replicate become sepsis. And then like, that's where like it goes in your limbs, in

your blood and then like, it could potentially kill you or it gets like that's like when people get like flu that turns into sepsis and it can be really dangerous, like loss of limbs, loss of loss of life. Like that's like worst case scenario.

DR. KEELY MUSCATELL: Yeah, yeah exactly. You, you played it out even further than I typically do just given that. Like, you know, fortunately, like for most people, if your immune system is functioning relatively well, like you never, you don't typically get to that point. But yes, exactly then you know, if, if the virus can like replicate and then like, you know, kind of go everywhere in your body as, as opposed to being contained in this, like more local space that it's easier for those immune cells to like, know where it is, and come all kind of, like, migrate toward that one specific site. Um, then that's going to be sort of better for you in the short term versus this, like, widespread systemic infection.

JVN: But you said that, like, that could take like, days, like, sometimes for those memory cells or maybe you don't even have the memory cells if it's been like a really long time or something.

DR. KEELY MUSCATELL: Yeah. Exactly.

JVN: Or if it's like some, like, tropical disease that you, like, never gotten before.

DR. KEELY MUSCATELL: Yeah. If you have no exposure, if you haven't been vaccinated. Yeah, exactly. So, then it's just going to take, like, much longer. Your symptoms may last longer. Um, and, you know, it, it, it is just a can be that like, kind of perfect storm of, um, your immune system having to, like, just, like, suck up all of your, of your energy resources and put it toward fighting this thing off.

JVN: So, basically, like, in that whole airplane analogy, like, all of the things were correct. Like, my, like, you know, whatever reason my immune system was low enough that I, I do get the flu or, you know, I get the flu, like, just for, or I get the cold. Um, yeah, the whole point of the immune system is to, like, try to keep the infection, like, localized and out of your bloodstream. Like is bloodstream like the, or like your lymphs? Like, are those like the two things that, like, your body is really trying to make sure it doesn't happen?

DR. KEELY MUSCATELL: Well it, it could, like, be in your bloodstream but not, like, replicated to such a level that it's like, you know, sort of like, dispersed everywhere. Um exactly, so that I would say is like, the more, um, uh, attempt to localize it.

JVN: So it might get in your bloodstream a little bit, but it's really just trying to make sure that it, like, whatever the thing is, it don't fucking kill you.

DR. KEELY MUSCATELL: Yeah exactly. Exactly. That's what we're aiming for.

JVN: So could it be true that like, if you're like, dehydrated or like, just already doing a lot of things that keep you kind of inflamed whether that's smoking cigarettes or like smoking drugs, like, really sugary. Like, I love sugar but like just really inflammatory foods. Like, does that make, like, the immune path? Is there like pathways that those memory cells would go through? Does it make it harder for them to get there as fast? Like, what are the, like, why do some people, like, how can we keep our immune systems working better? Like, do we know about that?

DR. KEELY MUSCATELL: Yeah. Yeah. Great question. We do, we do know about that. At least in so far we don't have like all the specific pathways for like how some of these things

might increase risk or be like, more protective. Generally a lot, like you're saying, like, a lot of these things that we tend to think of as like risk factors are associated with increased levels of inflammation in the body. And what that can really do is like, you know, in the absence of any infection—so like nothing like no, no foreign invaders at any moment—like that can also make you more at risk to develop chronic disease. So like, you know, if you're forming plaques in your arteries, because you have all of these cell adhesion molecules that are like activated by the inflammatory response due to, let's say, um you know, I think some of the the most kind of potent risk factors, like you said, you know, smoking um having an unhealthy diet, not being physically active, sleep is a huge one. So not getting enough sleep is a, is a massive um risk factor for both the development of chronic disease and kind of acute infectious disease; interestingly, also social isolation. Um so, and there has been research showing that um social isolation and loneliness is sort of as predictive of mortality over the long term as things like smoking and obesity. So I think this is one thing that we don't pay nearly enough attention to as a society is the ways in which our social experiences and our social relationships can impact our risk for both acute illness and chronic disease.

JVN: Like my Grandma lived to be 85 or my Great Grandma lived to be 85 and she smoked so many fucking cigarettes and make your head spin. Plus she was like, I think it was like a, like her go to was like a, like a Big Gulp of, like vodka, ice and like a splash of vermouth. It was just like an extra large martini, like, all the time. She was hardcore. Like, she lived to be like, 85. But she was just, like, always with people. She was, like, always around people. She, like loved, like hanging out with people. That was her thing.

DR. KEELY MUSCATELL: Yeah. Yeah. Yeah. I mean, again, like it's hard to say in any individual instance, but I do think like we tend to undervalue as a society in the health care system, the role that these social experiences and also like that our mental health can play. So you, you know, I thought you, you kind of draw drew this interesting distinction between we were talking about like, you know, acute versus chronic and, and mental health. And I actually think they're super interrelated. That's another thing that I think we should really pay a lot more attention to when we talk about who's at risk for disease is um you know, mental health is a huge predictor: depression and cardiovascular disease are super likely to go hand in hand. And you know, so I think to the extent that we can not just kind of target the the physical side of things but also target the psychological side, which I think in a lot of ways is kind of a false dichotomy anyway; they are there all part of the same body, our brains are in our bodies, they're constantly communicating. And if we could pay more attention to that, I think we could do a much better job with the prevention of chronic illness and, and acute infection in a lot of ways.

JVN: I mean, it really gives me such western medicine vibes, you know. I mean, I, I'm like the grandchild of a doctor. I'm always saying like I'm a doctor's grandchild, like I know what to do um is like a joke because my dad always says like I'm a doctor's son, like clear out of the way, like I know what to do. Um but like, I think my grandparents generation especially was just like, pull yourself up by the bootstraps, like get off that shit. It's like you're imagining it like just really disavowing the mental, you know, or emotional impacts or experiences and just really kind of divorcing those from physical. And I think that like health is holistic, it's not one thing or the other. And I think we, I mean, even I am even I like, I absolutely do that. Like, I very much just like compartmentalize like all these different parts of health that like that probably isn't great, but I don't exactly know how to, to deal with that.

DR. KEELY MUSCATELL: Yeah. Well, yeah, exactly. And we, we exist in a society and in a health care system that just reinforces it. In the U.S., in western medicine. And you're right that, like, these are things that have been appreciated. Those the mind body connection has been appreciated so much more sophisticatedly for so long in, in other cultures and, and through, you know, eastern medicine in a lot of ways just has a much better understanding of these things. But like, I, I do the same thing like this is what I have spend my days thinking about and it's still even hard for me to remember. Like, oh yeah, maybe the fact that I'm super stressed right now, like, maybe I should try to do something about that before I get super sick or like, maybe I should, you know, try to sleep more. Um but I just think the systems aren't there to, to help us, you know, kind of retrain our brains to think in that in that way.

JVN: Yes! So let's talk about the um psychological responses and I really am so interested in your work and what you do, which is just fucking fascinating. So tell it because you mentioned your work a couple times and I've been like Petri dish tell in which your work does have a lot to do with Petri dishes because you're a fucking scientist, but also has to do a lot with like psychological responses to illness and like what those psychological responses are and how they like either reinforce or like can make it worse for like individuals and like society. Is that right?

DR. KEELY MUSCATELL: Yeah, that's, that's beautifully said. Um yes, exactly. So, you know, we, we've talked a little bit about the ways in which kind of structural, systemic, socio-economic, psychological things can impact our risk for getting things and for developing diseases and infections. But part of what my work has focused on it and other people who work in this area is understanding, ok, once we have gotten something, once we have this inflammation in our bodies, how does that, what, what are the impacts that that has can have on our brains in ways that could influence our behavior and influence our, our mental health and our, our social experiences. So it's sort of like, you know, I think it really is a feedback loop and I think, you know, we're starting to do a little bit better job of appreciating the ways in which, you know, stress and inequality can influence disease risk.

But then it's also really important to acknowledge that um you know, once you have this maybe higher level of, of inflammation in your body caused by things completely, you know, that aren't your fault, then that can also make you feel more depressed, it can make you feel more socially withdrawn, it can make you see the world as more threatening. Um and so that, and then that can just like reinforce itself and it's really hard to like break out of those cycles and I think these are things that we don't; we can kind of appreciate, like, yeah, when I'm like, acutely not feeling well, like, maybe I feel a little less joy about things. I don't really want to go out and socialize with people all that much. But, you know, thinking about how that could play out over the long term. And if you're dealing with something like, you know, chronically, or even like you were saying, in the case of like, you know, an an acute health episode that, you know, probably does leave some lingering inflammation in the body: that can really shape your mood. It can shape, you know, how you feel about other people, it can shape your perceptions of threat in the environment. And I, I think, you know, that's a really underappreciated part of, of illness and, and chronic disease as well. It's just like, what are the psychological impacts um that those things that can have? And again that like mind body connection, it, you know, it goes body to mind too. Um and I think it's important to appreciate that.

JVN: Does anyone's like mental or emotional response, like keep them sick or longer or like help them get better faster or can we control that or like what, what have you deduced from your, from your work there?

DR. KEELY MUSCATELL: Yeah. Yeah. This is a really, really good question. Yes, I do think that people's responses could both serve to sort of keep them kind of sick or keep levels of inflammation elevated more chronically, but also, you know, could potentially on the kind of benefits or like resiliency side, like could have some positive impacts as well. So we haven't, we're kind of just starting to scratch the surface about what are the individual characteristics and what are the kind of societal characteristics that make people sort of more susceptible to the psychological impacts of, of illness and of inflammation. So, um TBD maybe you can have me back in like 10 years or something and we can talk more about like what we've discovered. But I mean, I'm super interested in like, for example, the role that like attachment and attachment styles could play in the impact that inflammation has on our social approach or social withdrawal behavior. So, you know, for someone who has a relatively kind of secure attachment style, um maybe they're able to approach people when they're, they're sick or when they have high level levels of inflammation and those people can like, help them out and provide them with comfort or care versus someone who's like more anxiously attached or more avoidantly attached. Maybe they like, you know, withdraw even more than, you know...

JVN: In your work, like what are like the mental health ramifications and long term impacts from illness. And like what I mean, I think medical trauma is like a really big deal. I've mentioned on the podcast, a few times um, you know, I had a close family member who passed away in 2023 from, like, complications of, like, sepsis. And it, it, it's like, and I, I think just realizing how fragile we are or, like, can be, it's like, it's just made me, like, really, like, is that a common thing? Just like people, like, even just, like, reading something in the news, like, when it's not you, like, what are people's like mental health reactions to like knowing about illness and sickness?

DR. KEELY MUSCATELL: Yeah. Yeah. That's a, it's a really, it's a really interesting question and you definitely can have, you know, I think beyond kind of what, what people may be classically think of is like sort of hypochondria or like, you know, more the fear of getting in yeah, I fear of getting infected with something. But it, it, you know, it can also be more of this like anxiety about, you know, chronic disease and chronic illness and I'm really sorry about your family member and that's really super hard to, to experience and can definitely, you know, play into our own anxieties and, and you know, sense of uh concern about our own, our own illness. I think, you know, anxiety is such a double edged sword in terms of like, I think one of the kind of more positive things to, to come out of it is um you know, you obviously we don't want it to go to the to the point of sort of disrupting your activities. But if you are, you know, as a result, kind of more willing to engage in preventative health care, like, you know, get more screenings, make sure that you're kind of taking care of your body and that, you know, getting checked out when you need to, whether that be, you know, a colonoscopy or, you know, like you're saying, pap smears like that sort of thing, then, you know, in some ways that kind of anxiety, as long as it, you know, doesn't cross some threshold can be really motivating and to can get people to engage in the type of preventative health care that we know can, you know, prevent disease or at least like help us catch it early enough that we can be more effective with our treatments.

I think one of the things you were saying that I think is really interesting is again with this like sort of feedback cycle where like, okay, you had a physical health problem that then probably because of the immune response that you were having in some ways, you know, could cause an increase in depression and anxiety symptoms. That is super common. We see that, you know, if you, you know, put cytokines in people's bodies and they do tend to feel more depressed and more anxious and that can cause us to, you know, disengage from um social interactions, it can cause us to, you know, not experience as much joy or pleasure from things that we used to get, which can, you know, continue to, like, sort of keep this, like, feedback loop alive. And it's just, it's really, it's really tough to get out of that to break out of those things.

JVN: So, from a physical perspective, what can we do to try to prevent getting sick?

DR. KEELY MUSCATELL: Yeah, a good question. I mean, lots of things that we've been talking about over the past few years: wash your hands, definitely wash your hands. Um, but I think, you know, some of the bigger things that we don't necessarily think of as like preventative um in the way that we think of hand washing are also super important. So we talked about this a little bit earlier about things like, you know, getting physical activity when you can, like trying to get, you know, a healthy amount of sleep, trying to put, you know, good things, um, healthy food into your body. Um, you know, and, and taking care of your, of your mental health too, like making sure that, you know, you're, you're taking care of your, your stress levels as best you can and, and finding ways to, to deal with things. Um, all of those things are going to have an impact physically even. So, you know, we don't necessarily think of them as, as ways to prevent disease. They, they absolutely, absolutely can. Um, and I think there are things that that we should think of investing in, in terms of like sort of preventative care.

JVN: Yes mindfulness. As a doctor do, like as a scientist do, what's the shit that you don't do? Like when my husband comes home from the airport and doesn't take a shower, like I want to kill him. Like I just, I'm like, get in the fucking shower. Like ever since COVID I was that I've been that girl, I'm like, I take my clothes off, I wash them and I like I get in the fucking shower like I don't get in my bed with unwashed hair because like I remember those videos of all those nurses like shaving their heads in China at the beginning of COVID because they're like maybe it lives up in there; I'm washing my shit and I am and I really wish that like do you like never get in bed or like sit on your couch with like outside clothes? Like if you like go out like in the world or like is there any like or like are you like fucking N95 queen in the subway? Like do you think whatever you want Trumpy out in there? Like I don't give a fuck. Like are you N95 queen in the airplane still? Like if you had to be on like trains, would you like what, what are you doing as a scientist who studies this stuff? Like what do you do? Like what are you not fucking with in the world?

DR. KEELY MUSCATELL: Yeah, I mean good question I did. Um I'm in England right now. I wore a mask in the airport, an N95 mask in the airport but I took it off on the plane. It seems like the evidence is like that, you know, the air circulation there is pretty good.

JVN: Even if the guy next to you, you don't know him and you are like, and you open your mouth and he sneezes in your mouth as our earlier...Are you still vibing, are you still playing the cards like that? Risky or like if you feel like you sit next to like a symptomatic person, are you, are you going to mask up and like, I don't need that food or like you take your food into the bathroom and like, eat it in there and then like mask up again?

DR. KEELY MUSCATELL: No, I don't, I don't do that. No, I don't.

JVN: What if he seemed really symptomatic, like *Contagion* symptomatic, like really fucking sick, like pink eye would like, are you going to try to get him removed from the flight? They're like, this guy seems like he should go to the fucking ER, like he shouldn't be on a plane.

DR. KEELY MUSCATELL: No, I don't think I'm gonna do that. Um II I really think like, you know, uh uh the wearing outside clothes, like all of those things, there's, there's so many different ways that things can be transmitted and sure some, like do live on surfaces and whatnot, but a lot of it, you know, is like, respiratory, like droplets type of transmission.

JVN: But what if those hoes get on your clothes?

DR. KEELY MUSCATELL: Yeah but they don't, like, survive there for very long, depending on what it is, depending on what it is. Um, but assuming you don't like, you know, lick your shirt or something in the, like, five minutes after, don't..

JVN: But I guess if you're in the airport it would be dead by the time you got potentially, if you know what I do is just take your clothes off and take a shower when you get home from anywhere, you don't have to worry. That's what I do.

DR. KEELY MUSCATELL: Yeah. Yeah, that's true. I think it's like, so many of these things now are, like, all about, like, trade offs, right where, you know, I think every person has some level of risk that they're willing to tolerate and we just, like, you know, we have to make choices that are kind of consistent with those things, especially now that we have more information. I think, you know, obviously we have like, a new virus or a new disease that we don't, you know, know how it's being transmitted or like, what to do about it. That that's like one set of circumstances, but now that we have more information, you know, I think it's just a matter of like, again, like, kind of cost, cost benefit of, like, if you don't mind, you know, wearing a mask and it doesn't really bother you then, like, by all means, do it. Or if you don't mind taking the shower when you get home, like, definitely do it. I mean, do wash your hands. That's not really that inconvenient and everyone, everyone should wash their hands. But I think it's, yeah, it's like, it's about like making those tradeoffs. And again, I, I sound like a broken record here but I can't say enough invest in those like the, the behavior, the more kind of chronic health behaviors if you can, you know, in, in terms of like trying to keep yourself generally healthy because they can also, you know, even if you are exposed to something, prevent you from, from getting serious symptoms or prevent you from even getting infected upon exposure. So I think that's really useful.

JVN: Ok. What are you the most scared of and the most inspired by?

DR. KEELY MUSCATELL: Hm what a good question, what am I the most scared of? I mean, in research?

JVN: Yeah, like, like Rand Paul, like gaining function, like is it like or like, or like something like that? Like, like, like if like, because I don't really think I believe this, like, I feel like he's giving me QAnon conspiracy. Like I like, I think, I believe more as far as COVID that it was just like living in the world and then like, for whatever it like spilled over. But are you scared of like people trying to like, like maybe they're trying to like, cure a virus or fix a virus and something gets out like, like I feel like there was like that one book that we all had to read in grade school that was like redacted, that was no, that was Ebola but whatever. Like, are you scared of like some sort of spill over crossover contamination? Like polar ice caps melting

releases like an ancient virus and fucks us or not really so scared of that. More scared of just like a random sepsis, cytokine storm because you got like flu A and your body wasn't ready for it?

DR. KEELY MUSCATELL: I I mean, the amount of regulation that exists around lab safety is insane. I should have said this, this is like, it's not insane. It's very appropriate, but they're...

JVN: But is it standardized around the world?

DR. KEELY MUSCATELL: No, not necessarily around the world. It's, that's a fair point but certainly like within the U.S., like the amount of time that we spend um having to document procedures and you know, get regulatory approvals is it's a lot, it's a lot. So yeah, you, you're a fair point that it's not necessarily consistent across every country.

JVN: Is anyone trying to make it consistent or like create guidelines or something so that everyone can just be like a good global citizen?

DR. KEELY MUSCATELL: It's a good question. I don't, I don't actually know.

JVN: Someone should do that. I'm curious about that.

DR. KEELY MUSCATELL: Yeah. I'm curious about that too. Someone should do that.

JVN: What are you the most inspired by though just so that we don't end on, like, a shit stack of stress?

DR. KEELY MUSCATELL: Yeah. Yeah. I'm...

JVN: I just saw something yesterday that there's this new medicine for HIV treatment that, like, they're gonna study because, like, like the pills that I take, like, you know, it keeps the copies, like, out of your blood but there's still like, reservoirs that like the medicine can't get to. But there's this like thing, this like type of something they're studying where like it basically makes like your body flush out the reservoir so that the medicine can get to it. So like hopefully it's like a potential like cure vibe but it's not a cure now and they haven't even tested on people but there's just been some very preliminary testing. That's cool.

DR. KEELY MUSCATELL: That is very cool.

JVN: What about CRISPR? Are you into CRISPR?

DR. KEELY MUSCATELL: CRISPR is it is definitely cool. Um like designer drugs with designer receptors. Those are very cool. I think, I mean...

JVN: Is that not the same thing? Like designer drugs, designer receptors and CRISPR? That's like two different things.

DR. KEELY MUSCATELL: Yeah exactly. Two different things. They, they um they can inform each other because, you know, having knowledge about like the specific DNA profiles of any, you know, particular pathogen or whatever could, could inform the development of drugs for it. But um I definitely think that's, that's uh super promising. I think the other thing honestly, like, I just think there's gonna be, well, I, I, I'm inspired by honestly, like young people right now's willingness to talk about these things. And to, I think do some of the work around appreciating connections between mental and physical health and not letting capitalism totally dictate all of the um decisions we make about our health and well being. And I feel like

I'm seeing so much more conversation about it and kind of push back about it. And I really love that for us as a society moving forward. I think it would be great if people were able to be more kind of interoceptive and, and able to, to take care of their bodies. Um I, I, that makes me very helpful,

JVN: Keely, I'm obsessed with you. Thank you for coming on Getting Curious. Where are you the most active on social? Where can people follow you if they're just like they have fallen in love with you?

DR. KEELY MUSCATELL: I'm really bad at social media actually. Um where can they find me? I guess Instagram.

JVN: You on the gram sometimes? You should have put your link in the episode description so people can follow your work. But I mean, your work is so fascinating. That's like, it's our inaugural part where I'm like, share more of your work on social, like teach these people science. It'd be so cool. I mean, not to do free labor, but I think a lot of people would be into it.

DR. KEELY MUSCATELL: Yeah, you're right. I do think that that um that would be a useful endeavor. Um but thank you for being curious about the work and for disseminating it to an audience.

JVN: Did we miss anything that you want to talk about or that you, that we, I didn't ask you about your work. That was like dumb a me not or that was silly of me not to ask?

DR. KEELY MUSCATELL: No, no, I think this is great.

JVN: Well I had so much fun, Keely. Thank you so much for coming on the show. We love you so much. Thank you, Keely.

DR. KEELY MUSCATELL: Yeah. Thank you, Jonathan. Take good care.

JVN: I will, honey. OK. How obsessed with Dr. Muscatell are we? We love Keely. Um did we learn about like what happens the moment in which we get sick? I would say yes and no because all of the illnesses are so different and they act so different and we're also different. It's kind of like it was kind of a binary question and then, and that like what happens in the moment we get sick? But that's literally different for everyone. And because there is a mixture of like because all of our immune systems are different and there's also so many other factors that go into it, we don't exactly know when someone goes from exposed to infected across all diseases. We know about some diseases but not all diseases. Um so, but I do think that we learned about like what the goal of the body is or what the goal of the immune system is, which is to like isolate and uh remove pathogens, bacteria, viruses from our body so that we can stay healthy. Another way that we learned that is just learning about the immune system that there's the adaptive immune system and then the innate immune system, which I thought was really interesting.

Um some of the biggest takeaways from the conversation for me was the relationship that social isolation and loneliness can have. Um in terms of our immune system, like it can be as detrimental as smoking cigarettes. And that is something that we really need to avoid like community and human connection in your life is so important and I think social media does give us connection, but it's not necessarily like that in real life connection um that is so important for us. And so, um I just thought that was a really important takeaway. We, we also

we undervalue the role that social and mental health plays in our immune systems. But now my, I'm really curious about so many other things now. Uh I'm interested in the way that like biological sex and gender roles get accounted for in studies because if, if we're really studying like men and women so much, but like there's never intersex representation or like so or even like trans representation, I just think that there's, we really do need more studies in terms of safety because I think a lot of the studies that we have now points to why trans people should be included. Um but we really don't have enough studies to really show.

And I think a lot of the studies that we do have, there's such a negativity bias by the people who are doing the studies that we actually really do need large scale studies on like on what happens to trans people. And, and I mean, if we know that like social isolation can make you sicker who is more socially isolated than trans people in the U.S. I mean, but also like people who are living with a disability, get socially isolated. And that's really interesting. I'm really curious about that. Um didn't I say Chris write this down oh yeah. Who wrote *Contagion*? I'm also curious about who wrote the film *Contagion* with Gwyneth Paltrow because I feel that the death face that they gave her in this movie was very similar to *The Ring*. I think that's kind of investigative journalism. Thanks for coming to this episode of Getting Curious. We'll see you next time. We love you guys. No, but seriously, we love you guys so much and thanks for listening to me about my butthole and learn about the world around us. Um we love you so much. We'll see you next time.

You've been listening to Getting Curious with me, Jonathan Van Ness. You can learn more about this week's guest and their area of expertise and the episode description of whatever you're listening to the show on. And honey, there's more where that came from. You can follow us on Instagram @curiouswithjvn. We are doing the most over there and it is so much fun. You can catch us here every Wednesday and also make sure to tune in every Monday for Pretty Curious! Still can't get enough? Subscribe to Extra Curious on Apple podcasts for commercial free listening and our subscription only show, Ask JVN, where we're talking sex relationships and so much more. Our theme music is Freak by Quinn. Thank you so much to her for letting us use it. Our engineer is Nathanael McClure. Getting Curious is produced by me, Chris McClure, Julia Melfi and Allison Weiss with production support from Julie Carrillo, Anne Currie and Chad Hall.