

# Behind the Breakthrough Podcast - University Health Network

## Season 4 - Dr. Carmela Tartaglia

### Transcript

#### **BTB**

This is behind the breakthrough, the podcast all about groundbreaking medical research and the people behind it at Toronto's University Health Network, Canada's largest research and teaching hospital. I'm your host, Christine Côté and on the podcast today, Dr. Carmela Tartaglia, award winning clinician and scientist at UHN's Krembil Research Institute, Dr. Tartaglia is pioneering research into how our brain ages and the factors that contribute to brain degeneration, including the much publicized issue of concussions. In recognition of her work, Dr. Tartaglia was awarded the Marion and Gerald Solloway chair in brain injury and concussion research. That's the first ever such chair in Canada focused on concussion research. Dr. Carmela Tartaglia, welcome to Behind the Breakthrough.

#### **DR. CARMELA TARTAGLIA**

Thank you for inviting me happy to be here.

#### **BTB**

Carmela, let's just start with how does our Brain Age?

#### **DR. CARMELA TARTAGLIA**

Yeah, well, there's natural history, you're born you at one point, you're actually accumulating brain cells, right, your brain is growing. And then after about the age of 30, all our brains start to age and we start to lose brain cells. And that's okay, that's normal, we expect a certain amount of brain loss over time. But the problem we have is that there's a number of different things that cause this accelerated aging, right. So bad things happen to your brain that actually make it age faster. And really, the way we look at that is the loss that happens because a brain ages too fast.

#### **DR. CARMELA TARTAGLIA**

So in Alzheimer's disease, we are building up these abnormal proteins in our brain, they're killing off our brain cells. So our brains are shrinking faster than they should be. Because actually, that's what aging does, it actually shrinks our brains, different diseases shrink our brains in different areas. And so what you end up with is a different constellation of symptoms that really goes with the areas of the brain that are no longer functioning well, because they're too shrunken, to injured. And so there's many different things that contribute to brain aging to accelerated brain aging. And it just so happens that concussion seems to be one of them.

**BTB**

In the case of the neuro degenerative disease known as chronic traumatic encephalopathy, or CTE, what do we know about this disease in terms of the patient profile and causes?

**DR. CARMELA TARTAGLIA**

Right now, CTE seems to have one risk factor, and that is repetitive head injuries. And so to date, we've only found it in people who've had repetitive injuries, usually through contact sports. So you know, we've seen lots of it in football players, in hockey players, in boxers, and some people are even worried about the sub concussive, right. So sometimes, there's not even been reported concussions. So you know, we found CTE in some rugby players, in some soccer players, in in sports that we don't really think about concussions so much or not as much as we do in, let's say, boxing or football.

**BTB**

So when it comes to CTE, what's the biggest challenge then when it comes to diagnosing?

**DR. CARMELA TARTAGLIA**

Yeah, that's a great question. Because the problem with all brain diseases is that the way you know that a brain disease is going on is basically somebody changes, their personality changes, their cognition changes. And they tell you about the symptoms that they have, right? They can't remember as well, they can't concentrate, they become irritable or angry. Those changes reflect the change in the brain. But the cause of that change is what we have difficulty with. And so in Alzheimer's disease, after decades of work, we have been able to design tests where we can test somebody with very high accuracy if they have Alzheimer's disease or not.

**DR. CARMELA TARTAGLIA**

So when you come in and you say, I got this and this symptom, we can test you and we can say, yes, you have Alzheimer's disease. It's actually not readily available to everybody. But the possibility is there. The tests are very good. This is not the case for CTE. I have many people who come to me and they've had some change in their personality or their cognitive function. They could be in their 20s. They could be in their 40s. They could be in their 80s and telling me, I used to be a professional contact sports player. And now I have these changes, do I have CTE in the brain? And I have to tell them, that as of today, there are no tests available that can tell somebody that and so the issue is that if you could detect CTE, you could think about starting a therapy that could maybe stop the disease, right?

**DR. CARMELA TARTAGLIA**

Like some people come to us and they have significant symptoms. But I'll tell you that some people come to us and they have no symptoms, they are simply just worried because, you know, there's been a lot of media attention to CTE saying, you know, I used to be a boxer, I used to be a professional

football player, am I gonna get CTE? Do I actually even have CTE right now, even if I'm 40 years old. And so what we're working towards is trying to find the tests to be able to tell to somebody, yes, you have CTE in the brain. And we're going to take all the people who we can detect CTE, and we're going to put them in clinical trials, just like we do with Alzheimer's, and we do with other diseases where we can detect the disease, and then say, Yes, we have these therapies that are aimed at that disease. And we will start you in these experimental trials and hopefully, stop the disease.

## **BTB**

So let's drill down here, because this is a big part of one aspect of your research. It's aimed at this gap of accurate CTE diagnosis. And you're testing different diagnostics to measure brain change, damaged structure, etc. So let's begin with I understand there's a paper that goes back to 2016, details how the brains of former professional athletes showed notable differences from those of a controlled group that they were compared to, particularly the loss of white matter in the brain. How did that loss of white matter inform your research when it came to diagnosis?

## **DR. CARMELA TARTAGLIA**

You're right, we have had over the years, we've been very fortunate, we have a research program in former professional context sports athletes, and been able to recruit quite a number of them. So over the years, we've been able to assess different parts of their brain to try to understand what's changing in them. We know that pathologically, you know, once they've died, and we look at their brains, some of the players do have CTE and actually a pretty decent number do, not everybody, but a good number do. And so we know that these diseases, they don't start one day to the next, right? Like these are diseases that are insidious, they start little by little and progress over time.

## **DR. CARMELA TARTAGLIA**

People who are in their 50s and 60s, they must have some in the brain if they're dying in their 70s and 80s and they have it. So we started to look at structural changes, are there changes in the white matter? We started with the white matter, because white matter is where we think of the injury like traumatic brain injury occurs. So in the past, moderate and severe traumatic brain injury, a lot of it you see in the white matter. And so we thought, Well, is there also damage to these people who have mild traumatic brain injury or concussion? Is there a change in their white matter, and we did see that certain white matter tracks that were involved in irritability, aggressivity, were altered, also some longer tracks that are important for concentration. And so we can say, Yes, as a group, they seem to be different than healthy controls, who had not suffered from any concussions.

## **DR. CARMELA TARTAGLIA**

We also looked at the gray matter. So you know, your brain is made up of gray matter and white matter. And in the gray matter, again, we could see that people, they are not even patients, a lot of these people, right, they score normal range in cognitive assessment, but they have complaints, they feel like they're not the same. We could see that even people from their 20s to their 80s, their brains were more

shrunk than people who are of the same age who had no concussions, and it was particular areas. So the hippocampus, the part that's important for memory, there were some subcortical structures, other areas of the brain. So again, as a group, we could say that there was some evidence that there was accelerated aging in those people. We couldn't tell what the cause was. We didn't even have a measure to do that back then. But we said yes, it looks like their brains are accelerated in the aging process. So what's there?

**BTB**

So let's turn to the various diagnostics you're testing to confirm if someone has CTE another paper 2019, I understand reported results of a first in Canada investigation, where you looked at proteins in the brains of athletes with suspected CTE. What did you set out to do with this study first of all?

**DR. CARMELA TARTAGLIA**

I think the paper you're referring to is one where we looked at cerebral spinal fluid. And when you think of like, trying to figure out what's going on in somebody's brain, you know, you think of like, how close can you get an MRI is pretty far. And the closest is a biopsy. But you know, we're not going to take out any bit of people's brains if we don't have to, right that's too invasive. But looking at people's cerebral spinal fluid, I mean, that's a fluid that is made by your brain really reflects the abnormal proteins in the brain and we know that in other diseases that are in that neuro degenerative family, we can do very good diagnostics on the cerebral spinal fluid. So we got cerebral spinal fluid from former professional athletes, I'll tell you, they don't all sign up for this one, lumbar punctures are not, they're not that keen on, even though, you know, lots of bones broken.

**DR. CARMELA TARTAGLIA**

But what we could find in the people who had given up their cerebral spinal fluid is that there were two groups of players, there was a group who had tau levels that were in the relatively normal range. And there was another group who had tau levels who were above normal. And then when we looked at the brains of these two groups, we could see that the integrity of the players who had elevated tau integrity of the white matter tracks was lower. So again, making us think yes, there's something happening to the brain, is being reflected in this elevated tau protein that we can detect with our lumbar punctures?

**BTB**

Does the higher tau presence point only to concussion induced degeneration or could it also be an indicator of dementia due to aging or genetics?

**DR. CARMELA TARTAGLIA**

Well, these people don't have dementia. Okay. Dementia is an umbrella term that basically covers all of neurodegenerative disease, even non neurodegenerative, right? A person can have dementia, if they have traumatic brain injury, if they have a stroke, if they have multiple sclerosis, if they have

Alzheimer's disease, or Parkinson's disease, right? So dementia is the umbrella term, these players, these participants, they are either mildly impaired or not impaired at all. Right? They are normal cognitively functioning people. And so that's why we're really interested in detecting disease in them because we have an opportunity to stop the disease. And so what we could see was that the elevated group, they had mild differences in their cognitive function. But actually, what the tau was telling us is that there were brain changes that had occurred, and that those brain changes, could they predict that maybe in the future, these people would dement? Could they also be reflection of an abnormal process going on in the brain, and it could be CTE, it could be something else, because we do exclude Alzheimer's disease, I've told you, we're have very good accuracy. So we can tell you those people did not have Alzheimer's disease in the brain, but they had something causing their tau to elevate.

**BTB**

So it's certainly an interesting stepping stone in terms of the issue of diagnostics. And I understand as part of that 2019 study, you also assessed 22 athletes brain structure using magnetic resonance imaging and brain function through neuropsychological tests. What were you looking for with those tests?

**DR. CARMELA TARTAGLIA**

Well, MRI is what we use to look at the structural changes, so we can look at the gray matter. And we can look at the white matter. And so with the MRI, we can look at the integrity of the brain, we can look at the integrity of the gray matter, the integrity of the white matter. And that means we can look at the white matter tracks and see how they look. We can also look at the structure of the brain in terms of is the volume appropriate for the age? Or is it too shrunken? Is it in a particular pattern? And we can also look at connectivity across the different parts of the brain, how well connected are the different parts. And you know, we have new evidence showing that the connectivity is actually altered in these people to and you know, long before you actually change the structure of a brain, right? Like what I mean by that is that you can actually see the shrinkage of the brain, lots of stuff is happening. And so we're trying to find ways to detect that.

**BTB**

So in this 2019 study, what are the results of the MRIs and the neuro psychological tests?

**DR. CARMELA TARTAGLIA**

In the tau group, there was changes in the white matter integrity that was showing it to be that the people who had elevated tau had lower white matter integrity, and it actually was across all their white matter tracks, you know, you can think of some process is damaging the axons, and you can damage the axons by different ways, right? Like one would be that you actually do something to the axon itself. So when people have a concussion, what happens is there's something that actually shears the axons, stretches them, does something to them, but it isn't visible in conventional MRI because their brains look fine. Is it something that actually hurts the cells of the brain? So if you hurt the cell, then the axon

could be damaged because it's dying back, right? Like if the cell dies, the axon that feeds it will also die. So even though we see a change, we still have to work at figuring out well, what's causing that change. How does it relate to their neuropsychological function, and there were some subtle differences also in their neuro psych ability, which was different between the two groups.

**BTB**

I understand you also tested Positron Emission Tomography or PET scans to see if they pick up tau proteins. What did that reveal?

**DR. CARMELA TARTAGLIA**

Yeah. So when you try to think of like how you're going to diagnose, at the end of the day, we're not looking for group differences. We're looking for precision medicine, you want to know what you have, you don't care what group you belong to, or you as a group are different than another group, you want to know if there's a disease in your brain. And so that's what Positron Emission Tomography PET scans allows us to do. So there is a abnormal tau protein in the brain of people who have CTE. And there's a tag that we are investigating whether it would be useful to detect that at the single person level to say, yes, you have something that looks like it could be CTE, your tau positive, or no, you do not. In these people, we actually can rule out Alzheimer's disease because we have markers for that. And so if you have tau in the brain, and you don't have Alzheimer's disease, we have to figure out well, what's causing it. And so CTE is a possibility. It's not the only one, there are other changes. But if somebody is 40 years old, and they don't have Alzheimer's, and they have PET tau, positivity, it's kind of difficult to figure out what else they have going on in their brain other than CTE.

**BTB**

And another study 2022, you test for something called neuro filament light chain or NFL, you're ironic in that it's an acronym also for a major football league. Another protein, this NFL, that's released into the blood when there is injury to the central nervous system, what did you set out to do there?

**DR. CARMELA TARTAGLIA**

NFL or neural filament light chain is a marker of brain injury doesn't matter what the injury is. So it is elevated in stroke, it's elevated in multiple sclerosis, it's elevated in Alzheimer's, it's elevated in other diseases, but all of them are from damage to the brain. So a normal person with normal aging has a certain level and it goes up with age. But we know what, you know, let's say that trajectory is right. So if you have elevated NFL, although it doesn't tell us what's going on, it does tell us something bad's going on.

**BTB**

Okay.

## **DR. CARMELA TARTAGLIA**

And so what we're doing is trying to say well, okay, using neurofilament, could we one, relate it to changes in the brain that are occurring, and yes, NFL was able to tell us that there was more brain shrinkage was able to tell us that there was loss of integrity, it was able to tell us that was lower connectivity of the brain. So the brain was less well connected in areas that are important for memory. It also could tell us that people who had elevated NFL also had lower scores on their cognitive assessments. So although they weren't demented, they didn't perform as well. But more importantly, it could tell us that over the next two years, because this is this is longitudinal study. So we follow these people over time, every two years, they come back to be scanned, it could tell us that NFL could predict that your integrity of your white matter was actually going to go down over two years, which is kind of impressive, because we expect only slow changes in the brain over time, right? We don't expect fast changes, especially in a group of people who are not, you know, they're not demented. So it does make us worried, right, like all the evidence kind of converges to say something is going on in these people's brains. And it's predicting that in the future, it might not be so bright for them.

## **BTB**

And one final research that you're exploring is a blood test?

## **DR. CARMELA TARTAGLIA**

We have not just one blood test, we have multiple blood tests. And the issue is that patients want to know what they have. But we would like to do it with the less invasiveness possible. And so a blood test is what you know, we think would be best, but we don't have a blood test for CTE. I would say that right now, our best bet is looking at the positron emission tomography. So the PET scan for tau as well as looking at markers like neuro filament light chain, we're combining that to look at different things, right, like markers of inflammation, other markers of degeneration, different parts of the brain. So some of them are in blood tests. But I would say that the cerebral spinal fluid and the brain imaging is where we think we're going to have the biggest bang for our buck to be able to really say to somebody yes This is what's going on, we would like to intervene with some disease modifying therapy.

## **BTB**

What I find interesting is really just in several years, you've corralled all these different elements of research to try and fill this gap of diagnosis, you know, the, the MRI, the neuropsychological tests that during the spinal fluid, the PET scan, et cetera, are you able to say that with all of those pooled together, you're close to being able to diagnose CTE?

## **DR. CARMELA TARTAGLIA**

We are, I think, very close. And we're also very close to being able to say that, if you look at people who have any of these degenerative markers in the brain, so whether it's a positive PET scan, whether it's an elevated neurofilament, whether it's elevated tau, that those brains have a problem with them.

And you know that they have changes in the brain that even though with conventional imaging, you cannot see it, but that they have loss of connectivity in the brain, and that the loss of connectivity actually explains some of the symptoms that they're complaining about. So, you know, one thing is to diagnose somebody, and actually, that is our end goal, because that will allow us to intervene to actually do some therapies. But also we're trying to understand, well, what are the changes that are happening? And is there any way to use them as a marker, right, like, so even when you think of you want to a disease modifying therapy, but you have to have endpoints, right?

**DR. CARMELA TARTAGLIA**

You, when you when you do a clinical trial for anything like for cancer, one of the things they look like is, well, if it's a solid tumor, they'll say, oh, has the tumor shrunken, has it disappeared, if it's a blood cancer, they will look at different blood markers. So we're going to need markers too. So that's part of the journey to trying to be able to run a clinical trial. And so we are seeing that when you have a marker that falls in that category of neurodegeneration, it actually has an impact on your brain, even if you're high functioning. So I think that those are two parallel pathways is one the diagnostics. So saying, Yes, this is the test that's going to tell me that you have something. The other one is trying to find good markers to be able to say, Okay, well, what's the effect of all these alterations that have happened? And we have data that the pet tau, the way it accumulates in CTE is actually not a trivial matter to be able to analyze it. Because unlike the other neurodegenerative diseases, that basically the disease progresses in a pattern that is known to us.

**DR. CARMELA TARTAGLIA**

So in Alzheimer's, we use this bracket staging. And there's the same thing in Parkinson's. In CTE. It's very patchy in different parts of the brain and progresses in different ways. So even trying to figure out well, how are we going to follow whether the drug you give actually changes the course of the spread, right? But we have now evidence that if you have something that looks like pet tau positivity in a part of the brain, it actually is associated with increased shrinkage of the brain in that same area. And so then you could say, Okay, well, maybe one of the markers we could use is these MRIs, looking at brain regions. And if you can pull that tau out, maybe that area will not shrink as much, maybe it will actually not continue on its trajectory of dying. And so yes, all of these things work together to try to bring a disease modifying therapy to these people.

**BTB**

I'm wondering, with this combination of diagnostics that you're testing, certainly the pet tau test, would this be useful to athletes now in high context sports, to inform them you know, if they were to have a test, allow them to make maybe more informed decisions on when they should end their careers?

**DR. CARMELA TARTAGLIA**

Yeah. And that's a very important question for people who are actively playing. And I would say that, you know, in those people, we may not want to wait till their pet tau is positive, right? I see sometimes



professional athletes, and if they take a long time to recover from a concussion, and that means that when they're going out to play, they could be at risk of having another concussion. I don't think I need a pet tau to tell me that that brain is at risk. Because we don't understand the relationship between concussion and CTE. We don't, we in the sense of we don't know what that trajectory is right? Like, what's that change? But no matter what, concussion is the risk factor for CTE. There are no others that we know of at this time.

**BTB**

And you have indicated potential treatments. But again, there really isn't any kind of treatment that alters outcomes at this point?

**DR. CARMELA TARTAGLIA**

Right now, the way we treat people who come to my clinic and have symptoms As we treat on a symptom based approach, so you know, if they come in that they have chronic headaches, we can treat that if they come in that they have some mood issues very common after concussions for people to have some depression or anxiety or even post traumatic stress disorder, we can treat those things. If they have cognitive impairment, we can send them for occupational therapy to give them strategies to help so we can treat based on a symptom based approach. In terms of if we figured out how to detect the tau in CTE, well, actually, we could intervene with some treatments that we're trialing in Alzheimer's disease. So we have anti tau agents that we're using in Alzheimer's disease. So the hope would be if you can figure out who has tau in the brain, then you could give them one of those agents and see what happens over time. Because, you know, we know that all these diseases start decades before. So the point is to try to intervene as early as possible and not when they have a ton of tau in their brain. And the brains degenerated because nobody's bringing any cells back with today's technology, at least not in the brain.

**BTB**

Carmela you've spoken in the past about concussion, unfortunately, not getting the attention as deserved in part, because for too long, we didn't see it as a brain injury, but as well, because of a knowledge gap and medical education. Is that changing?

**DR. CARMELA TARTAGLIA**

Yeah, that is slowly slowly changing. I have to say that when I was a medical student or a neurology resident, I don't think I even heard the word concussion. And it's actually only come about because of the media attention to chronic traumatic encephalopathy and all the concussions in professional athletes. So slowly, it's starting to make it into the medical curricula of medical students, and the neurology residents at University of Toronto all get education on concussion. And I'm certain that this is happening across the country too. Because, you know, we all know that the eye sees what the mind knows. And the problem is that people didn't recognize that a brain injury even when it's considered

mild, which is kind of an oxymoron. But any brain injury could be really mild, could have long term effects, right?

**DR. CARMELA TARTAGLIA**

We know people can end up with persisting symptoms of concussion that affect your ability to go to school, work, play, and even can have long term repercussions. So of course, this has to be recognized by the medical practitioners, medical students, physicians, nurse practitioners, nurses, physiotherapist, everybody who deals with patients should recognize that concussions can have long term effects, including persisting symptoms that need to be dealt with, but also possibly longer term effects. And, you know, I think one of the groups of people that need to be educated too are patients themselves, because although people recognize concussion in athletes, there are many people who have a fall, a motor vehicle accident, involved in spousal abuse, unfortunately, who do not recognize that they've suffered a concussion, the elderly, it's quite rare for elderly people to be referred to a concussion clinic, or even to recognize that they possibly had a concussion. And so all healthcare practitioners need to be educated on the effects of concussion.

**BTB**

You're listening to Behind the Breakthrough, the podcast all about groundbreaking medical research and the people behind it at The Toronto's University Health Network, Canada's largest research and teaching hospital. I'm your host, Cristian Coté, and on this episode, we're speaking with Dr. Carmela Tartaglia, award winning scientist at UHN's Krembil Research Institute. Carmela is pioneering ways to accurately diagnose, for chronic traumatic encephalopathy or CTE. Currently, there is no way to diagnose CTE until after the patient has died. Carmela you were born and raised in the town of Schefferville in northern Quebec, then moved to Montreal, where you studied the artistic side of the brain, a bachelor's degree in English and then Film Studies at Concordia. Talk to us about what attracted you to these creative social sciences?

**DR. CARMELA TARTAGLIA**

Well, I was interested in film, and I was interested in people's stories, mostly I was interested in documentary film. And that's maybe one of the reasons I ended up in Cognitive Neurology, because what I get to do every day is listen to people's stories, actually, their life stories and how they've changed but it's their life stories.

**BTB**

I understand the pivot to science, in part can be traced back to a summer job at the Montreal Neurological Institute now called the Neuro. What was it about that experience that inspired you to move into medical research?

**DR. CARMELA TARTAGLIA**

I became interested in the brain, even when I was in art, and I had done it more from a philosophical perspective and then decided that I wanted to do the biomedical approach to the brain and so I was going back to school. And I had a friend of mine who worked in imaging in multiple sclerosis. And so I said, Oh, that sounded like it would be an interesting thing. And I could look at images of the brain and try to understand how people changed in relation to those images. And so I got started there and actually had planned to do a Master's and PhD and I think I really enjoyed interacting with the patients, my projects were all patients based. And so my supervisor at the time said, you know, maybe you want to apply to medical school and you know, you can become a clinician scientist and still be able to do science and research but get to interact with patients all the time. And I thought, yeah, that sounded like it could be interesting.

**BTB**

And it was.

**DR. CARMELA TARTAGLIA**

You're right.

**BTB**

So you're back to school for I understand for like 10 years to achieve your BSC MD residency and a fellowship at the University of California's San Francisco Memory and Aging Center until 2011. When you're approached by one of Canada's foremost concussion experts to come work at UHN. Talk to us about that turning point?

**DR. CARMELA TARTAGLIA**

Yeah, I still remember that I was in Arizona at a meeting and Dr. Charles Tator called me to know if I would be interested in joining him in his pursuit of looking at the effect of multiple concussions on athletes and...

**BTB**

How did he land on you like, how did he find you?

**DR. CARMELA TARTAGLIA**

Actually, I should ask him how he did that. But I think I had met with some people here and was thinking about coming here. And he heard about it. And he knew that I was a cognitive neurologist, and I was interested in degenerative disease and interested in tauopathies, right which CTE is, and neurodegeneration. And so at the time, when I came, like this was over 11 years ago, it was before I actually even started here, that idea of CTE was starting to, you know, come to light and how many

cases there were like even today, when we think about the number of cases with CTE, it's actually a very small number that have been recognized.

**DR. CARMELA TARTAGLIA**

And that's why, you know, we're trying to focus on the neuro degeneration that comes about after concussion. And, you know, although CTE is important, and I think will also teach us about other tauopathies, right, Alzheimer's is a tauopathy, progressive Supranuclear palsy is of tauopathy. But the number of cases with CTE is still relatively low right now that we recognize. And so I was interested in neurodegenerative disease. And CTE happens to be one of them. I was interested in tau and CTE's tauopathy. So I think that's how he got around to calling me and I thought it would be very exciting to look at this.

**BTB**

So talk to us about I guess, just in general, the notion of mentorship, what that means in terms of the progression of your career.

**DR. CARMELA TARTAGLIA**

I think mentors are essential, right? You always want to sit on the shoulder of giants. And I think it's really important for people to get appropriate mentorship. When you choose a path, it's not that that's the only path available to you, right? So you have no idea, which is going to be the best course for you. So it's very important to have mentors, and to have all kinds of mentors, right. You have scientific mentors, you have your clinical mentors, you also have non academic mentors, right, people who have been able to bounce things off of.

**BTB**

In your research, when you come up against a roadblock or failure. How do you navigate these challenges?

**DR. CARMELA TARTAGLIA**

(laughing)

That's a hard question. I don't really think of anything as insurmountable. When I was a kid, I went to my father worked in a mine. And we went to visit the mines as a school trip. And there was these trucks, I don't even know what they're called. But you know, they have these wheels that are I don't know, like, maybe six or seven feet, right? These are mines and digging out. Huge. And I remember thinking, oh, I want to drive that and I said that. And some little boy said, Oh, no, no, girls don't drive those trucks. And so I went home and told my mother that I was like, but I want to drive those trucks. And he said, Girls don't tell my mother said no, no, of course you could drive the truck if you want to. Fun funny for me, we hate driving, but at the time, that's what I wanted to do. I wanted to be a driver of these giant trucks that Yeah, can't even fathom.

**DR. CARMELA TARTAGLIA**

But I think that idea that whatever you want to do, you can do right you I mean, you have to figure out that you want to do it, you know, it's worth for you to do it. But after that, I don't really think of obstacles that are insurmountable, I think of them as annoyances. And, yeah, but I do figure out a way, because my parents actually instilled that in me, you know, they gave me the tools to think about obstacles in a way that yeah, I could get around them, you know, it's different. When people have disease, disease is different, right? Like when sickness hits, that's different. But even then we have different ways of surmounting them, right of overcoming them, of dealing with them or reacting. And so I think of obstacles in that way, I'll figure out a way around them.

**BTB**

You're a scientist and a clinician. So you see patients, obviously, you know, the urgency of their needs. How do you reconcile, though that urgency with the fact that, you know, science, medical research takes time?

**DR. CARMELA TARTAGLIA**

Yeah, I reconcile it in the sense of I see people with neurodegenerative disease, I see people with persisting symptoms of concussion, and they have needs at that time that need to be addressed. And although we can't cure either of those things, I treat people in a personalized way. Or as personalized I can get where you have certain symptoms, let's try to deal with those symptoms. And if we have a treatment that is addressing Alzheimer's disease, well, of course, we are going to give you that because we're going to try to figure out if you have Alzheimer's, and then if I figure out that yes, you do, I'm going to target you with Alzheimer's treatment. But aside from that disease, that process, you have other symptoms. And so I think that treating all those symptoms is super important.

**DR. CARMELA TARTAGLIA**

And in our clinic, we're very fortunate we have a nurse, and we have a social worker, and our social worker and nurse are actually part of our treatment arsenal, they are able to help some of our patients so much. And I wish that we had even more allied health, because an occupational therapist, a physiotherapist, a speech language therapist, neuro psychologist, all these people would help us treat patients better. Because a patient is not just the disease, right? A patient is a patient and they have many things going on with them. We tried to help their families, we try to give them tools to try to get back to work. So even if we don't have it yet in brain disease, but we tried to use a precision medicine kind of approach where we target your symptoms. While we're trying to figure out exactly what the cause is of those symptoms. We know some of those symptoms aren't necessarily caused by this disease. They're kind of the aftermath.

**BTB**

As you move through your research each day do you feel pressure to deliver for your patients?

## **DR. CARMELA TARTAGLIA**

Yeah, of course. Yeah. There's an urgency in neurodegeneration, right? There's an urgency in all brain diseases, because unlike other parts of your body, when your brain changes, you change. It's not very romantic. But that's where it comes down to, right. You love with your brain you hate with your brain. And when certain parts of your brain change, you change dramatically. I mean, some of my patients, the injury of the brain is two parts that are responsible for empathy. And they no longer feel empathy for their family members. Parts of the brain that are responsible for you having good judgment, and not doing things that are harmful to you. And when those parts of the brain don't work well, you know, you change. So yes, there is an urgency. And, you know, when you think of the number of people who are affected by brain diseases, well, that's a lot of people. And that could be me, too. Could be my family. So yes, I do think the brain diseases there is a real urgency, and there has been a lack of investment to date. But, I think that is going to change, has changed somewhat, but it has to change even more.

## **BTB**

I'm curious then in terms of getting the message out. I know you've done a lot of media over the years. What's your take on the value of scientists communicating their work in such a way that it's accessible to a mainstream audience?

## **DR. CARMELA TARTAGLIA**

Oh I think that's essential. We organize caregiver education. We do webinars for people with post concussion symptoms, it's essential. Science in a lab is really not abused to the patients unless it gets to them. So some science belongs in a lab, right? Like trying to understand the fundamental processes that happen in some cell regulation method. That's fine. But I don't do that kind of science. So I do science that needs to be translated. And so I need to speak to people and I need them to understand. And the other really important thing is that there's a lot of misinformation in our society. And so I do think they're all scientists who are doing research that will impact patients have an obligation to share the science in a way that patients understand. Because I'll tell you that the non scientific people out there, who are, you know, basically preying on our patients vulnerabilities, oh, they're speaking a lot. They're very loud.

## **DR. CARMELA TARTAGLIA**

I think we've seen that through COVID. I think we've seen that in other areas and concussion, it's very apparent, but in all areas, so scientists have an obligation to speak to patients, to their family members. And also scientists have an obligation to engage patients at the research stage where you are trying to design your experiment, the patients, at least for clinical research have to be there, because you're supposed to be answering the questions that are important to them, not just what is important to us. And sometimes we have to try to find meaning that's halfway, right. Because, of course, for most patients, they want a cure, and rightly so. But to get to a cure, there's a lot of things we have to understand before. And so you know, just sharing that with patients, but patients need to be involved. We have a patient advisory committee for our concussion work, and they are integral to us. And the

research that we undertake, as well as the way we communicate information, the partnerships that we make with other researchers. So yes, we need their voice. So scientists have to speak but we have to also listen.

## **BTB**

There's a leadership author, I love asking people about a quote of his his name's Simon Sinek. And he says, People don't buy what you do, they buy why you do it. Why do you do what you do?

## **DR. CARMELA TARTAGLIA**

I am very, very captivated by social cognition, I want to understand how we relate to each other. And it's related to brain function. And it changes in a lot of the diseases that I deal with. And so I think that's why I do this, I want to understand how we relate. And I think that's because at the end of the day, these functions that, in a way, help us to either get along or not get along. They're based in the brain and they change with the brain. So understanding their substrates, maybe we could figure out how to prevent their degeneration. But even helping people understand that they change sometimes helps people understand why the person they love for 50 years is acting in a way that they don't recognize them anymore. I think the other aspect of why I love to do this is I'm very interested in people's stories. And you know, I started off in film, but I was less interested in writing as I was in documenting other people's stories. And so I think those stories come about because of your brain.

## **BTB**

Well Dr. Carmela Tartaglia award winning clinician and scientist at UHn's Krembil Research Institute, thanks so much for sharing your time and your groundbreaking research with us and continued success.

## **DR. CARMELA TARTAGLIA**

Thank you.

## **BTB**

For more on Dr. Tartaglia's work and on the podcast go to our website, [www.behindthebreakthrough.ca](http://www.behindthebreakthrough.ca) and let us know what you think. That's a wrap for this edition of Behind the Breakthrough the podcast all about groundbreaking medical research and the people behind it at the University Health Network in Toronto, Canada's largest research and teaching hospital. I'm your host, Christine Coté. Thanks for listening.