



Webcast Transcript
Research Advances from the World's Largest MS Meeting
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Webcast Moderator: Kate Milliken

Panelists:

Dr. Philip De Jager, Associate Neurologist, Brigham and Women's Hospital; Associate Professor, Harvard Medical School

Dr. Don Mahad, Scottish Senior Clinical Fellow, University of Edinburgh, UK

Dr. Ellen Mowry, Assistant Professor of Neurology, Johns Hopkins University and MS Center

Dr. Timothy Coetzee, Chief Advocacy, Services and Research Officer of the National MS Society

Presentation

Kate Milliken: Hello and thank you for joining National MS Society's live webcast titled Research Advances from the World's Largest MS Meeting. I'm Kate Milliken, your moderator. And I've been living with MS since 2006. For the past several days, more than 8,500 researchers have convened here in Boston for the ACTRIMS-ECTRIMS conference to share over 1,000 presentations focusing on the latest progress toward stopping MS, restoring function and ending MS forever.

I was privy to much of the week's activities and I talked to many researchers. And I can tell you first hand that there is amazing work happening in many different areas of MS, including emerging therapies, MS genes, nervous system repair and lifestyle and wellness. The international meeting also had a press briefing announcing the

International Progressive MS Alliance's first investments in what is projected to be a \$30 million investment over six years, covering 22 grants awarded in nine countries.

For the first time, MS Societies around the globe are funding research together, wherever the best ideas can be found to secure answers the progressive MS community urgently needs. We'll hear more about this progress during the next hour. I'm joined today by a panel of some of the top researchers in the field of MS who will share with us their thoughts on what they heard at the conference and how it impacts the MS community and also their own research efforts.

Throughout our live webcast, our panelists will address questions received in advance from participants online, the ones from our live studio audience and those received in real time during the webcast itself. Check your webcast screen now for details on submitting questions during the panel discussion. We will cover as many questions as we can. Please note that we cannot answer specific, individual medical questions.

Let's get started. I'd like to introduce our panelists. We have Dr. Philip De Jager. Dr. De Jager is based here in Boston. He is an associate neurologist at Brigham and Women's Hospital and also an associate professor at Harvard Medical School. Dr. De Jager's research focuses on understanding the role of human genetic variation in neurologic conditions and diseases, and especially in MS.

Thank you so much for being with us, Phil.

Dr. De Jager: Thank you.

Kate Milliken: Next, we have Dr. Don Mahad. Dr. Mahad is currently a Scottish Senior Clinical Fellow at the University of Edinburgh in the UK. Dr. Mahad's leading research focused on the role of mitochondria in progressive MS. He is one of the first grantees to be awarded research funds from the Progressive MS Alliance, which was just announced this week.

Glad to have you here, Don.

Dr. Mahad: It's a pleasure.

Kate Milliken: Thanks. We also have Dr. Ellen Mowry. Dr. Mowry is an assistant professor of neurology at the John Hopkins University in MS Center in Baltimore, Maryland. She first performed research in MS as an undergraduate and is currently studying the role of vitamin D in the course of MS.

Thank you for joining us, Ellen.

Dr. Mowry: Thank you, Kate.

Kate Milliken: Finally, we have Dr. Timothy Coetzee. Dr. Coetzee is a chief advocacy services and research officer of the National MS Society and he oversees mission delivery efforts. Dr. Coetzee leads the Society's global investment in MS research. He pioneered the Society investments in commercial therapy development; helped drive the creation of the International Progress of MS Alliance and created critical collaborations worldwide to move research and treatment forward for people affected by all forms of MS.

Nice job, Tim.

Dr. Coetzee: Thanks. Good to be with you.

Kate Milliken: It's great to have you here. So, before we begin, I would like to recognize five companies that have provided generous educational grants to make this program possible: Biogen Idec; Genzyme, a Sanofi Company; Novartis Pharmaceuticals; Questcor Pharmaceuticals; and Walgreens Specialty Pharmacy.

Okay, you, guys. So, let's start talking a little bit about -- one of the things I noticed is that there were really four buckets or rather four themes that came up throughout the conference for me: being susceptible to MS; technology and collaboration; myelin repair; and progressive MS. I'd like to actually start with the concept of lifestyle and behavior as there were a lot of presentations that talked about lifestyle and behavior and how there were certain things you might be able to do that would actually impact getting MS or starting to become prone to MS.

So, let's talk a little bit about some of the presentations that you saw. Phil -- should we start with you?

Dr. De Jager: Sure. So, there were many excellent presentations from my colleagues in the subject. I think I was particularly struck by the number and the quality of the studies that were reported that on the subject of the microbiomes. This obviously is a very important area that's influenced by what we do, by what we eat. And it's basically --

Kate Milliken: And it's actually the bacteria in the gut.

Dr. De Jager: Correct. As is relates -- and not just the gut, but the bacteria that live on us and inside us. So, in the gut, but also in our nasal cavity, on our skin, et cetera, and

that this is a major driver for differences in immune function, and almost certainly has a role to play in MS. But what role is still not quite clear.

But what's exciting is really the amount of work being done and the quality, which is really tremendous. And so, I'm very excited and I suspect that we should soon see some breakthroughs coming through.

Kate Milliken: Good. Don, was there anything you saw that you thought was...

Dr. Mahad: Yes. I mean, it was -- along the lines that Phil mentioned about infections and how the immune system communicates with the central nervous system. So, when you have an infection, how some of the immune cells might secrete certain soluble factors and that could really provide signals into the brain and that could cascade down and could persist for a bit longer, even after you cleared up the infection. So, I think this is a really interesting area where we could, maybe therapeutically target some of these pathways.

Kate Milliken: Great. Tim, anything you want to add on that?

Dr. Coetzee: Well I think that's interesting when we think about this. Well, first of all, you've got to figure out what to eat, which is really one of the bigger challenges, adjusting that. But, when we think about something like bacteria and MS and sort of what would that connection be in our intestinal tract, it doesn't seem obvious at the time. But what this is a reflection of, and what amazed me about this conference, is that for years you've had people studying bacteria in the intestinal tract. They've known they've been there.

But now, we're making this connection with human disease and saying, "Okay, there is a connection here." And if I could -- if we could alter pieces of it, that then gives us an option when you think about the kinds of conversation that these three doctors have with their patients about, "Well, let's talk about a therapeutic strategy, about one of the potential FDA approved treatments. But then also, let's talk about diet and nutrition and what are -- what are real solutions you could actually use today to manage your life."

Now, we still have a lot to do and long way to go. We can talk about it some more about what we know and don't know. But I think it does give us the opportunity of having this holistic approach to living with MS, which I think is really so vital -- I think in -- and certainly the time I've been in the MS community, it's just a new conversation and I think a really important conversation for us to have with patients.

Kate Milliken: And I think that brings up a good thought about the idea of people actually being able to do something now in their real lifestyle, whether it be in the environment, how they behave and/or the life choices they make. So, Ellen, can you think of anything that people can do now in terms of those choices?

Dr. Mowry: Sure. So, there is emerging data, both at this conference and at others, looking at obesity and how it may modify the risk of MS. We still have yet to learn how it impacts the disease course once it's already started. But, I think that that's a really great example of something that we can do and modify to impact the MS risk.

Kate Milliken: What about vitamin D?

Dr. Mowry: Vitamin D is an area that I'm definitely interested in as we mentioned before.

Dr. Coetzee: We know that well.

Kate Milliken: Yes, yes. A Vitamin D guru right here.

Dr. Mowry: So, we've known for some time that low vitamin D is a risk factor for getting MS. And we've shown more recently that low vitamin D for folks who already have the disease is associated with more attacks and white spots. The vitamin D trial that we're running with the support of the National MS Society should tell us if supplementation is actually helpful in suppressing some of those bad parts of the MS disease process.

Dr. Coetzee: So, I think, when we think about wellness, we talk about diet, and vitamin D, but I think another aspect of what happened at this conference is also the aspect of exercise and rehab, strategies. And we'll talk a little bit more about that later.

But, I think what we're seeing is this real linkage. I mean, somebody can do something now, which is definitely get into a program, start using whatever works. And I think what we're seeing is that it's not just important for feeling well. Some of the research that we're funding now is also pointing to that. It also can improve things like fatigue, recognition. And those are dimensions that we still have to really try to tackle to understand what it is going on. But what it says is that, not only will you feel better, but it also could actually have other impact, which is -- I think a new part of what living with MS is about.

Dr. De Jager: I think that's a good point, Tim. Because I think a lot of these different factors interact with one another. And as a result, it's not just dealing with a single

effect by itself, but it may have some synergistic effects. So, it's just that if you deal with perhaps your sleep habit, your mood will be improved, your energy level will be improved and long term your cognition could also be improved potentially.

So, again, I think that's really the challenge. But the excitement is that understanding how these very different factors, and factors that may superficially not seem to go together, actually do at a deep level interact with one another.

Dr. Mowry: I thought that paper looking at the interaction between the history of mono and being overweight or obese was really interesting, actually. So, we've long known that having history of mono is associated with an increased risk of developing MS. And what the authors of this particular paper showed was that, "Yes, that's true," but if you also had obesity at the age of 20 or so, you are much more likely to then go on and develop MS. So, this is good example of how two factors coming together are so much more powerful than either on its own.

Kate Milliken: Well, on the subject of being susceptible, right, of these combined factors, but also another way that that is being looked at in depth and that is genetics. And, Phil, you actually did a presentation today about some of the work you're doing in genetics. Can you tell us about it?

Dr. De Jager: Certainly. Okay. So, what I reported today was actually a very large study that was funded by the National MS Society. It was a very ambitious project that included recruiting over 10,000 subjects with MS throughout the country and also abroad. We had collaborators in the UK.

And we -- actually with those new subjects and subjects in existing cohorts we put together data on over 40,000 subjects with MS and 40,000 control subjects. And then we compared their genomes and then in each person we measured over 8 million variants in their genome and compared their frequency in the healthy individuals and the individuals with MS.

And so we've now generated a genetic map of MS. Although we had such maps before, this one is much more comprehensive, I would say, and it's actually beginning to be a roadmap for how to pursue these questions of susceptibility.

The big advantage of genetics and MS is it has genetic components but it's not a genetic disease in the sense that the genetics doesn't drive the disease, there's actually an attraction between that risk factor -- the genetic one -- and environmental risk factors and other risk factors.

So, again it's not that if you have a certain genetic variant that you will definitely get MS. And perhaps changing again your lifestyle and things like that, it may ultimately be helpful to prevent the onset of MS. We don't know that at this point whether that's the case, but that's certainly the direction in which we're going.

Kate Milliken: And the biggest benefit of actually knowing the kind of genetic component is -- we spoke earlier about the whole idea of medicine that's specifically targeted and really being able to see MS in a different way.

Dr. De Jager: Correct, because again -- as we know no two MS patients are alike. Everybody has their own trajectory and also everybody came to MS in a different way. And so how can we track each person's course from the point of time where they're born and healthy and at what point did actually the disease start. And that's ultimately, I think, one of the critical questions actually that are firing me up these days is to try to track that trajectory and define the different steps that lead us from being healthy to having MS with the ultimate goal obviously of preventing that from happening.

Kate Milliken: Which could actually redefine how you characterize what type of MS people have.

Dr. Coetzee: Absolutely and I think what's so exciting -- and I'm going to brag a little on this work that we're doing -- because I think it really is so remarkable. So, we've had 8,500 people here, we talk about collaboration a lot.

The thing that's so special about this consortium that Phil is part of is that we, as a Society, we were able to fund it and we are proud to fund it. But what's really remarkable is that you had teams of scientist that were actually competitors, really serious competitors, really labs going up against each other, toe-to-toe and they realized that the solution for MS wasn't going to come if they each had their 5,000, their 10,000. The only way was to really bring the power of all of those groups together. And it took a long time, but --

Kate Milliken: Well, 40,000 subjects, I mean that's --

Dr. Coetzee: That's a huge number.

Kate Milliken: That's a big study.

Dr. Coetzee: I know. They couldn't -- by himself, Phil, would not be able to get 40,000. And it really took people realizing that it's not going to work if we all try to

work on our own and it's really an understated part of this aspect but it's really changed the field.

Dr. De Jager: That is exactly right, Tim. I think it has -- it's not just in MS but MS was actually at the forefront of this. And we very early, I think, realized this and again at the end of the day all of us while we're competitive with one another we ultimately want to understand the disease and to get truth about what's going on.

And that at the end of the day is what drove us to come together in this way and although I presented this work on behalf of the consortium and it's not just me, I mean there are many, many people involved and many of them could've presented it just as well as I did.

Kate Milliken: Yes. Before we go on to our next subject, I would like to ask you, Ellen, one other thing that's been coming up is the whole idea of menstruation and menopause and pregnancy and women's cycle, so what's some of the research there?

Dr. Mowry: Well, I think there's research already available and other research is sort of building momentum. So there are a lot of people who notice that there is a fluctuation of their symptoms with menstrual cycle and there was one paper several years ago suggesting perhaps that there were more attacks occurring in that period. However other have suggested that maybe they seem like attacks but weren't because women tend to feel kind of bad during that period of time.

But certainly I think menstrual cycle, pregnancy, menopause are all really interesting topics considering that MS disproportionately affects women, so that there really may be something about female hormones that impact risk and prognosis. I know Dr. Bove [Dr. Riley Bove, Harvard's Brigham and Women's Hospital] and colleagues are looking into the role of menopause and how that might impact the disease. It's challenging because people are aging at the same time.

Kate Milliken: Yes, right.

Dr. Mowry: So, teasing apart those two different processes, just aging on its own and menopause is very tricky.

Kate Milliken: I bet.

Dr. De Jager: And Ellen, do you think -- I mean one challenge in this field is also how we measure the symptoms that patients experience because I think that -- has that been a challenge do you think for this field?

Dr. Mowry: I think in general that's true. Even taking the definition of what is a relapse it can be hard even for patients to know if new symptoms represent a relapse or not. Then we as scientists are trying to quantify those to figure out does a medicine reduce the number of relapses. It's even challenging to know how to define that appropriately, it causes a lot of problems.

Dr. Mahad: Do you think, Ellen, some of the technologies, sort of a self-administered performance technology, that maybe Kate might want to mention later on, things that you could do at home.

Dr. Mowry: Yes.

Dr. Mahad: Or there are times you could assist, maybe shed better light on that?

Dr. Mowry: I'd love to hear your thoughts too, I thought there were a number of new tools that came out of this meeting. Using iPad technology and other things to ask people to do their own performance measures. And right now those are mostly being incorporated it seems in clinics, but I think it's only a few steps away from people taking their iPads at home and doing some of the same performance tests that we do in the clinic now and really being able to get those data coming in and shedding a lot more light on how to better conduct our research as well as to probably keep a better eye on our patients even though they're not sitting in front of us.

Kate Milliken: Yes, just like a whole new world of technology for sure which we'll talk about a little later, but one of things I wanted to mention is the previous ECTRIMS have had 7,000 researchers and now we're up to 8,500. And before we go to on to myelin repair, I did want to ask you guys, in terms of the scope and the spectrum in what you saw, what were the things that really did excited you when you went?

Dr. De Jager: I think what's really exciting to me is also, I mean as a researcher, one of our important tasks is training the next generation of scientists. And I think what was really exciting is to see so many young people and in terms of young scientists at the conference and particularly I think the care with which the organizer of the conference selects young investigators to give them the opportunity to present. I mean I can present, I love doing it, but I think people like to see other people talk as well.

Kate Milliken: I was lucky enough to go into Dr. De Jager's lab. It was this room of about 10, 25-year-olds and I walked in I'm like, "Okay, I'm sure you guys are really smart, you definitely have a good time." And they were really young and super curious, it's true. Don't

Dr. Mahad: I guess young guys are also very good at using technology, right? So, I was really impressed by how the technology has infiltrated into measurements of neurological function and real-time at home. And we could really get good insight into people's lives that performance is in fluctuations and so on using these. So that was very impressive.

Kate Milliken: Ellen?

Dr. Mowry: Yes, I, as a person interested in modifiable risk factors, I like to see that people continue to branch out and expand. There were posters trying to look at air pollution and better studies of diet and again rehashing what I said before, how those factors may come together to influence MS. I think that's definitely the way of the future.

Kate Milliken: Tim?

Dr. Coetzee: My take on this is there's a lot of amazing science. When we started off with that number, 8,500, if you think about 8,500 scientists just here talking --

Kate Milliken: It was a lot of brainpower.

Dr. Coetzee: A lot of brainpower focused on MS and then many of those people have labs at home like you, so you just multiply that. And you start to get a picture of this collective of people that are really all working together.

And I have to agree with Phil, Don and Ellen about the energy of seeing fellows and post docs and, I mean, we look at these three, they're alumni of our -- the Society's fellowship program and it's this kind of care and nurturing that the field is doing about making sure that the talent actually has an opportunity to grow and develop, but also to be curious and to be able to pursue those innovative ideas.

Kate Milliken: Yes.

Dr. Coetzee: That's what we need. That's where the breakthroughs are going to come from, and so it's exciting to see that happen at a conference like this.

Kate Milliken: Yes. Okay. Myelin repair, so anyone who is living with MS is probably familiar with myelin. So, what are some of the approaches some of these scientists are taking to repair myelin and, Don, maybe I could start with you?

Dr. Mahad: Yes, sure. I mean -- obviously there's been a lot of background to this before, Kate. So at this meeting I was quite impressed with one of the talks that summarized the base of how you could detect myelin repair in the brain, in a live individual.

So lots of different techniques and this is going to be a crucial part, right? So, if you're going to do clinical trials and so on to be able to measure that, so using sort of the myelin water measurements and using special scans like called PET scans, where you put these ligands and measure myelin. So the measurement aspect was pretty impressive.

And also how some of the cell stem repair, stem cells for example, I think we might come back to these, how these might communicate with the immune cells and how they secrete molecules to signal immune cells, that was an impressive aspect. And there were some specific studies, such as the one where they describe this Klotho gene, which is a life-expanding gene [which may be a new approach to myelin repair].

So if you have mutations and you now have an aging phenotype bone loss and so on. And how if you over-express [the Klotho gene] in an animal model that has an MS like disease, they actually repair much better. So that was -- that was quite exciting.

Kate Milliken: I feel like the whole idea at one point of repairing myelin was that it wasn't necessarily possible. And I feel like there's a whole different world, I know you've been involved with it, so.

Dr. Coetzee: Certainly, when I was a fellow that was one of the questions as I was studying myelin and understanding myelin repair. And that when I started in the lab, I said, "Myelin repair is never going to happen."

Kate Milliken: Never.

Dr. Coetzee: Never going to happen. That was about 20 years ago now. And they just said, "No. It's just not even feasible." And I think we've seen a lot of the basic sciences told us that "Yes, the brain can regenerate itself." And when you look at people with MS, you can see that there are some lesions that do repair themselves that go from -- on the MRI from being there to having a lesion to not having a lesion.

And really understanding what's happening there has really opened up the field, so that now you have a Phase II trial that's being done by Biogen with Lingo. You've got work that Jonah Chan and Ari Green are doing at UCSF, looking at other therapies that could potentially have nerve repair strategies. And I think what you've seen in this, again,

coming back to that theme of collaboration is really people working across fields and asking what are the questions we need to address.

And so, I think today we're at a place that we've got at least two or three therapies now or in early testing and many more coming behind it including probably stem cell strategies and others. And it's really an inspiring place to be. I think, and Don touched on it, the big question is how do we do this in clinical trials? How do we know that you can actually give a therapy and know that it works? Because that's going to be really important, unlike, say their disease modifying therapy.

Kate Milliken: Or what quantifies success. And when you talk about that whole idea of like, if somebody doesn't get out of a wheelchair, is there still success.

Dr. Coetzee: Exactly.

Kate Milliken: Right?

Dr. Coetzee: And this is a whole new area. The FDA actually hasn't even had to think about what would be required. With the other -- with our current treatments we have things like relapses, right, you can count the number of relapses. And we don't have that with nerve repair. But I'd guess I'd flip it on its head and say, "If that's the challenge we have, well let's figure out what we have to do to get the outcome measure." It's not like something we can't do.

Kate Milliken: It's not going to stop the research per se.

Dr. Coetzee: Absolutely, not.

Kate Milliken: No.

Dr. Coetzee: And that's what I'm looking towards -- if you get 8,500 people really thinking hard about this, there are going to be solutions to it which I'm really excited about.

Kate Milliken: Right.

Dr. Mowry: One thing that I want to add to that Tim is just agreeing with you 20 years ago, I mean, was this even on the radar. But then you sit here and say, "Wow, we're doing trials of myelin repair now. What's going to happen in the next 5, 10, 15 years?" I think the sky's the limit, in a way, in terms of where the field is moving.

Kate Milliken: Well, and I think that is an excellent segue to the world of progressive MS, right? So I've been involved with working the MS Society for a number of years interviewing researchers at ECTRIMS. And there has been this feeling of progressive MS just being -- just something that hasn't been able to really move forward. And I think there a lot of people living with MS that have enormous frustration.

I mean, everybody's happy that relapsing and remitting MS is getting covered with these amazing therapies, but what about us? So for me, I felt there was an enormous shift this time of people working on with progressive MS. And I think it's probably worth telling our audience about The Progressive MS Alliance, a little bit about what it is when you talk about those studies.

Dr. Coetzee: Sure. Let's start about that. And I think The Progressive MS Alliance really very simply was put together to solve these issue. And it's an effort of the MS Societies in Canada, Italy, the United Kingdom, Denmark, Australia now, United States and others from around the world.

And the idea really is to come together, to mobilize the scientific community as well as companies and everybody who's interested in solving progressive MS. And I think there's just the recognition that the success that we've seen in developing treatments for relapsing-remitting MS, although we should be thrilled and proud, but we just cannot forget that there are people who live with progressive forms of the disease who need solutions too.

And so the Alliance was formed and came together to also say, how can we pool our resources as Societies, because we each fund research -- and we all have our programs, and really they said, "What can we do together?" And so we set out to team up our efforts, team our staff, our volunteers, our leadership to then issue science requests for applications and then do peer reviews together, the first time we've actually done this as a global community. Now these six MS societies are funding research together pooling their money without any concern for geography.

And that's actually impressive in the MS community. And it represents -- I'd say it's a first step. This is a journey. We're not going to solve this overnight, but what it represents is us saying, "We've got to start. And we start here and we'll create momentum and bring in more people, more stakeholders." And the grants that we're funding really represent the first step in I think what will be another transformation in MS.

Kate Milliken: And I'm thrilled to say we have one of the 22 grantees here.

Dr. Coetzee: One of the 22. Don Mahad is here, well done.

Kate Milliken: Hello, Don Mahad. Okay

Dr. Mahad: Thanks, Kate.

Kate Milliken: So let's talk about what you're up to?

Dr. Mahad: Okay. So we've been sort of working on progressive MS for nearly a decade and it's really exciting to see the Progressive MS Alliance and have this structure, which is seamless, to work across the world and collaborate and for them to just provide that opportunity and that's been fantastic.

And I've been very struck by the kind of the different aspects that we've studied in the past in Multiple Sclerosis, but equally at the same time other aspects that we haven't really studied to that extent and one of these is perhaps one of the important cell types, the neuron in the brain. We've kind of attempted to think about that cell as a silhouette if you like and we haven't really paid that much attention to its contents. But the studies from many different groups recently have identified problems with the neurons.

So it really is a key player certainly in progressive MS. So recognizing this, I think -- I think is pretty important. And personally what we study are these very tiny powerhouses, if you like, the energy producing factories of the cells called mitochondria.

Kate Milliken: Which we all learned in seventh grade science class. So it's nice to be reminded, Okay.

Dr. Mahad: And so these mitochondria are actually definitely affected and the majority of the changes occur within the nerve cell. And what we see when you look at the nerve cell, the mitochondria are these powerhouses that are actually struggling to produce energy. So this is reported in Parkinson's disease and ALS and so on, but what's unique about multiple sclerosis or progressive MS is at the same time there's an increase demand for energy in the nerve fiber.

So following damage to myelin, the axon is shouting out for more energy and the cell body is struggling. So this combination of reduced supply and increase demand really makes MS quite unique. I think the other exciting thing as far as therapy is concerned is compared with some of the classic neuro degenerative disorders, in multiple sclerosis we've got a very nice window of opportunity to really try and save these nerve cells.

So if someone presents with their first attack of MS, maybe the progressive MS doesn't develop for another 10 years to 15 years, we have that amount of time to try and protect. So that's from a neuro protection perspective, that's very exciting.

Dr. De Jager: And I agree Don. I think that's -- I've practicing in the field in MS for 10 years and I think even in that short of time I have seen this dramatic change in our concept of what progressive disease is. And I agree, unlike Alzheimer's disease, for example, you do have this opportunity to intervene early, because the brain begins to atrophy a little faster than with aging at the very beginning after the first episode, and so we can't wait until the person displays the progressive clinical course.

That's probably too late to really have a profound impact. We really need to get it in there as quickly as possible at the beginning. And I think it goes back also to what you mentioned earlier which we need new tools. Because for all these studies that we need to do, we need to have better ways of measuring. Not just a gait, which obviously is very important, but other types of functions as well.

And again thanks to all sorts of new devices that we have, the phones that we use, there is actually a ton of different data that are collected passively that we should take advantage of and use in our clinical practice.

Kate Milliken: The whole idea too of actually working really hard to collaborate on large amounts of data I think is really interesting-- I know Phil a lot of your work, I mean, one of the things I was struck with is that half your staff are experts in numbers and analyses because your data pool is so big. And everybody talks about big data in lots of different domains, but can one of you guys give an example of how that could be a benefit in science?

Dr. De Jager: Well, again, I think we were very interested in this area. We started off in genetics but we have now expanded into many different domains. And particularly, I think again, as of -- as the change has come from going after susceptibility to progression, what frustrated me was that we had -- we tried to do some studies with EDSS with these clinical measures that we have currently or even some MRI outcomes, but we didn't really get very far. And the problem was that we just didn't have good enough data on enough people to be able to touch the studies that we do.

What we needed were ways of measuring the behavior and the performance of people with MS in a much more frequent way and in the much more quantitative way. And that's what drove me to begin to look at different devices, and it's also clear that it's not -- again, MS is multidimensional. It affects the whole brain, in all sorts of different circuits, and no two MS patient is similar.

So really we have to build really complex models to basically say, "Well, this individual has these deficits and this person has these other deficits," but how does it all come together and how do the biological processes lead to one or the other outcome?

So this is where, I guess, I mean, sort of the large number of the big data crunching comes into play. And I think, again, the Society and other sources have been very strong in their support in developing a new generation of computational scientists and some of which work with me, but many others in other groups that are excellent, and just excited that the technology and the analysis methods has come together at this point.

Kate Milliken: Yes, I think the stereotype of scientists and -- there was some truth to it in terms of -- we talked about competition, right? Of labs—of scientists wearing lab coats, looking at a very small problem -- not a small problem, but a very specific problem really honing in on that and how this whole bigger approach is cracking that wide open. What do you think has caused a shift in thinking? And I'll start it with you Tim --

Dr. Coetzee: Okay.

Kate Milliken: -- in terms of this collaboration.

Dr. Coetzee: Well, I think, a couple of things, one is the kinds of questions that Phil, and Don, and others are trying to ask. We realize they're the biggest, hardest questions and with the available resources you just -- you're not going to be able to do it by yourself. And the reality is that if you got patients around the world, it's not one person that is going to solve it and it's the rare individual that can be both a physician, mathematician, statistician, computational biologist, social media expert, so I think that's what's changed the dynamic.

Also, I think people with MS have changed in terms of how they interact. And so you think about engaging tools, I know Phil's worked with Patients Like Me and other social media that allows people to share their stories and to really put in the information that requires an awareness of what's happening in the world around you. So that's another piece of it.

And then the other aspect is that I just think scientists have changed. I think that we realize that you just cannot work alone anymore and that funding organizations like ours expect you to collaborate. And the reality also is that the nature of the technology evolves so quickly --

Kate Milliken: Yes.

Dr. Coetzee: -- that the only way you do it is if you work with other people. And there's no other way to approach this. And I think the next generation of scientists just take it as a given, that you're going to collaborate, actually. And it's that my generation and older, we were very used to having our own lab, well, that's just no longer the case, it just doesn't work.

Kate Milliken: I feel like the speed of the world on some level is, everybody is moving faster anyway and there is such an urgency for people living with MS of "Hurry up," right? So, I know we come back to that same thing.

I mean, when I sit down and I hear, "How long have you been working on MS?" I've been working at the subject of progressive MS for 10 years and they're like, "Oh my gosh, you're so patient", right? But that whole feeling of, I think, collaboration and technology combined does have some faster results. Have you guys seen that from your experience?

Dr. Mowry: I mean, I think that technology definitely helps move ideas forward more quickly and it allows for facilitating the merging of data sets and that sort of thing, just easy examples of how it's very helpful, actually.

Dr. Mahad: Tim, couple of points as with Kate, we earlier talked about young, enthusiastic investigators and so Tim mentioned about next generation of scientists, I mean, it is, really. Because if you think about interferon era and the treatment at the beginning of it, maybe 20, 25 years ago, and that's almost a generational shift.

And one of the benefits, I think, of the Progressive MS Alliance has these pearls of wisdom from individuals who've been through the journey for relapsing MS.

So we have a very nice buffer. So we can-- hopefully, minimize going down blind alleys and so on and so that's another great benefit.

Dr. De Jager: But I think one of the exciting things also with the new technology, in terms of gathering data, is that it opens up new study designs and this I think came to really to roost for me, where we were trying to start this large stakeholder pool for GEMS, the Genes and Environment in MS, where we study -- we recruit the first degree relatives, people who are at risk for MS.

And we initially did the standard thing. We went to our MS center, we tried to get family members and to be honest we didn't really get very far. And it's only when we really engaged in social media and reached out and reached out to the Society, which was very helpful that we actually were deluged, the first time the Society helped us to disperse our message, we were surprised. We had over a thousand replies in a week and that actually became a different problem, but a very good one.

Dr. Mowry: A good kind of problem, exactly.

Kate Milliken: Well, I love hearing that story in terms of people wanting to help to push things forward as much as they can. I think people are invested in their own care, in their own wellness, but also the MS movement. I think there are a lot of people who are really invested on wanting everybody as a whole who's affected by MS to get what they need.

The other thing I wanted to say about technology and this kind of change is I think that there was a real sense of being literal in terms of therapy and what's good for you and what's not. And there's a lot of unproven stuff with lifestyle, diet, exercise, whatever, but this whole feeling of the scientific community recognizing that there is something there, because I think people living with MS have some knowledge that they might be able to do something for themselves now.

So how do you get them -- the fact that the scientist community in their traditional way is making that shift to try to show in a clinical way that this is all good, but really beginning to try to move forward to encourage people to be their own expert and to find ways that make them feel better in the interim.

Dr. Coetzee: Right. Well we're seeing that, I think, one of the things we've learned and that we've watched is what individuals want either when they are diagnosed with MS or a family member diagnosed with MS, what's the first thing you do? You Google what MS is.

Kate Milliken: Right, right.

Dr. Coetzee: And we want to know and understand because as individuals we want to live a powerful life, and that's really what we're -- what we all strive for. And I think that what you're seeing and I think what you're touching on is the kind conversation that we continue to have with -- that we want doctors to have with their patients around here are the therapy choices but also let's talk about your lifestyle, the exercise program, are there things that you may need to change in your life?

That we may at this point, as scientists, not to be able to say, "Okay, here's a study that shows that it does this. But what we know kind of generally is that if you take this approach, this is better for you." And I think this is some of the science that we're going to have to fund. We're going to have to be careful about understanding it. But, at the end of the day, you put -- you describe it beautifully as like "What can I do now?" That's the question, I want to be powerful.

And what I think is -- I think what I'm hopeful about is that the scientific community is also seeing this and saying, "How do we ask those questions in a strong way?" So that we get the right answer, because I think the reality is that as a scientist you don't want to embark on a pathway, spend a lot of time and then figure out I'm asking the question not in a smart way. And we're not entirely sure how to ask some of these questions but I think there's enough collective brain power in the world that we're going to figure out how to do it in a good way.

Audience Questions and Answers

Kate Milliken: Yes, that's great. So we've actually already received a bunch of questions, so I just want to kind of kick-in on some of them. So I'm going to start with you Dr. Coetzee. What are your thoughts about stem cell therapy for MS?

Dr. Coetzee: That's a great question. I think stem cells are I think, I have -- I'm optimistic that those will continue to develop as a potential option for people with MS. We heard some, I think, really exciting presentations from Jeff Cullen at Cleveland Clinic who's been looking at mesenchymal stem cells, those are from the bone marrow, as a potential strategy in progressive MS. Overall, I think they represent a really promising lead that we've got to continue to really explore deeply and then figure out what it would mean to develop into a therapy.

We don't know entirely are they going to be a strategy for nerve repair? Or modulating the immune system, or both? They could be a both end kind of thing, and would it be for relapsing MS versus secondary progressive MS?

So those are some of the open questions, but I'll be the first to admit that when I started working in MS, there was a lot of skepticism about stem cells and really just thought, I don't see it. There were so many unknowns.

But now we know for example from some of the mouse studies is that these mesenchymal stem cells migrate to the brain. They then go to the areas of damage and end up serving as a promoter of repair. They don't necessary do the repair themselves

and those are insights we didn't have. And I think this is where studying stem cells, I think, really represents an opportunity.

And like the microbiome is one of those areas we've just got to continue to follow the science. And science -- Mother Nature may surprise us as always is her case. But I think I'm optimistic that we're going to have some stem cell solutions in a not too distant future.

Kate Milliken: Awesome. Ellen I'll pose this one to you. "Is marijuana a variable treatment and or a pain management option for patients? Must they discontinue all of their medications to use it?"

Dr. Mowry: That's a great question. There's a lot of interest in marijuana because a lot of patients have found that marijuana actually helps their symptoms. The studies of course often are lagging behind the patient's own experience. And so I think there are more and more studies coming up that have been looking at this.

Early studies were able to show that the patients felt better but when examiners were testing them for things like stiffness and that sort of thing it wasn't making a huge difference on those measures. Some more recent studies have started to show a potential promise. So I think that we're going to need larger studies to know for sure but that there is some evidence that in fact the patient knows best and that there may be something to it.

Now stopping other medications there's not any good evidence that that would be safe or recommended especially in terms of the platform MS therapies. So right now I'd say as a prescriber I don't think there's enough evidence for me to prescribe marijuana if that were legal. But it's promising and in the meantime maintaining other medications is really important.

Kate Milliken: Great. Dr. De Jager. "If you were asked about a new study of a potential defective gene found that slows the nerve conduction rate," do you know what that is? I bet you do.

Dr. De Jager: Sure. So I mean, there are many different types of studies that have been done in terms of susceptibility. And some of these actually also look at the function of the genes which may influence this or maybe genes that don't necessarily influence getting MS but may influence how severe the disease is once you get it.

So again that's where all these new insights lead us to consider new genes in terms of what may be important proteins in the function of neurons and ultimately targets for clinical development if it proves to be of value in the context of MS.

Kate Milliken: Dr. Mowry, Ellen. "So what are some natural supplements that might prevent progression?"

Dr. Mowry: A lot of supplements have drawn interest as well in the MS community and from some providers, but again unfortunately a little bit understudied, in the whole realm of diet and lifestyle. There's actually been a recent consensus statement from the American Academy of Neurology with experts trying to sort out whether the evidence sufficiently supports use of supplements and things like that. And it was disappointingly empty.

There were some supplements that people have tried like ginkgo biloba for memory and things like. That seemed not to be very helpful. But I think everything else is a wide-open field in terms of us trying to tease out how they might be used beneficially by patients.

Of course vitamin D is a supplement. And I think we'll have answers soon about how it may be helpful for folks with MS. And also being able to tie in that science with genetics and with immunology to get a fuller and more complete picture of how vitamin D might actually be doing its work.

Dr. De Jager: I would also caution patients, I mean, there're some companies that are providing genetic testing and then recommending certain over the counter medications. And as we know the big challenge with supplements is that we don't really understand what's in them.

So I think people should be cautious but, again, I think that there's a lot of important science to be done in a rigorous way.

Dr. Coetzee: And that's one of the things that I think that we as a National MS Society have to focus some of our research strategies around because I think we know from talking to many people who live with the disease that they're trying different supplements.

And as Phil and Ellen point out if you were just going to look at it from a hardcore science point of view, it's hard to know how things shake out.

But that the important thing is: first have a conversation with your health provider but then we also realize that we've got to start teasing this out. And with the advent of technology and the options that we have for monitoring individuals, we have now potentially the tools to be able to get those insights sooner. So that we can then update those guidelines to say, "Okay. Here's what we know and here's what we don't know."

Kate Milliken: And I think patients would be so psyched for that because going into a health food store and being like, "I want to better myself."

Dr. Coetzee: Yes.

Kate Milliken: "What do I do?"

Dr. Mowry: That's right.

Dr. De Jager: I think the challenges in terms of that there is actually a lot of data out there, a lot of information because all of our patients are trying different things but we don't collect that data in any meaningful way.

And so, of course, in the past it was impossible to do so in a structured way. But now, again, with all the different social media and tools that we have, I mean, it's not going to be easy and there's a lot of challenges but I think that there is a possibility that we can actually collect this type of data on a large scale.

Kate Milliken: Okay. Don your turn. "What advancements have been made with respect to remyelination of a central nervous system?"

Dr. Mahad: Yes. There are a couple of clinical trials that have been going on and, hopefully, we will find out maybe early next year or towards the end of this year whether these are being successful or not. And this stem cell approach is to try to enhance remyelination as are stem cell transplantation and trying to encourage the indigenous stem cells to differentiate, develop, and form new myelin.

But also I think looking from the neuron perspective, I think there's another compartment if you like that we haven't really paid a great deal of attention to. So I mean we know the myelin forming cells would wrap around kind of like tiny plastic tubes and form myelin and so on. But given the choice between a real nerve cell and a plastic tube they'd much prefer to do the real thing.

And if the question is, "Are there any problems in this neuron compartment that we could target to enhance remyelination?" So I think inside the Progressive MS Alliance

really gives the opportunity to think about these if you like outside the box to try and identify --

Dr. Coetzee: And that's Don's really highlighting what I think is so special both of our conferences like this as well as the Alliance is trying to achieve is that expand our horizons beyond just oligodendrocytes and myelin. Clearly in MS those are critical central players. But the brain actually has a couple of other cell types in it, which are actually important.

And the reason why remyelination I think is important also is that we tend to think about lesions as the things that happen in white matter. But what we're learning now is that there's also lesions in the gray matter which really actually matters a lot for people who are experiencing cognitive challenges because if you lose those oligodendrocytes and those nerve cells in the gray matter then you start seeing that cognitive dysfunction. And that's one of the big challenges that we still haven't been able to crack.

And by thinking about remyelination, not just in terms of the usual places, but also in other parts of the brain and in rebuilding neuro cells, I mean -- imagine being able to get back what you've lost from cognition, that would be huge.

Kate Milliken: Huge.

Dr. Coetzee: And I think inspiring, I mean, big challenges. I mean these are the big goals, but I think to be able to even think about that now is a place we wouldn't have been 20 years ago.

Kate Milliken: Phil, I have one question here and then I actually have some questions here from the live stream. So is there any research preventing MS for children of people living with MS?

Dr. De Jager: This is not my area so I don't know for sure. But as far as I know, I don't believe so at this point. I think there's a lot of interest really in this question. But as with any medical trial that we might consider, we have to be very careful about the risks and benefits. And so particularly in the context of very lower rates of recurrence in children, we have to begin to design the types of studies that we could look at this.

So there's a lot of information that we just didn't have until recently. And so I know some of our colleagues in Sweden, in the US and the UK have actually separately begun to do different pilot studies in this direction.

So to really understand how we can do this type of study, to really try to find what we can do to prevent the onset of the disease.

And the exciting thing is that just in the margin of this meeting, we all got together, and again we're talking about forming a new consortium to address this issue, to basically come together and start a very large study that might address this important question.

Kate Milliken: And for you, being involved with genetics, I'm sure that's especially alluring for you.

Okay, here we go. So I'll throw this out to everybody. What about diet and MS? Ready, go.

Dr. Coetzee: That is an easy one. I think you, Ellen, have something to say on that.

Dr. Mowry: Well there was a presentation that tried to get at whether diet could be associated with MS risk and they looked at a number of different ways of scaling diet. If you're eating a more Western diet -- high fats, lots of meat, processed foods, that sort of stuff -- lots of different ways of trying to tease out "Does bad diet matter?"

And the study was sort of disappointingly flat, which I think might potentially be related more to difficulties in questioning people about their diets. I know when I fill out dietary questionnaires, I'm like, "Oh, I must not eat anything. I haven't eaten a hamburger in months."

Kate Milliken: What chocolate cake?

Dr. Mowry: Chocolate cake? Never.

So I think that probably part of this initiative to study diet more will include better ways of measuring what people are eating and/or really rigorous ways of intervening on diets to test what impact such interventions have on the disease course.

Dr. De Jager: I agree on that. When I see the type of data that comes out, and whether we collect on diet, I mean, everyone is screening back to genetics, which is actually much simpler to deal with. But thinking again, we have to study this and we have to develop the new tools to do that.

Kate Milliken: Only a scientist would say genetics is easier to deal with than diet. I just want to state that for the record.

Dr. Coetzee: Indeed, exactly.

I'll add to that. I think there's another dimension. The diet piece, really, there're two pieces of it. One is, when you're doing the studies, like you said, can someone actually stick to the diet? Because if you don't stick to it, it really just -- then as a study, it becomes really challenging to know, is it making a difference? And that's one aspect of it.

But then the other aspect is also looking -- and some of the researchers we've funded are thinking about this is not just the individual living with MS, it's like they need a support system also being around it. Because it really kind of -- I know when I'm on a diet, it kind of sucks when I'm dieting and everyone else isn't. And that's really important; actually, sticking to something really depends on people around you, my son suffering along with me.

Kate Milliken: Right.

Dr. Coetzee: Which doesn't happen often enough. But I think these are parts of the equation that when we think about we need to think actually holistically, because that really makes a difference, is what we're learning.

Dr. Mowry: And I think also, just thinking about the whole family getting involved actually goes back to the point about children of individuals with MS. We know that cigarette smoking is a risk factor for MS, it makes it worse. So if I have a patient who's with me and they say, "What can I do?" I say, "Well, stopping that smoking will not only help your MS but it may reduce your child's risk of getting it. And if your partner smokes, get them to knock it off too so that you're not tempted to go back."

Exercise, same thing, right? So I agree. I mean, involving the family is more -- could be really a very powerful way of making some of these interventions.

Kate Milliken: Especially because a caregiver has as relevant a story as a patient, period.

Dr. Mowry: Absolutely.

Dr. Coetzee: Absolutely.

Kate Milliken: So before we close up, I want to go to each of you and I want you to tell me -- I mean, again, I've been privy to go to the meeting and be utterly inspired. But

what can people who are watching today expect, specifically from your field of research in the next few years?

Dr. De Jager: In terms of genetics of MS, I think we have a very good handle in terms of how to do studies for susceptibility. And the matter we have today -- I mean, really, I was talking to some other scientists -- really I think what we have today is a map -- like if you think of a geographic map of a country with all the different cities, but that's it. And when that map is getting denser and denser, we're finding the smaller and smaller cities in the map.

But it's still a two-dimensional map at this point. And I think the big change that will come this year -- and we have heard some of it from some of colleagues at the conference -- is really the topography of the map.

So where are the mountain ranges? Where are the fields and the rivers, et cetera? So really understanding in a very deep way how the human genome is set up and how it is different in context of MS. And so I think that is something that's going to start driving the thought process in a roughly deep way this year, but it actually is going to take 5 or 10 years to come to fruition.

And I would say the other thing is, what I sort of alluded to earlier, which is pivoting some of our effort from the onset of MS and studying the disease after it starts, truly is looking at individuals who are at risk of MS and understanding what they're going through and why some of them develop MS and others don't. Because again, only a small fraction of family members will eventually develop MS themselves.

Kate Milliken: Don.

Dr. Mahad: So from a progressive MS perspective, I think with the help from the Alliance and the collaborative efforts, I feel pretty confident that we will be able to deliver something for those affected by progressive MS. This may be, I guess, first at a symptomatic level -- so for an example, fatigue -- so that's a very nice way that we could bring science into this really important problem. And so that's one of the areas I think that we would be able to deliver.

And for someone who's got MS but may develop progressive MS, that perhaps could be prevented, or could kind of be slowed down -- that's a bit more of a challenging area. But I think we will definitely be able to make advances in our understanding and identifying important targets, which could then be worked on and new drugs developed.

Kate Milliken: And by the way, somebody told me when I was speaking with them that there are some 60 new therapies in the pipeline, and many of them are for progressive MS. I think that's a really important point. Ellen.

Dr. Mowry: So I'm looking forward to having the results of our vitamin D study. That'll be very exciting. But in terms of diet in general, I think we're going to make some rapid advances in terms of understanding how we should be measuring what people are eating and how we can intervene upon those. And also I'm excited to see how studies might merge, not only that dietary information but also looking at the microbiome and what the mechanisms are by which diet influences the disease.

Kate Milliken: Tim.

Dr. Coetzee: So I'm going to connect the dots amongst all these groups. I think that what I'm expecting is that we're going to be able to really completely reshape the conversation that Phil and Don and Ellen are going to have with their patients when they're being newly diagnosed, or for those who are living with progressive MS. We'll be able to have a conversation about let's take a look at your genetic profile, determine are you a candidate for this therapy or that therapy, if you have relapsing MS or if you have progressive MS here's some options about neuroprotection or remyelination repair.

That's not as far away as we think and the intersection of technology of genetics, diet, thinking about new technology about monitoring individuals with their progression in real time. It's just going to simply speed up the way we address MS.

And I think I really appreciated Phil's point about them also taking the next leap, which is about how do we prevent the onset of MS, which is something we've not really talked about in this panel. But I think with technology and our understanding of the disease, to be able to say what are the environmental factors that married up with somebody genetically at risk of developing MS and what we can do to intervene earlier is really in our reach.

And I know there are many people living with MS today, and so we want to address that. But also with the idea of not ever having to have that conversation in the future --

Kate Milliken: Right.

Dr. Coetzee: -- I'd be okay with that, actually. And I think that we are not that far away and I believe that.

Kate Milliken: It's awesome.

I want to thank our panelists, Drs. De Jager, Mahad, Mowry and Coetzee for being here today and sharing their expertise with us. I also want to thank you, our viewers, for joining us.

If your questions weren't answered, please speak directly to your healthcare provider or visit the Society website at nationalmssociety.org. You can also contact the Society's information resource center and speak with one of our MS navigators at 1-800-344-4867. Please note that today's webcast will be archived and available for viewing at nationalmssociety.org.

Thank you all, and goodbye from Boston.