Gut Metabolites and the Brain: What Autism Research Is Revealing Transcript

(Transcripts are generated by AI and may contain errors)

Introduction to the podcast and Dr. Jim Adams

A normal person has about 500 species of bacteria in their gut, whereas kids with autism are missing on average about 100 of those. So they're missing about 25% of their normal gut bacteria, but it's very different from one child to another.

And also there are about 500 bacteria that are elevated in kids with autism. So that's one major clue. They have too few of the good bacteria, too many of the harmful ones.

Welcome to Demystifying Pans and Pandas, the podcast where we uncover the mysteries, breakthroughs, and hope behind these life-altering conditions. I'm Dr.

Nancy O'Hara, a board-certified pediatrician, educator, and advocate with over three decades of experience helping children and families navigate the challenges of neurodevelopmental and neuropsychiatric conditions, especially pans and pandas.

These disorders can feel overwhelming, but here we'll break down the science, explore transformative treatments, and share stories of resilience and recovery.

If you've ever wondered what's possible for your child or how to find answers, this is the place to start. Let's dive in. Hi everybody, and welcome back to Demystifying Pan's Pandas.

I'm Dr. Nancy O'Hara, and I'm really excited to welcome Dr. Jim Adams to our podcast today. Jim is a professor at Arizona State University, a leader in their autism research group there, and really an instrumental leader in the field and research of autism in general, uncovering biological causes, innovative treatments for autism.

And Jim, it's just such a pleasure to have you on the podcast. Great to have a chance to chat with you again, Nancy. I think we've known one another close to 20 years, so it's great.

Absolutely. And your work in the Autism Research Institute and your work at Arizona and especially the plethora of research you have done has just been so instrumental in all of our kids, especially those with autism.

How Dr. Adams entered autism research

So I really personally appreciate it and professionally thank you also. Well, thanks. Again, I think in the autism field, so much of the research has been really driven by what the parents then tell the physicians, the physicians then tell the researchers, and then we go and follow up on it.

So it's very much a great collaboration. Yeah. So just for those listening or watching that don't know you, how did you get into this in the first place?

So I have a daughter with autism, and when she didn't talk at age two and just ignored us, that was a big clue. At age two and a half, she was diagnosed with both severe autism and severe intellectual disability, and we were told just a matter of time until we'd have to institutionalize her, and it was crushing.

But my wife and I decided we were just going to love her. Then my wife went to an ARI conference and came away thinking there was something there we could do biologically, and I was very skeptical.

I said, vitamins and minerals? How could those possibly be important for children with autism? We've known about them for decades. And then when I looked at the research by Bernie Rimland and other studies, I was rapidly convinced.

And now for 13 years, we've had our own vitamin mineral supplement company. So thanks to the work by you and many others at ARI and other groups. Yeah, it's just incredible.

And as a background, there have been dozens of research studies demonstrating that bacterial and yeast infections in the gut are just so common in people with autism.

And as you know, and many of our listeners know, Sid Baker was my mentor, so I was I was on this 30 years ago because of CID. And, you know, the bacteria in the yeast produce toxins that affect our gut and our body and our brain.

But, you know, there are obviously gut symptoms, constipation, diarrhea, but a lot of these things also worsen symptoms of autism and also symptoms of pans-pandas.

So can you talk a little bit more about that, the effect of the microbial metabolites, all of that? Yeah, there's so much we can say. We know that in our medical histories, we've done of children with autism, even of adults with autism.

In almost all cases, the gut symptoms begin in infancy and can continue on for many decades if not treated. We published a study 15 years ago showing a very high correlation between severity of gut symptoms and severity of autism.

Gut bacteria, metabolites, and autism symptoms

There was a study 25 years ago by Lucin Feingold and Ellen Bolte showing that vancomycin, very effective in wiping out harmful bacteria temporarily and greatly improving GI and autism symptoms.

But when you stop treatment, The benefits were lost within a month, even with standard probiotics. So now we know from some meta-analyses done by Jamie Morton of our work and others, a normal person has about 500 species of bacteria in their gut, whereas kids with autism are missing on average about 100 of those.

So they're missing about 25% of their normal gut bacteria, but it's very different from one child to another. And also there are about 500 bacteria that are elevated in kids with autism.

So that's one major clue. They have too few of the good bacteria, too many of the harmful ones. And so also we've been lately very focused on the metabolites these gut bacteria make.

And so one of the best known ones, Paracresol, 17 studies have it for autism. Every study shows it's elevated in a subset of kids with autism. It's really nasty.

We know that if you administer to mice, it causes autistic symptoms in the mice. If the mice get a fecal transplant from a healthy mouse, they recover.

We know that it not only damages the gut, it acts as an antibiotic in the gut to kill off the competition. It damages the kidneys. It damages the mitochondria.

We think that's one of the major reasons for mitochondrial dysfunction. in autism, causing a lot of oxidative stress. And in the brain, it acts to disrupt normal dopamine function.

So it turns out people with Parkinson's have extremely high levels, about eight times the normal amount of P-Cresol in their brain. And we know that's the key issue in Parkinson's is dopamine disruption.

And sadly, we know that adults with autism, much higher risk of Parkinson's, and they get it much earlier. And again, it's the same with chronic kidney disease.

Adults with autism have a higher rate of it and comes on earlier. And again, this, we believe, P-creasal is one of the major factors. So we've followed research or over 50 research studies now showing kids with autism have elevated

levels of these microbial metabolites.

Some of them affect the dopamine system. The others affect the serotonin system, which then goes on to make melatonin and hence causes sleep issues. So we think many of the sleep problems in autism are due to these, but together by affecting dopamine or serotonin, They're affecting mood.

They're affecting cognition. So they're affecting anxiety and depression. AD probably contributing to repetitive behaviors and interests and many other related issues.

So this is really important. That's why we've now developed a test. We've worked for several years with our colleagues at Andalutos in the United Kingdom, and now we have a test.

We can measure 17 of these. We have a paper under review right now, but the preprint is out, showing that roughly 90% of kids with autism have high levels of one or more of these metabolites versus none of the typical kids.

And so our test is able to differentiate kids with autism from typical kids with just a urine sample, just measuring how many of these harmful metabolites are in the gut.

And so roughly 90% accurate in distinguishing kids with autism from typical kids. But what's even more important, it lets you know what is the problem.

Is it a yeast problem? Is it a bacterial problem? For many kids, it's both. So I'll pause there, but we can also chat more about yeast. Yeah. So let's go first.

Since you mentioned the test, I know everybody's going to be asking, is that the microbial derived metabolite gut health test? This is our new microbially derived metabolite system test that we've trademarked that is now available from the UK.

Anyone in the world can now order a copy of the test and can order the test kit mailed to their home. You just pee in a cup and you get a FedEx return label and you just send it back to the UK.

So very, very easy to do. And it's testing for these metabolites of Clostridia, of bacteria, of yeast, et cetera, within that test. That's right, that's right.

And so again, roughly 90% of children with autism have high levels of one of these, often both, but it's very important to not just tell it to help diagnose autism early.

Our dream is that to test every child at the age of two years or so to see if they're have a gut dysbiosis and let's treat them before severe symptoms develop, before they usually lose years of development.

But also, it's a very important guide for how changes continue. Sorry, Nancy. Go ahead. Right. No, no, no. I was just going to say, and it's more than just those with autism, because as you said, we know that these metabolites affect dopamine.

affect serotonin and therefore are going to affect the symptoms that many of our children, especially those with pans and pandas may have, anxiety, OCD or perseverations, tics even, and many of the Parkinsonian effects we see in very severe cases with catatonia and things like that.

So it can apply to many more than just those with autism, correct? That's right. Right now we're doing a study with about 140 children who have a variety of health disorders.

So children with anxiety, children with depression, children with intellectual disability. And so we're testing, as well as children with autism and healthy children.

And that's a key part of our test is we have lots of samples from very healthy children to compare against. We have

a really good reference range. But yes, we suspect that kids with autism have very high levels, ADHD probably a bit lower.

For pans and pandas, we don't know yet. It's probably higher during a flare-up, I would guess, but that's again why we'd love to do research with that group too.

So when people send in a sample, we just ask them voluntarily, you know, tell us what the condition is, and then we'll soon build up data for a wide variety of different groups.

That's amazing and will be a great test.

Testing microbial metabolites in urine

We'll talk about how to order that more toward the end of the podcast. But let's go back a little bit. What percentage of children with autism have gut issues?

That's a great question. It depends on how you ask it. So the data, the researchers are all over the place because if you ask the question, have you ever had a GI symptom?

Well, that's 90% of kids with autism. It's 90% of the general public. The real question. But if you actually compare side to side and say, are you having current cup problems?

Roughly 40% of children with autism and many adults with autism have a chronic gut issue, constipation, diarrhea, abdominal pain, sometimes reflux, which we think is almost always due to constipation.

Cause when we treat the constipation, the reflux disappears. And often that constipation and diarrhea, as you know, is alternating that the kids are so constipated.

you have overflow diarrhea. But it's important to distinguish that because then the treatment for overflow diarrhea is very different from that for regular diarrhea.

Absolutely. Yeah. And I think that specifically you and I both look at yeast overgrowth and it's something that I think the general public or conventional medicine doesn't look at in the same way.

What would you say specifically about yeast overgrowth or yeast metabolites that you may have found in kids with autism or others? Yeah, we've done a lot of research on this.

In the first paper we published 15 years ago, we found that the kids with autism who had a positive yeast culture did not have worse gut symptoms, but they had worse autism symptoms.

So the only symptom, again, was worse autism. And if you think about it, if you think about some of the toxins that yeast make, like alcohol, alcohol has a big effect on your brain function, on your cognition.

It can affect slurring of speech. It can affect, of course, your emotion regulation. Are you happy? Are you angry? Just hard to control your emotions.

And at a higher level, it affects your coordination. So many of the symptoms with autism could be explained by yeast-like metabolites. But we found in kids with autism, they have other yeast-derived metabolites that are up to 100 times more toxic.

And again, in a study we published just a year ago, We found the kids who had higher levels of Candida, especially Candida albicans, had worse autism symptoms, but not worse gut symptoms.

So we call it a hidden gut problem because the only symptom is worse autism symptoms. That's why, although 40% of kids with autism have obvious gut symptoms, it's so important to test the rest.

Because some of these gut bacteria and yeast seem to only affect brain function or mostly affect brain function and not gut symptoms. So these hidden infections are so important.

Yeah, and it's fascinating. I mean, when I'm talking to parents and a parent's asking, well, how do I know if they have yeast? You know, I often say, well, think about a drunk.

And that's the alcohol comparison. You know, you can have a belligerent, angry drunk. That can be a yeast symptom. You can have a silly, inappropriate drunk.

That's a yeast symptom. You can have a clumsy, klutzy, you know, gait, you know, unstable. That can be a yeast symptom. And it's not just children with autism.

We see that in many children with PANS pandas. And I think in children with PANS, yeast is one of those infections or flora that often get missed and may well be causing the symptoms that the children are having.

And if all we're doing is putting antibiotics on to treat the pandas, we may be missing another germ that is even more relevant in that particular child.

Yeah, absolutely. I think that's so important. And one of the key things we found in our latest paper on yeast is that not only were Candida elevated, but there was an anti-correlation where they had lower levels of cerevisiae.

Gut issues, yeast overgrowth, and hidden symptoms

And so similar to S. bilardi, Saccharomyces bilardi. So it's a problem in yeast of not just high levels of harmful yeast, but too few of the normal commensal yeast.

I won't necessarily say beneficial, but the ones that are normally there. So I think that's, again, an important message to get across. It's not necessarily all bad and some are helpful.

As many physicians have said, aspilarity seems helpful in many cases. Yeah, and it's also an idea that, you know, I often wrap my head around, you know, there's not necessarily just good, bad, and ugly within the floor of the gut.

It's how they interact. It's what proportions they're in with others. So there are so many nuances to this that I think are so important for people to understand and that you've done such a great job in helping many of us to understand.

Yeah, that balance is just so key. I mean, a little bit of E. coli is good, too much can be fatal. So depending on the species. So, you know, we use the analogy of a village.

You don't want to have a village that's all policemen or all farmers or all doctors. You need all of them working together. And that's really what we try to focus on is balance.

And that's one of the surprising things to us is that the latest meta-analyses of over 10 studies of probiotics for autism show, on average, no effect.

That it's surprising, but on average, there is no effect of them on gut symptoms, maybe a small benefit for autism symptoms. Highly variable from one child to another.

That was one of the surprises when we did a study, published a study on a customized probiotic. measure the microbiome for every child, use a tailored approach to choose specific probiotics, species for that person, and yet we found it just so incredibly varied from one child to another.

And the probiotics are, you know, one to ten species, but if you're missing a hundred, it's just a very small amount of what's really needed. Yeah. I often refer to it as peeing in the ocean.

Yeah. And also that idea of the grass and the weeds, that's always a great analogy. If you're just putting one weed killer in one spot, you may well miss it.

It's all about letting all the grass grow, which has as much to do, I know this is important to you too, with diet as it does with the supplements or medications that we put in, correct?

Yeah. Yeah, I think diet is so important in trying to prevent these issues. In our studies, we've seen the biggest challenge is low fiber consumption.

And fiber, as you know, is converted by the gut bacteria into butyrate, the main food for the cells that line our gut, providing about 60 to 70% of their energy.

So most Americans just not getting nearly enough fiber from their vegetables and fruits. But sadly, we haven't seen much. I haven't heard much anecdotally.

There hasn't been a formal research study. But when people go to a higher fiber diet, it doesn't seem to help. It's not enough to fight off these infections in our experience.

You may have different experience. But although we highly recommend a healthy diet, it doesn't seem to be able to eliminate these embedded infections that seem to last for many years or decades if we can't find a powerful intervention for them.

Yeah, yeah, absolutely. And what treatment options are available? From your perspective. Yeah, so there are, of course, many treatments for the symptoms, for the GI symptoms.

So treating constipation, I think, is very important. People don't often recognize this. We've had families come into our study say, yeah, my child poops once every 10 days.

Sure, they swell up like a balloon, but they don't seem to be bothered by it. In the same way for a bottle of wine, the longer you let it ferment, the more alcohol is produced.

The longer that stool sits in the gut, the more toxins are being produced. So we recommend trying to have a bowel movement at least once a day, if not once for each meal.

So exercise is great for that, enough water, having the right foods that you eat, a healthy diet. If necessary, laxatives, suppositories, enemas as a last resort.

I'm not keen on those. Diarrhea is a separate issue. Diarrhea is the body's defense against something harmful. So generally, I'm not too thrilled with treatments like Imodium that try to stop diarrhea.

I'd rather figure out what is the cause of the diarrhea? Why is the body rejecting the food that you're giving it or whatever it's exposed to? So food allergies could be a big issue, so changing diet.

to avoid those. But then the more advanced things that we really focus on, we have our vitamin mineral micronutrient supplement that we think is very important.

So getting a powerful vitamin mineral micronutrient supplement helps somewhat with gut issues. And then for yeast, the data out of ARI is incredibly strong, survey of 23,000 families.

The top two treatments of any type higher rated than any psych med are Nystatin and Diflucan. So, and very safe to give. So again, really, really great to say.

I mean, with Diflucan, you do have to check occasionally for liver and kidney toxicity, but it seems to be extremely rare. Yeah, 30 years, seen it once, I say three times, but the two others with the liver function were fine and checking it every two to three months, absolutely safe.

I'm reassured to hear that. We've tried several times to get federal funding for study of antifungals. But so far, the federal government has said no, they just haven't been interested.

The challenges of those antifungals we think are not enough, then you need to couple them with a modified diet, low sugar, low starch diet. So those, I think, are very powerful.

The real challenge is treating the bacterial infections that we find. Again, we can treat the symptoms, but these infections seem to have been very embedded in the microbiome, very resistant to treatment through forming biofilms.

Obviously, we've had some very good success with microbiota transplant, and I can talk about that. We strongly oppose use of antibiotics.

Diet, constipation, and first-line treatments

The studies out of ARI show it's much more likely to worsen problems than to improve them. In fact, it's one of the most common features we see in medical histories of kids with autism is overuse of antibiotics during infancy.

So if there's been an overuse of them, then I think that's a major clue. You probably are at much higher risk of a gut infection or a yeast infection.

So you can try probiotics, you can try prebiotics. Again, with prebiotics, generally the research is mixed on using prebiotics because of the problem you're often giving just one strain like inulin, and that can actually worsen problems in some people.

So you want to give a balance of fiber because that's what the gut is used to. Having a wide variety of fiber sources, wide variety of fruits and vegetables, supplementing with some inulin is probably okay.

I wouldn't overdo it. I would use a variety of prebiotics. And then, but the real issue, the real treatment I think that we've had great success with and others have is our microbiota transplant.

And I can talk about that more if you want. Yeah, I do want to go into that. I want to talk a little bit, though, about a couple of things as related to pans and pandas, because I absolutely agree with you that the overuse and plethora of antibiotics, especially in the first few years of life, can be very detrimental to most kids.

not just those with autism. However, in our Pans Pandas group, when the antibiotic is targeted to a strep infection or to a tick-borne disease in combination with herbals, in my opinion, and I'm a big believer in herbals for all of these, I think, you know, sometimes in those cases it is necessary.

So, but I think it's the use of them and to a great degree, the overuse in the very early parts of life that become much more problematic. Yeah, I think the key issue with antibiotics is that they're very different one from another.

Some are very broad. Some are very target, more targeted. None are as targeted as we'd like. There's a company we're working with that has a really wonderful antibiotic.

We'd really love to get approved, but we were trying to raise millions of dollars to do the studies that we need to get it approved. It's great because it really targets only the harmful ones, but it's not available yet.

Yeah, I know, I know. And you know, Jim, you do such a great job with all of the research that you do. I mean, hundreds and hundreds of published research articles.

I've read a lot of them, not all of them. And you have mentioned, and I have not read, the paper you recently published on Pan's Pandas. Could you talk about that one just a little bit?

Yeah, so I had a relatively smaller role in that, that the PANS-PANDAS group came to me and said they wanted to

develop a questionnaire because there wasn't one that we can use for treatment study.

So if you want to get treatments approved for a condition, you need to be able to evaluate the severity of the symptoms beforehand and after treatment.

And so we've developed questionnaires for a very rare condition, pit Hopkins. We've also developed questionnaires for autism. And so the key factor here is to first survey a group of families, find out what symptoms they feel their child has, and then work with them on developing a questionnaire that matches their symptoms.

It's understandable to families. And then after you've developed that and checked it with one group of families, then the next step is to validate it.

Give it to another group of families and have them take the questionnaire. And then a couple of weeks later, have them take it again when there have been no changes and make sure that you're getting the same answers.

And in general, we found good reliability in this questionnaire. So it's now published. It's out there. Encourage people to use it. Even if they're doing treatments at home, it's really nice to be able to have a standardized questionnaire that you can use.

Yeah, absolutely. And, and we recommend that use on questionnaires quite readily. I mean, Richard Horowitz's questionnaire on Lyme disease, Jill Christa's on mold, the ones that Tonya Murphy and Sue Suito have been part of in Pans Pandas.

The use of validated questionnaires can save families lots of money in specialty testing and can also help all of us clinicians and researchers to better understand what's next to be done to treat the child or what's next to be done to research what's going on in this particular issue.

Absolutely. Absolutely. So, and one other thing I wanted to touch on before we get to the microbiota transplant therapy, was just the whole idea of constipation and treating it.

And I totally agree with what you said. And there's another area where a lot of things nutraceuticaly may be very helpful. aloe, magnesium, sometimes vitamin C, good fluids, all of that.

And where research has shown us again, not just in autism, but in kids with Pans Pandas, that that's stooling once a day at least. And I always say, don't go do it right now during this listening to this podcast, but if you haven't done it today, you should be doing it.

You know, how that pooping is, is so important. And I, I love that I've listened to a couple of the other webinars and podcasts that you've done, and you're always talking about looking at poop and smelling poop.

And I love that. We don't talk enough about poop or farting for that matter. And I think it's really important. Yeah, I mean, roughly a third of the stool is gut bacteria.

And one of the most common comments we have from families is their child's stool has a strange color, and more importantly, can have a very foul odor.

In some extreme cases, the family says when the child has a bowel movement, they go outside the house. That's just so bad. usually not that bad, but usually quite noticeable.

And after microbiota transplant, we see it back to normal. So it really matters. So there's a Bristol stool scale that has been used for many studies, you know, to tell you is the stool unusually hard?

Is it unusually soft or liquid? Or is it forming like a sausage?

Antifungals, antibiotics, and microbiota transplant

And that's really the ideal So many families, when we ask them to then go do a 14-day stool analysis, look at their child's stool in the toilet, they come back and say, I had no idea how bad my child's stool was until I started looking at it.

Because after age five or so, depending on the child, you never see your child's poop anymore. And so they have no idea how bad it is. They may hear them grunt occasionally in the bathroom.

Some kids cry out, but often they have no idea. One of the most important recommendations we have for families is look at your child's poop. Yeah, I love that.

And, you know, like you were talking earlier about encaprecis, you know, those children that have constipation may really have liquid poop around it. But if they're examining the stool, they may have diarrhea or this liquid poop first and then this rabbit pellets.

Again, you're going to be able to understand what's going on if you're really looking at it, smelling it. I wouldn't go as far as tasting it, but that then brings us to the microbiota transplant.

And you know, Jim, I've often laughed that after some of your studies years ago, I'd never drink chocolate milk again. Tell us more about that, why you started studying that, all about, all you've learned, anything you want to talk about.

Yeah, so as I mentioned, the vancomycin study inspired me many years ago that we knew that a powerful antibiotic like vancomycin could kill off bacteria, leading to big improvements in gut symptoms and autism symptoms temporarily.

But within a few weeks, the benefits were lost. So it told us that it's like having a garden filled with weeds. You can pluck all the weeds, but when you stop those weeds, you're just going to grow right back.

So our idea is to pluck and replant. So what the technique we've developed and this follows work by Tom Brody who's really the pioneer, one of the leading pioneers in the field.

He advised us on this was first we do two weeks of vancomycin, a very safe antibiotic when taken orally because almost zero absorption into the gut. And again, the classic study 25 years ago showing it helped.

And then that study, they treated for eight weeks, where two weeks is enough to kill it off, whatever it's going to. And then we do a bowel cleanse, just like you'd have for a colonoscopy prep.

And that's really the only hard part of the study. taking a strong laxative like Miralax or magnesium citrate, and then for several hours having diarrhea.

Our goal is to have just to be very blunt, clear liquid, no solids coming out still. We really want to flush the gut as much as possible. There'll still be a biofilm there.

but remove as much of the competition, go garden as carefully as we can and then replant. So we replant with high dose microbiota and then use a maintenance dose on later days.

And so the high dose microbiota or all microbiota comes from the University of Minnesota now. They have an incredible facility there. They're the leader in the United States in producing microbiota for academic research studies.

They've treated over 8,000 people, over a dozen different health disorders, zero serious adverse effects. It is extremely safe because they spend a lot of money.

of order five to $10,000 to make enough product for a person, because donors are not just healthy, they are exceptionally healthy people. People who are not on any medications, people who have ideal body weight, not

underweight, not overweight.

no history of GI problems in themselves, no GI cancers in their family, just very, very extensive testing. And so our donors are really the top few percent healthiest Americans in the United States.

And wouldn't you want to have gut bacteria like that? And so what we've done is use that product and currently we have both the capsule version that we use.

So you can just swallow the capsule. It passes through the stomach acid, which would otherwise kill off most of what you take. And then it gets into the gut and releases there.

We also now have a powder version because some kids can't swallow capsules. So the powder version, we just mix a little bit of milk or yogurt. We do use chocolate milk to hide the color a little bit.

That's okay. But again, the product is so incredibly pure. It's just 99% bacteria. It just looks like a probiotic. and you just mix it with a little bit of milk or yogurt it's tasteless odorless and then we also have to give an antacid at the same time or a stomach acid suppressant and that works well so we've used both forms we have done a little bit of work with enemas but we find that that didn't was not as effective as the oral route and the reason as you know is that the gut is very long you know of order 28 feet long and You giving an enema only goes a very short distance.

And although most of your gut bacteria is in the colon, you still have some good guys in your small intestine as well. So you get your bacteria from the food you eat, the water you drink, and oral we think is the right way to go.

Yeah. Well, I mean, the study of those donors is so important. Often, you know, with Brody's Protocol, many of my families were trying to do it on their own and finding a donor within their family which has its own genetic and other problems or another donor that's really clean is so hard to do because you don't want somebody that's had multiple antibiotics or infections or So many other things.

So knowing that is so key, I think, for this work. Absolutely. That's so very key. For a C. diff infection, it's common to use a spouse or someone else.

Almost anyone can be a donor for a C. diff infection. where you have life-threatening diarrhea, you get one to two doses, in two to three days you're cured 90% of the time and symptom-free the rest of your life in almost all cases.

But with autism, it's a much harder infection to fight. That's why we have to treat for months this major pretreatment, but in most cases it works. But the exciting news that we've begun to realize now is that we do see decreases in the amounts of these microbiota metabolites as we treat, but not as much as we would like.

So we think we have been underdosing. So in the same way that half an aspirin is good for a headache, But a whole aspirin would be better, and you might need two aspirin for a severe headache.

We're now doing a dosing study to go to higher dose, and we hope to see even more improvement than we've seen so far. So that's our goal. And as per your previous research, you've not just seen improvement in those metabolites, you're also seeing improvement in symptoms, more importantly.

That's right. And not just gut symptoms, certainly neuropsychiatric and neurologic symptoms. Yeah, what's so exciting is, again, we see the improvements in the gut symptoms first.

A little bit later, we begin seeing improvements, especially in the mood-related symptoms, because by affecting dopamine and serotonin, and by normalizing those, getting rid of the harmful metabolites and the melatonin affecting sleep, We often see kids begin to sleep better, they're happier.

The most common comment we get is just their child's happier. Again, that's, you know, serotonin and dopamine have big effects on your happiness. But we see improvements in anxiety.

We had one young man, an adult, who was on five different antidepressants. And after treatment, he said, wow, I haven't felt this good in years. So, anxiety, depression, hyperactivity, aggression, self-injury, these are the sort of mood-related disorders that we think are really driven by these issues.

We also had one person with Tourette's who, eight weeks into the treatment, they were cured of Tourette's. It just disappeared. I don't use the word cure lightly.

So we are anxious to try the treatment on people with seizures. We are now starting to treat some children who have stable seizures. Again, we're very cautious, but we do know that people with seizures, people with epilepsy, not autistic, but just straight epilepsy, have higher levels of P.

creosal even than the autism kids do. So we think many, and we know P. creosal causes seizures in animals. So it's not too surprising. It's causing it in humans as well.

Now, those with ticks or Tourette's like that one, have you studied that anymore? Do you think that's a similar mechanism of action or not sure yet? We can't say for sure, we think it's similar, but we've had only one case of Tourette's in our study because we're studying children with autism and one of them also had Tourette's, so we'll see.

But certainly many children improve on their repetitive stims, on their repetitive vocalizations, and that has some relationship. But we really need to do a study with more children who have Tourette's to see if there's additional hope for them as well.

PANS/PANDAS research, questionnaires, and future studies

And correct me if I'm wrong, but the microbiotic transplant is only available through research studies from your perspective now, correct? That's right.

That's right. So that's why we've done phase one studies. We've done several phase two studies. We're now gearing up to do what we hope will be a final phase three study.

There's just one little detail we need to raise about $20 million to be able to do that last big study. But we're partway there. We formed a company to be able to fund our final studies.

And the amazing thing is we've had 120 autism families invest a total of 10 million so far in our company. So our company is very unusual. We're funded by autism families to help autism families.

But now we need to raise 20 million for a final phase three study. And so we are talking with some venture capital firms too. But honestly, we'd much rather have investors from the autism community because let me just say there's the potential to be wildly profitable and we'd like to see those profits go to autism families.

And we'd like them to share a motivation. In speaking with many companies, they say, we'd like to You know, we think you have a great plan, but we think your plan pricing is too low, and we want to keep our prices low.

Our goal is to get it approved by the FDA, then it will be covered by Medicaid, likely to be covered by insurance. We want to make it free or as close to free as possible for every family.

Yeah, yeah, you know, not just great research, great goals, and great ethics. So that is always something that I and many of the people listening so appreciate because this is a very expensive road to hoe, whether your child has autism or pans pandas.

And expensive for many, you know, not just the financial end, but the effort end and the emotional, psychological end for all the families, as you know.

Yeah. Then we've spoken with a couple of PANs organizations and they'd say, yeah, we'd love to do a study of

MTT. They've come to us about it, but they just don't have the money to do it.

These studies are unfortunately very expensive. We'd need about a million dollars to do a study for say 20 kids with Pitt-Hopkin, with PANDIS. But I think it'd be fascinating to do even a small pilot.

I think that, again, the fluctuations in Pans-Pandas, if we could identify that with fluctuations in the gut microbiome, and we can do it with just our simple urine tests, get a urine when they are flaring and when they aren't, I think that would be really fascinating to see.

I do too. I think that would be fabulous and I'm going to work on that. I'm going to work on some Pan's Pandas donations for you because I think we need to understand certainly with Pan's Pandas there can be a flare because they have a virus.

There could be a flare because they were exposed to mold or you know a plethora of things but what is really going on when they have that flare and if we can find some of these metabolites in an easy urine test rather than having to go for a blood test or more invasive studies and interventions.

That would be remarkable. And I think one important thing too is that with autism, in general, you inherit most of your gut microbiome from your mother.

So assuming, especially if they're born by a vaginal normal birth as opposed to a C-section. And so for children with autism, where the symptoms begin very early in life, we think that's a major driving force.

So if a mother has one child with autism, we'd urge them to again check their gut microbiome early on before having another child if possible. With Pans Pandas, if it's occurring later in life, as you say, there are a variety of other things that could be leading to those disruptions.

Maybe that's why most of them don't have autism but have other symptoms because it struck later in life. They had enough time for the child to develop partway.

Yeah, but I have to say clinically, I find a lot of these children that later develop pans pandas also have a very disrupted gut milieu. You know, a mom that had multiple antibiotics or born by C-section or, you know, all of the classic things that we think about with autism.

And I think there's a spectrum to all of this. And, you know, those children may have been lucky enough to be neurotypical in the first several years of life, but unlucky enough that some environmental trigger, infectious trigger came in on a somewhat compromised gut that they were getting by on.

But now that trigger, you know, as we always say, genetics loads the gun and environment pulls the trigger. That trigger may just be much later. But there's differences early on that I think would be fascinating to research more.

Absolutely. So there's so many, so many places where I know many of my listeners want to go. So first of all, you've published so much, where could the listeners, and there are so practitioners listening, where can they find your published research?

Sure. So one place to go is to our ASU website, autism.asu.edu. They can also go to our gut brain access website for more in the business side and specific to microbiota.

So that's just GBAT, gut brain access therapeutics, gbat.com. If they want to learn more about our nutritional supplement side of things, then it's autism and for nutrition, R for research, C for centered.org.

That's our nonprofit that distributes our vitamin mineral supplement and gives general recommendations. That's great. And then if somebody wants to order the microbial-derived metabolite gut health test, how do they do that?

How can they order that? Yeah, so the name of the company is Analudos. It was originally written to say analite,

but the first four letters, A-N-A-L, so anal, A-N-A-L-U-T-O-S.

Okay, Analudos. Okay. Okay. And they can order it right there. Okay. And then if they're interested in the clinical trials you're doing and the microbiota transplant, is that a separate website or where would they go?

Just go to my ASU website and they can get on our email list and we'll let people know whenever we have a new study coming out. Again, the challenge is when we have an opening for 50 people, we have, you know, a thousand applications in a week.

We just get inundated. I get emails every day. from a family wanting to be in our study. Again, we'd love to have them, but we're limited by finances, how many we can admit.

Yeah. Yeah. Well, the research is unending, Jen, and I hope you never stop because I think we've learned so much through what you've done, not just in the autism world, but as applies to so many of our other children.

And any last words of wisdom or experience or hope you want to leave any of the families with? I think the main thing I'd say is just we've seen so many of children improve, not everyone.

Right now, microbiota transplant therapy is a treatment. It leads to substantial benefits, but it's not a cure. But it is a substantial benefit for many people.

Again, most families just say their child's happier. But as we do more research, we think we're going to be able to improve on the treatment to help more people.

And again, probably the most important message I'd give is, sure, about 40% of kids with autism have obvious gut symptoms, but most of the rest have a hidden gut symptom and the only symptom is worse autism.

So we encourage people to go get it tested somehow. If you don't use our tests or others, but ours is, we think especially good. Well, if you had a hand in it, I would have to agree.

So Jim, thank you so much for joining us today. Thanks for talking about all this really incredible research and hope for all of our families. So thanks everybody for being here and we'll see you next time on Demystifying Pan's Pandas.

Thanks, Jim. Thank you. That's it for today's episode of Demystifying Pan's Pandas. I hope you're walking away with insights, tools, and hope to help you and your child on this journey.

If you found today's conversation valuable, be sure to subscribe so you never miss an episode. Share this podcast with anyone who might need it. It could be the lifeline they're searching for.

And if you have a moment, leaving a review helps us reach even more families who deserve answers. Also, for more information, training, and community, check out our website, drohara.com, and join our annual membership.

And remember, every step forward, no matter how small, brings us closer to healing and understanding. Until next time, be present, be hopeful, and we look forward to seeing you next time on Demystifying Pan's Pandas.