



Dr. Katherine Cook

Dr. Katherine Cook is a translational cancer researcher at **Wake Forest University School of Medicine** in the US, where she is studying how the gut microbiome impacts the outcomes of breast cancer treatment. In this podcast, she shares how her personal experiences with breast cancer have inspired her work and talks about the importance of curiosity for scientists.

Break the podcast down:

00:57: Hi Katherine, welcome to the Futurum Careers podcast. Thanks for being with me today.

Thanks for the invite.

No worries. So, I start these conversations with three quick-fire questions that I haven't warned you about, just to get to know you a little bit better as a person.

Just throw you right into the deep!

Exactly. So, the first question is, what was your first job?

My first job was a grocery cashier, and I still remember those terrible produce codes that we had to memorize, for bananas and lettuce and things of that nature.

Cool. And the next question is, what's the best way to make you smile?

Oh, that's a tough one! I wasn't expecting that! Nothing like... a joke I suppose.

Cool. And the last question is, if you could be any animal, what animal would you be, and why?

That one I've actually given some thought to. I wish I had night vision. So, I wish I was a panther. At the same time, I'd love to be venomous. I mean there's so many options!

If you had to pick one?

No, I'm going to say a bear and that way I can hibernate through winter.

That's a great answer. Cool. So, that's probably the most difficult questions out of the way now. So, we'll get stuck into ...

You almost got me with that second question!

02:18: Your research is focused on breast cancer and specifically, at the moment, you're working on a project that looks at how the gut microbiome can influence the outcomes of different treatments. Could you briefly give us an overview of that project and what you're hoping to find out from it?

Yeah. So, your gut microbiome is all the microorganisms that reside in your gastrointestinal tract. And so, there's trillions of different types of microbes that live in there. And when you think of the average human body, we only have about 30 trillion cells that make up "us". So, I think if you crunch the numbers, I think you're only 43% human! So, I like to

joke that our bacterial overlords that are using us as a human incubator, we need to keep them happy!

So, normally with those gut microbes, they're all very balanced and they serve functions where they help us develop our immune systems, they produce vitamins, they protect us from infections and pathogens. And so, when they're balanced, they help us out quite a lot actually. But in the instance of disease, this is when they get unbalanced, or something we call dysbiosis. And so, when they're not balanced, they end up throwing us out of whack, so to speak.

And so, if you're familiar with the phrase, "You are what you eat," well, I would say we could apply that to our microbes. Our microbes are what we eat, because they're completely reliant about what we put in our bodies. So, we're really interested in potentially investigating, one, how the microbiome might be slightly out of whack when it comes to breast cancer and then, two, how can we potentially balance back our microbes to influence therapeutic responsiveness.

The trial that you mentioned is our triple negative breast cancer trial. In the past, there hasn't been targeted therapy for this type of breast cancer and so they were limited to classical chemotherapy. But recently, the FDA approved of a type of immunotherapy, which is a type of therapy that basically ramps up our own immune system to help fight breast cancer. And so, triple-negative breast cancer is the only type of breast cancer that is immunogenic and can be actually treated with this new type of immunotherapy.

But as I mentioned in the very beginning, our gut microbiome actually helps with our immune system development. So, it's been shown that a certain type of gut microbes are associated with improved response to immunotherapy. So, what we're trying to do is, one, to see if this is also true in breast cancer, two, understand what these microbes might be producing to help the immune system, and then, three, understand the potential dietary contributions to modulating your gut microbiome that could potentially increase those bugs in your gut.

So, the idea being that potentially you might find if someone's suffering from breast cancer or going through this type of immunotherapy, there's a certain diet that might help them respond better to that therapy?

We're trying to find that diet, yes.



05:29: Awesome. So, now that we've learned a little bit about your research, I want to go back in time a little bit and think about where you started from and how your career started. So, did you always know that you wanted to be a scientist when you were in school, or did you have some different ideas?

You know, I was very interested in science, took any science class I could get my hands on. In high school, I actually thought I wanted to be a chemist. So, the type of scientist has changed a little bit throughout the years. So, I went to undergrad and got my Bachelor of Science in biochemistry and that's where I was influenced to the biology side of the field and looked into potential cancer research in undergrad as what I wanted to do.

06:14: What was it that made you make the switch into breast cancer? I know that you had some in your family, there's been history. So, if you're comfortable talking about that?

Oh, of course. Yeah, so, I was eight when my grandmother passed unfortunately from breast cancer. And then, maybe two or three months later, my aunt was also diagnosed with breast cancer. And so, there was a lot in a very short window of time that we were made aware of. So, breast cancer is always something I've been pretty familiar with in our family, since I dealt with it and was exposed to it at such a young age.

My mother found her own lumps when I was a teenager and decided to go for a prophylactic dual mastectomy and she's always been very open about that. She'll probably kill me if I tell you this, but I'm going to tell you it anyways. I was probably the only teenager that had a mother that liked to mow her back lawn topless! She always said, "There's nothing there anymore. Why should I wear a shirt?" But that does have a profound impact on your understanding of breast cancer when you have it in your family that much.

07:30: What's it been like throughout your career, studying a topic that is so close to you and has such a history for you?

Well, it definitely serves as motivation, right? There are certain days in science when things don't work and you go back to the drawing board, but you have to keep why we got into this to begin with at the forefront of your mind.

I think about my family members and how far the breast cancer field has come since the 1990s, right? The options that were available for treatment for my grandmother and my aunt nowadays, weren't available back then. So, in 30 years we've come so far and just to think about the next 30 years where we will go. And so, that serves as motivation. And keeping things relevant and important to the patients gets you through those hard times, so to speak, when things aren't going correctly.

08:29: Does that happen often as a scientist? The challenges that come with that, is that one of the big ones, dealing with that?

Yes, all the time. I would say if you're lucky, 50% of your things work. So, half the time, things don't work. But that's part of science, figuring out what's going on and to ask a question and follow it and then realize oh, that isn't it at all. Let's go back and explore this other option and see if that's actually what's going on.

And so, the process of figuring it out, figuring out what exactly are the steps or what is the end results, that's all informative. So, even if you get a negative result, as in something didn't work, that still tells you something. It tells you that's not the answer. So, go back and try again.

09:21: What about some other challenges that you might have faced, not necessarily to do with the process of doing science but in terms of your career and moving from school into your professional career, any challenges that you might have faced?

Oh goodness. Well, in science, I always say there's a lot of rejection. Sometimes your papers get rejected, sometimes your grants get rejected. Sometimes, you get rejected from a job and you really have to just take it as, "It wasn't the best fit and something better will come along." So, as long as you have that potential of taking the criticisms, absorbing them as constructive and trying to make it better. I think that is probably one of the main things in science.

10:05: Do you have any advice for how to do that? Because I feel like as you're a young person moving into a career, when you receive criticism it can be quite easy to take that to heart and to get demoralized from that. So, how do you keep yourself going?

Have your people. Have a group of friends that understand what you're going through and you can bounce ideas off of them. I have to say I have a running buddy that's in science as well. So, she's familiar with it and so of course, once you get these rejections, you can go for a run and vent it out and talking about it always makes it seem less of a terrible day and then you can deal with it a little bit better.

10:46: Have you had any mentors or people along the way that have helped you navigate those situations?

Yeah, I mean science has a lot of mentorship potential there because you'll have peer mentors which are people at the same level as you and they can help you grab a beer after work and talk about the issues. Maybe that's not the best thing to say for high school! Grab a coffee, let's just say that!

You can have someone who mentors you from more of a not-a-peer instance, like a boss or other scientist that's been in academia longer and knows the ins and outs of the system and little nuances specific to your actual field. And then there can also be other people, your friend groups and those can also be your peers as well where they just listen to you vent and get it out of your chest and sometimes that is just, they don't really need to know what's going on too much but they're there and that's important.

12:00: And even not just for academic challenges but challenges just in general, it's good to have the right people around you to help you navigate stuff. And how can students who are thinking about this move from high school and where they're going to go next, how can they get experience if they're thinking about medicine or science, that kind of thing? How can they get some hands-on real-world experience?

Yeah, I mean, I think you said it. Hands-on is the best experience possible and so, trying to find a lab in which you can go do some experimental bench work, so to speak, and run some experiments. In college, I volunteered at a water treatment facility plant. And so, that was one of my summers I worked at the water treatment just testing water quality. And so that, while it wasn't cancer research, was definitely science lab experience.

I also worked in a lab in undergrad in the biochemistry department. I mean, it had nothing to do with cancer research, but it was still lab work and I was very much interested in that. And so, try to find the hands-on lab experiences and see if lab life is for you.



13:15: And I think that's an important point that it doesn't necessarily have to relate exactly to the thing that you're really interested in. Just getting that experiences is useful because you can transfer skills.

Correct. I mean, there's a lot of translatable skills in science and it feels if you're in the lab, you can pick things up and you'll take also things you've learned and move them into other fields. And so, all of those experiences can help you get through the door as well.

13:44: Are there any skills or personality traits that maybe aren't to do with academic stuff or hands-on practical experience, but that you can translate from other parts of your life and that are useful in science?

You know, a lot of grad students when they start in my lab, they always ask me what is a character trait that makes someone a good student. And I will always tell them the same thing. Be curious, ask the question, don't be afraid to ask. And I think that inquisitiveness is what makes a good scientist because you have to ask the question to get started.

14:26: Yeah, sure. And I wanted to know what you love most about your job. What really gets you excited to go into work in the morning?

That's a good question. There's a lot of things that make the job why I'm still here. You know there's some times where scientists might complain about certain things but at the end of the day, we're still here. We still choose to do this job. So, the pros definitely outweigh the cons and something that I absolutely love about my job is the ability to direct the science.

So, I could wake up one morning and be like "Hmm, I wonder if this does anything" or "Does this have an impact on breast cancer?" and then I could go design the experiment and explore and answer that question. So, the ability to self-direct the questions is really, I would say, the number one good thing about my job.

15:15: And then just finally, do you have any final advice that you would give someone, or maybe yourself looking back to when you were a high school student, what advice would you give to young Katherine at the start of her career?

Be bolder. Ask more questions. Don't be afraid of no. No is just a word. So, you'll hear it and you'll go, "Okay, I'll try again." So, don't be afraid of that and keep trying.

Great. Nice. Well, Katherine, thank you very much for joining me on the podcast. It's been wonderful.

You are very much welcome.



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