**Precision Medicine Podcast, Season 3, Episode 48**

**Dr. Howard McLeod on Chasing the Fun and the Power of Collaboration in Precision Medicine**

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**Karan Cushman, Producer:**
Welcome to Season Three of the Precision Medicine Podcast sponsored by Trapelo. This is the podcast where experts come to discuss the problems oncologists, reference labs, and payers face as precision medicine grows and consider solutions for advancing the quality of patient-centered cancer care. Be sure to subscribe at precisionmedicinepodcast.com to get the latest episodes delivered straight to your inbox.

**Jerome Madison, Host:**

Welcome to another episode of the Precision Medicine Podcast. I'm Jerome Madison, and today we have Dr. Howard McLeod, Medical Director for Precision Medicine at The Geriatric Oncology Consortium. Dr. McLeod, thanks for joining us on the podcast.

**Dr. Howard McLeod, Guest:**

Jerome, it's a pleasure.

**Jerome Madison:**

Tell us about your training and your career journey. My goodness, you've done research in some of the most notable institutions, but tell us about the career journey to where you are today.

**Dr. Howard McLeod:**

Yes, so I've been fortunate enough to always chase the fun. When I didn't know exactly what I wanted to do when I was a kid, but I worked at a pharmacy emptying the garbages and stacking vials, and so I decided to go to pharmacy school. And during that time, I'd noticed that the clinical pharmacists had much more fun than the regular pharmacists that you and I would think of, and so decided to go get my PharmD which was an extra… more of a quasi-medical degree back then… and so went and got that. I noticed the researchers had more fun than the clinical pharmacist, so went and did a clinical fellowship at St. Jude Children's Hospital in Memphis, Tennessee.

**Dr. Howard McLeod:**

And during that time, one of my colleagues went and spent a year in Europe in Nice, and so decided I wanted to do that and went over. I ended up going to Glasgow, Scotland for a year and then ended up staying in Scotland for eight years on faculty over there. One of the moves was from Glasgow up to Aberdeen. Aberdeen was having its 500-year anniversary as a medical school, it was founded in 1495, three years after Columbus found Barbados, so it's one of those things where it was just having a good time, having high impact. The great thing about the UK was the clinicians and the researchers had a divide between them, but I was trained clinically and in research, and therefore I was able to just do whatever I wanted, and so ended up having a very productive time there.

**Dr. Howard McLeod:**

Ended up coming back to the United States to Washington University in St. Louis and was part of the oncology department there as well as the genome center. Then moved to University of North Carolina to start an institute there, Institute for Pharmacogenomics and Individualized Therapy that went across the different schools of medicine. And then made my way down to Tampa, first to Moffitt Cancer Center where I set up their personalized medicine program there at one of the larger centers in the United States. And then, as I saw the focus of need really changing, started working at the Geriatric Oncology Consortium, which is a blend of a clinical trials center as well as doing a lot of policy work with the FDA and other institutions.

And the main driver there was, we see that the majority of patients are over 70, many over 75 years of age, often not allowed to be on clinical trials because of either direct prohibition with age limits or indirect because of limiting comorbidities and such. And so here we had most cancer patients not being tested in the clinical trial stage. And so when a drug becomes normal in use, these people are really just being experimented on because we don't really know how to use them.

And so that brings me up to date now, the precision medicine piece. I knew when I trained, there was two things that would never be important, and so I barely paid attention. One was the genome and the second was the immune system, because it was all about pharmacokinetics and pharmacodynamics, [inaudible 00:04:24]. Of course, don't take me to Vegas, because both of those things are the most important parts of medicine. But during my time at St. Jude, a little girl under my care nearly died from a normal dose of mercaptopurine, we had a few other kids in the same boat, and so we worked to help their care.

And then when I went to the UK, a gentleman had been in the ICU for 21 days after a single dose of 5-fluorouracil. We dug in to figure out why he had such a terrible reaction to a standardly given drug, found a genetic reason for him having trouble. And so a genetic reason for this child with mercaptopurine, a genetic reason for this man with 5-fluorouracil, I couldn't ignore, the lightning had struck twice, and so it drug me there.

So, it's probably more than you wanted, but that has drove me to where we are now. We're trying to make sure that precision medicine is not just something happening at academic centers, is not just something happening for the physically fit, but it's something that we can really bring across all areas of medicine, all ages, all different groups that might be needing help.

**Jerome Madison:**

I appreciate you sharing the experience of patients' effects from missed doses or potential drug interactions, I guess, since then, you've published over 560 peer-reviewed papers on pharmacogenomics. That is amazing.

**Dr. Howard McLeod:**

Well, one thing I learned early on is collaboration is worth it.

**Jerome Madison:**

Yes.

**Dr. Howard McLeod:**

Collaboration is not always successful, there are times you work with someone, and they steal your ideas and kick you to the curb, but most of the time, one plus one can equal three, because you can really get together and develop something. So, one of the reasons that I've ended up having so many peer-reviewed publications is not because that was the goal, but rather working with good collaborators, trying to ask important questions that really matter, try not to publish for the sake of publishing, but rather, how do we solve some of these issues? It just feeds on itself.

And you publish an interesting, novel finding, suddenly there's a group in Indonesia and a group in Romania that want to work with you, and you do some interesting work there, and you start working with some regulators, you start working with some other folks. And so it ends up being a bit schizophrenic… in that you are working all over the place in a lot of different sectors. But it's just a blast, because you can really see the impact as you're going forward.

**Jerome Madison:**

Yes. And I don't want to miss this because you said this, and Karen, if there ever was a jewel that's been dropped in podcast, Howard, you said, chase the fun, and not for nothing, but I can hear the enthusiasm coming through your voice as you talk about this, but chasing the fun, I mean, that's a diamond there. If you can find something that you really enjoy in your career, it's not work, and you can have the type of results that Dr. McLeod has had here, that's a gem, Karen.

**Karan Cushman:**

Mm-hmm (affirmative) I agree, absolutely. And the one, plus one, equals three, yes, the collaboration takeaway, that is key.

**Dr. Howard McLeod:**

I mean, it's just been my experience. And some people say, well, what about someone ... And there have been times when I've collaborated with someone, and then they've ran off and done things by themselves that we talked about doing together, but that's one out of 100, not 99 out of 100.

**Karan Cushman:**

Mm-hmm (affirmative).

**Dr. Howard McLeod:**

And so, I always tell our trainees or others going into the fields, expect to collaborate, expect to get burned every once in a while, but keep going. And if you ask me, I can think back to the times I got burned, but it's hard to see them over all the positives that we've got from collaboration. And the complexity of precision medicine is going up, not down. And if we can't collaborate together, at the best we'll end up with one-sided or one-dimensional explorations of a field, at the worst we'll completely miss opportunities. And I think we are missing opportunities currently because people tend to think that collaboration is only with people they are like, and if you collaborate with people that you don't really know exactly what they do, but you know that you need to work with them, it's a blast.

**Jerome Madison:**

Yes, I agree.

**Dr. Howard McLeod:**

I can't give you the best explanation of what machine learning is, or deep learning, or some of the other elements, but we've been able to work together with some folks, and we've been able to generate some stuff that's completely stupid and will never be useful, but because we're working together we recognize that, and we've been able to create some stuff that could really change the way practice happens. And so, I think, that's something that when I look at the academy right now, I look at academia in the traditional University of sense of the word, we've got such an emphasis on getting a grant and bringing in the indirects that pay for the institutional resources, and administrative infrastructure, and not so much about innovation, not so much about ... If you're a great collaborator, you get no points during promotion review.

**Jerome Madison:**

Mm-hmm (affirmative).

**Dr. Howard McLeod:**

It's only, did you bring in grants? Not, were you part of a team that brought in grants, but did you bring them in? A few places with foresight are doing things, but for the most part, it's still, what did you directly kill and bring to the meal? As opposed to, how do we actually make progress? And that's a problem. It's made it so that we're not as productive as a nation. It's made it so we're not as innovative, because safe things get funded easier than wild ideas. Frankly, it's why there's so many exciting things happening in the non-academic side because you see the innovations happening at commercial companies, but often in precision medicine at least, they're outstripping what you're seeing at the academic centers, and that's not a bad thing.

**Karan Cushman:**

Mm-hmm (affirmative).

**Jerome Madison:**

No, it's not. I mean, so we've asked Dr. Howard to come and talk about…He's mentioned collaboration and innovation already several times, and really, that's what we wanted to dig into it. Dr. McLeod, most people who are diagnosed with cancer today are alive in five years, I think that's fair to say, right?

**Dr. Howard McLeod:**

Yes, I mean, there are types of cancer where we have a long way to go, but many, many cancers… and even if you take out the skin cancers which can be superficial in nature and dermatologists can cure them with a swipe of their hand, you're looking at the so-called solid tumors, yes, many patients can be cured with that, and we still have places to go. So, it's hard for me to say the C-word, cure, easily because then I think of all the folks that I haven't been able to help and those who are currently fighting. But you're right, there has been amazing progress.

**Dr. Howard McLeod:**

I mean, there are types of cancer that I thought, having trained in both childhood cancers and adult cancers, you can say the word cure with a straight face with childhood leukemias and some other childhood cancers, it's been much more difficult to say that word in the adult side.

**Jerome Madison:**

Mm-hmm (affirmative).

**Dr. Howard McLeod:**

So if you go and take certain cancers that 15 years ago you asked me, “What cancers will never be cured?” melanoma would definitely be one of them. I would say non-small cell lung cancers would be on that list. We start going down the list, the immune therapies, some of the other kinase inhibitor therapies that are out, are actually allowing us to say that word. Now, not in everyone, not in as many people as we want, but it's one of those things that the technology advances, sometimes in leaps not just steps, and that's been the case for cancer. And it's happening in other areas of medicine too, but certainly on the cancer side.

**Dr. Howard McLeod:**

I still remember, part of my activities have been in the Phase I drug development arena, which is new drugs, first time in human, and it's very experimental. And people say, “Well, why would I take a patient and put them on a trial when we don't know if it'll cure them?” And I'll mention, well, first of all, the therapy we use now we don't know will cure them, but secondly, it's a bridge. And I think back to the late 90s, there were some patients with gastrointestinal stromal tumors that I was helping care for, and if I had been able to bridge them for another three weeks, to the point where Imatinib Gleevec was widely available through trials or otherwise, they might be still live today. But I couldn't, we tried, but I couldn't get them ... Even that three weeks would have been enough, I think. I don't know that, but I think that.

And so you think about technology, why are we putting patients on trials, why’re we doing this? Well part of it is we need to learn and patients are very altruistic, but part of it is, it can be a bridge to somewhere.

**Jerome Madison:**

Yes.

**Dr. Howard McLeod:**

And that's an element often we forget is that these advances, the immunotherapy advances, they came out of nowhere. Now, if you were working on them, they came out of years of hard work. But suddenly they were there and suddenly they were helping people in ways that we had not been able to do prior.

**Jerome Madison:**

Yes. And you're talking about the collaboration, I mean, we can credit, obviously, a lot of things with the improvement in five-years survival across all tumor types to advancement and surgical techniques, radiotherapy supportive care, but specifically as it pertains to precision medicine, we've seen five-year survival improve in diseases, as you mentioned just a second ago, that we would have never thought we could ever see improvement. I mean, you just take melanoma with BRAF inhibitors and now we have RET inhibitors coming as a benefit for those patients for lung cancers. I mean, we see certain subtypes of patients with extended five-year survival for EGFR mutant lung adenocarcinomas for instance, or patients with measurable PD-L1 expression treated with immunotherapy. But, again, you said it, we've achieved this with less than 10% of the adult population participating in clinical trials.

**Dr. Howard McLeod:**

Yes.

**Jerome Madison:**

And almost universally, our podcast guests have pointed to technology as a means to improve our clinical screen-rate and levels of participation. But, you tell me, in what ways are you seeing technology starting to impact cancer research as well as the clinical practice of oncology?

**Dr. Howard McLeod:**

So, it really goes across the spectrum. And I don't want to go down too many rabbit holes in the wrong places, but even at the very early, preclinical setting where they're screening compounds or screening proteins as possible targets, we're seeing some interesting uses of deep learning in particular, to try to pull out targets that wouldn't have been obvious otherwise. And that's been the thing, you know the old adage of the drunk looking for their keys under the lamppost and they're asked if they lost the key there, and they know I lost it somewhere else but the lighting is better here, and I didn't tell that well. But we've been looking under the lamppost in so many ways because that's what we know how to do.

**Dr. Howard McLeod:**

We're seeing now, even in the early discovery side, applications of less biased or differently biased tools to try to really bring in, “What are the targets that we wouldn't have expected?” But if you fast forward, there are two technology advances that I'd love to hit on briefly, one of them is in the area of clinical trials. No one has necessarily enjoyed the last 18 months or the last year-plus in terms of what's all happened, but there's been some real plusses that have come out of it: advancing the application of telemedicine, and trying to focus in on, can we get licensure across state lines? And things that have been more of an obstacle than benefits.

**Dr. Howard McLeod:**

One of the things that is slowly making its way forward is the use of telemedicine, tele-approaches for clinical trials. And that has had two positives: One is patients can have their follow up visits or, in some cases, even their enrollment in their home, and there's some big advantages to that, either with someone going to their house or just doing it all via the iPhone or the video device. The second piece is that patients at places that don't have access to clinical trials have now had a real impactful way of dealing with things, been able to be on trials. Access at least has the potential of really going forward. And that's exciting.

I think that if you look at part of the problem with number of patients going on trials, certainly part of it is the trials are written very narrowly, and so you have a problem where just people aren't necessarily available for trials, because they have a second cancer, or they have a brain matter, or bad kidneys, or whatever it might be. But part of it is distance. And if you want to be treated with near the convenience of your home and you live too far away from a clinical trial site, you don't go on a trial.

**Dr. Howard McLeod:**

There's a guy named Gary Puckering that you may or may not have run across, works for the National Quality Forum, and he does a lot of work looking at primarily the African American community, but also other underrepresented communities in different aspects of healthcare. And he generated a beautiful map, it's probably a decade ago now, showing where African American patients are and where clinical trials are.

**Jerome Madison:**

Mm-hmm (affirmative).

**Dr. Howard McLeod:**

And some of the problem was the trials are not convenient for, in that case, the African American patients. Say he has similar data for Native American patients, for other folks that don't get represented on trials very well. And so, there is issues there. Now, some of it also is, you might go to a place with a trial but they don't offer it to you, or there's some other problems and those have different solutions. But I think the telemedicine piece has been really important for bringing trials to people.

The second piece there is that we're seeing ... So, one thing that precision medicine has brought is a new type of disparity where if you're at an academic center where people do precision medicine, you can curbside consult them, you can run into them in the hall, or you can call them up, or you can whatever, and get access to expertise to allow you to practice at the highest level. If you're not there or don't know a guy, you're in trouble, because it is just a standard sequencing panel is too complex for most folks. You mentioned BRAF, you might see that BRAF mutation on there, but you don't realize that there's an ATM variant and this other fusion that have even more potent possibilities. And so, we're seeing now technologies, either informatics technologies or a blend of informatics and expert human technologies, being applied. And I do have some conflicts involved in some of those, so I want to mention that, that I'm in kissing some areas of potential conflict of interest.

**Dr. Howard McLeod:**

But the idea that one can help a practice that is not able to access these rare experts, now practice at a higher level. You think about their patients who did not have these opportunities open to them now having them. And so, it's exciting that we can do that, and that we can do that in a way that we're now seeing not only access to care, but access to trials and lots of positives coming through that allow things to go forward in ways we couldn't before.

**Jerome Madison:**

Yes, the things you just mentioned, the advances in around clinical trials, and telemedicine, and tools that can close the knowledge and communication gap that have created, as you mentioned, new disparities in knowledge, they've been as abated by the COVID pandemic, where at least in Community Medicine, they could get together in a tumor conference or similar forums to discuss these patients, but now we can't even be in the same room. I mean, but the things that you mentioned, these are huge advances, and we're seeing a number of articles that are being published talking about how CROs are becoming less stringent to motivate patients and clinicians to participate in clinical trials, even with these types of restrictions.

**Dr. Howard McLeod:**

Right. Right. And we're seeing centers, so I won't name names because I don't want to embarrass anyone, but there are some top-five ranked cancer centers that have reached out to us for some help with the practical side of precision medicine. And some of these are places that are famous for precision medicine, they sequence a lot of tumors, they put a lot of patients on trial, and those are two very good things, but the day-to-day practice is not really what they were doing. They're doing the trials piece of it or the other. And so even at some of the biggest centers, there are some practical problems. That's one thing that academic medicine tends to have as a theme is, if it's practical, it's not worth doing.

**Jerome Madison:**

Mm-hmm (affirmative).

**Dr. Howard McLeod:**

It has to be something that it is exotic, because you don't get on the platform at the American Society of Clinical Oncology meeting with something normal, needs to be exotic. And so you see that oncologist in the community, I mean, she just wants some help, and she wants it in 30 seconds or less so that she can go see her patients because she's got 39 more to see in the next few hours, and so that area of practicality is now starting to get some attention, and that's a wonderful thing.

**Jerome Madison:**

So, Dr. McLeod, you've worked on research projects with, as I mentioned, some of the most notable institutions around the world, the FDA, the NIH, NCI, you're a fellow of the American Society of Clinical Oncology, what obstacles do you see that can inhibit the adoption of technology tools into clinical practice, the standard patient care, or clinical trials, what's been the limiting factor for tech adoption?

**Dr. Howard McLeod:**

So, it's been different in the different scenarios. So, at the so-called leading cancer centers, the ones that have NCI comprehensive designation and are highly ranked in US News and World Report, there the problem is a little bit of “not invented here”-type of issues.

**Jerome Madison:**

Mm-hmm (affirmative) Mm-hmm (affirmative).

**Dr. Howard McLeod:**

So, if there's a technology that someone has developed and is brought to the place, the gut reaction is, well, we can do better than this. And so you see a delay in application of some of these things because of that. And because of, A, if you have intellectual property, you want to license it out to bring a lot of money in, but if you are bringing in intellectual property, well, do we really want to spend any money? And so you have these issues where those centers tend to be slow to adopt because they're used to being the tower that allows, lets down their golden hair not takes up anything.

**Dr. Howard McLeod:**

When you go into a community setting, most of the community folks are in a fast-paced, just-in-time type mode, and they're not really interested in alpha-testing or even beta-testing. They want to work on something that works, use something that works, and get in there and go. And so, you have a number of companies that have really good technologies, and part of the slowness is finding that early adopter who understands that things are not perfect. And if I had never had a chocolate cake, I probably wouldn't know that it's worth waiting for, that it's worth going and buying some eggs and making sure that I do my part to get a piece of chunk cake. And once you've had one, all right, I'm all in, let's go, get me some cake. But the idea that you find that.

So, we're seeing a few centers that are academically minded community centers, that are really developing a nice innovation reputation, and are early adopters in that format. And that's been a real problem. You've got some amazing technologies being developed in whatever your local Silicon Valley is called, and yet, typically, they're having trouble finding the right clinical partners to bring it into the point where it could start getting the data. And we even see this at the biggest level, the IBM Watson work in precision medicine, I know it's not over for them, they'll retool and have another go I'm sure, but some of the initial steps that were done, there wasn't enough emphasis on finding the right clinical partners and iterating. The iterative process of trying something, learning the mistakes, filling it up again, going forward, that's the partner you need, and there are too few of those right now, and that's a big problem.

**Jerome Madison:**

Yes. I had to mute myself because I was laughing so hard, one, for the Rapunzel reference, letting down the golden hair, by the way. But let's seriously think about this, the irony of thinking that technology has to be perfect before we adopt it, but the reality is we adopt imperfect technology all the time. I mean, how many updates on an iPhone do we get, right? The first iteration of these tools we buy, and they're imperfect, I mean, look no further than the EMR, which of course, nobody adopted because they thought it was a great idea, it was a federal mandate to adopt these tools. But how have they improved over these years? So, I was just chuckling because you hit the nail on the head. I mean, and before we got on, you mentioned some of the limiting factor is that technology is not trusted, right? And we don't trust it. We trust it in other areas of our life, but in healthcare, we don't seem to trust it to jump on the innovation bandwagon immediately.

**Dr. Howard McLeod:**

Yes, we'll trust it to assist but not to be the final adjudicator. And even in the context of robotic surgery, robotic surgery sounds as if there's no human in the room, except the patient. It's robotic-assisted surgery, the surgeon is sitting at the terminal doing his thing or her thing, but the robot allows a steadiness, it allows a precision that it's hard for a person to bring in. And I think that's where we are currently. We may get to the point where we can trust an algorithm to the point where it doesn't need a human intervention, but even now, what I would consider one of the most successful examples is Google did this study of about 120,000 different skin photos and identified some algorithms for finding melanoma or other skin lesions and diagnosing them, and did a comparative trial, compared to expert pathologists and etc.

**Dr. Howard McLeod:**

But in the end of the day, it's not a threat to dermatologists because what it's going to do is it's going to screen all of the stuff that doesn't need their attention and flag the things that do need their attention, with the human dermatologist being the expert adjudicator at the final step. And that level of confidence where you can put things into different buckets and then deal with them, I think we tend to be comfortable with that to some degree, especially if the data is strong enough.

**Dr. Howard McLeod:**

But even on the precision medicine side, there are some beautiful algorithms out there, including the IBM Watson efforts, but even since then a number of beautiful efforts. But at least in our experience, if we offer something that is augmented intelligence, followed by expert review, and then the report sent to the clinician, that's very well received, because an expert precision medicine medical oncologist has looked at it and signed off on it. And really, it's that person that the community oncologist is trusting, they don't really trust the algorithm, they just trust that the algorithm has helped that person. And so we're still there.

**Dr. Howard McLeod:**

And it's not necessarily a bad thing, it's hard to scale because there aren't that many experts out for precision medicine, true experts, but it's where we are and what we have to deal with. And I think, Silicon Valley is full of AI companies that assume that what we're saying is not true, and they're all getting to a point where they can't go forward. And I think designing something from the start where you accept that a human will be there is to me the better way to go, in the short term.

**Jerome Madison:**

Yes. Dr. Howard MacLeod. Hold on. Dr. Howard McLeod, medical director for precision medicine at the Geriatric Oncology Consortium. I tell you, the thing that stands out to me, this has been fun, Dr. McLeod, but it is amazing what can be accomplished when you chase the fun in your career and look to collaborate with people. And you said it, you meet people along the way, and you don't know how you're going to collaborate, but you know that you'd want to work together. I mean, that for those who are out there growing their career just starting out in this field, in any facet of precision medicine, that is really, really profound and sage advice.

**Dr. Howard McLeod:**

Well, and often, if I'm the visiting professor someplace and often you have lunch with the postdocs or the graduate students, and if I mention something like that, you can see the PhD advisors rolling their eyes like, don't tell them that. But it's true. I mean, you do have to get your work done, you do have to be someone who finishes, and I think that's something that is overlooked. We have lots of colleagues that are great at coming up with ideas and starting them, but not everyone can finish. But if you can focus your energy on things that you love doing, the old cliche is, I've never worked a day in my life because I love what I'm doing, well, you get a bit of that. I mean, no place is perfect, there are some days that are not so great. But for the most part, if you're able to do work that you find meaningful, you find enjoying, you don't have to worry about getting up in the morning, you're already ready to go.

**Jerome Madison:**

Yes. The last 18 years of me working in the precision medicine industry has been very much a testament to that. So, before we let you go, social media, if listeners are there, and they want to get in touch with you via social media or for speaking engagements, what's the best way for them to connect?

**Dr. Howard McLeod:**

Well, certainly, I'm on LinkedIn, and so feel free to message me there. I'm on Twitter as well, it's at McLeodHoward, and McLeod, is M-C-L-E-O-D which often people spell it phonetically and not that way. And so I'm on Twitter. drhowardmcleod.com is a website, you can get me through there. I love this field, I think that we're at a time now where there's a lot of places that could use some help to step up and really get in there, and so I'm a fan of that, happy to help. And just love the idea that precision medicine is becoming real, and that's the exciting thing about the current time, it's no longer someday, it's now.

**Jerome Madison:**

Yes. Now, Karen, I was talking to Dr. McLeod before we started recording, and he has one of the most unique hobbies of any guest that we've ever had.

**Karan Cushman:**

Okay, it can't be music then.

**Jerome Madison:**

No, it probably is, but he is a collector of antique maps.

**Karan Cushman:**

So interesting.

**Jerome Madison:**

What's your most prized possession?

**Karan Cushman:**

Yes, that's what I was going to ask.

**Dr. Howard McLeod:**

So, Abraham Ortelius is the Michael Jordan of cartography, and I have a 1545, Abraham Ortelius of Europe. That's probably my favorite of the collection. Initially, I got an old map as just I spent some time in Scotland, and we were getting ready to move back to the U.S., and I found a 1680 or something like that map of Scotland, and so I bought that as a keepsake, and then as I looked into it further I realized, there are people that were sitting in Amsterdam, taking little bits of information from ship captains, putting it together into a map that you and I would recognize if we were in outer space, we looked down and we could recognize it. And there were some maps that had South America as a turnip shaped thing, and California as an island and that sort of, but for the most part, you look at it and say, okay, yes, that's Europe, that's Africa, that's South America.

**Dr. Howard McLeod:**

And the idea of taking little bits of information and putting together the full picture, really was in the theme of my professional work, where can we take bits of the genome, bits of patient information, bits of other things, put it together and come up with a clear picture of how to help a person. That idea. And so, I think, part of the draw was not just the history of these maps, but the idea that somebody was smart enough—somebody who'd never even been up in a hot air balloon—was smart enough to take bits and come up with a picture. And can I be stimulated by that with our work with the genome and work with the proteome, and the list goes on?

**Dr. Howard McLeod:**

So anyway, it's one of those crossover hobbies that I do enjoy as a hobby, but it also is a little bit a secret link with my day job too.

**Jerome Madison:**

Bam, that's the way you end this conversation. That was well done.

**Karan Cushman:**

Yes, that's awesome. Well, Dr. McLeod, I just wanted to say, this episode in particular, you've hit on so many reasons why the podcast was started and still exists, was just the whole idea of collaboration, and everybody in this field being so busy, and one company saying we agree, let's do it. Let's give back to the industry and put this content together that people can listen to no matter where they are, driving to work, whatever. I mean, it's only here and valuable because of guests like you, and you really hit on so many of the concepts of why Jerome and I are so committed to this, why Trapelo is a sponsor and all of our listeners out there, so thank you very much.

**Dr. Howard McLeod:**

It's a pleasure. I mean, what the two of you are doing is really incredible for the field, and actually, anybody out there who wants to as a potential future guest, it's really fun to work with these guys, so do it.

**Karan Cushman:**

That’s awesome.

**Jerome Madison:**

Dr. McLeod, thank you for being a guest on the podcast.

**Dr. Howard McLeod:**

My pleasure.

**Karan Cushman, Producer:**

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**About Our Guest**

###### **Howard McLeod, PharmD**

**Medical Director, Precision Medicine at the Geriatric Oncology Consortium**

Dr. Howard McLeod is an internationally recognized expert in precision medicine, having made novel contributions at the discovery, translation, implementation, and policy levels. He is the Medical Director for Precision Medicine at the Geriatric Oncology Consortium and a Professor of Medicine and Pharmacy at the University of South Florida. Dr. McLeod chaired the NHGRI eMERGE network external scientific panel for the past decade and was a recent member of both the FDA committee on Clinical Pharmacology and the NIH Human Genome Advisory Council. Dr. McLeod has been recognized as a Fellow of both the American Society of Clinical Oncology and the American College of Clinical Pharmacy and was recently ranked #1 USA/#2 World for Pharmacogenomics.  He has also been an active Board Member and/or Founder for over a dozen privately held and publicly traded companies. Howard has published over 580 peer reviewed papers on pharmacogenomics, applied therapeutics, or clinical pharmacology and continues to work to advance innovative healthcare.