Depression And Anxiety In PCOS Patients Transcript

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Introduction to Integrative Psychiatry and PCOS

Welcome to this episode of the PCOS SOS Summit. I'm your host, Dr. Felice Gersh. With me for this interview is Dr. James Greenblatt. Now, I've known Dr.

Greenblatt for many years, and he is truly a pioneer in incorporating integrative and functional medicine into the world of psychiatry. And so we're going to do a deep dove into how this really applies to women of all sorts, but especially especially women with PCOS who suffer so greatly from issues involving mental health like anxiety and depression.

So welcome, Dr. Greenblatt. Jim, thank you so much for joining me. And I pleasure. I'm glad to be with you today. So please tell us a little bit about how you entered into this world of integrative and functional medicine, psychiatry, and what you've been doing with it in your practice.

Sure, I met traditionally trained psychiatrists practicing over 30 years. I'm board certified in adult and child psychiatry, and I've always been interested in nutrition and mental health.

And soon after coming out as a practicing psychiatrist, I just quickly realized the limitations of our current model, which is primarily medications. It's really symptomatic based treatment that when it works, it can be helpful, but it doesn't look at the underlying cause.

So my career has really focused on helping clinicians and patients understand potential underlying causes of depression and anxiety. So I 100% agree there can be definitely a role for medication, but it's not addressing underlying root causes.

So what are some of those underlying root causes and how can we try to deal with them in a maybe more holistic fashion? Yeah, the list is quite endless, actually.

You know, I have a I expression, you know, anatomy for a psychiatrist is just we have a neck. You know, everything that happens in the body affects the brain and vice versa.

So any of our systemic problems from hormones to nutritional deficiencies to autoimmune disorders to now a revolution in understanding how infections affect mental health, it is really this vast landscape of typical medical problems we now understand affect behavior and mood, as well as some common medications that we may prescribe for other particular illnesses.

Finding Root Causes of Depression and Anxiety

So our goal in a integrative, functional approach to psychiatry is really testing, objective testing to try to find these underlying causes. Well, I think it's really fascinating because it's been so unfortunate that psychiatry has so traditionally sort of ignored the connection to the rest of the body.

Right. And in terms of doing this testing, what where do you start? Typically, if, say, a woman with PCOS comes in and she has the whole array of issues involving hormonal imbalance and gut problems, sleep problems, stress problems, where would you even start?

Well, I think just the the package of PCOS that you've articulated and written about and described where there are so many metabolic complications from hormonal to inflammation, it really is a almost perfect storm for how we describe the underlying causes of depression and anxiety.

And as you know, your patients with PCOS have much higher incidence of depression and anxiety. So we could go

through a long list. But some of the core nutritional deficiencies that are most common are really some of the basic tests that any physician can order, like vitamin D deficiency, like vitamin B12 deficiency, and understanding the role of inflammation and depression.

Well, let's talk about that. I know sometimes the phrase neuroinflammation has been utilized and systemic inflammation, does that typically lead to neuroinflammation?

And if you're systemically like total body inflamed, will that typically affect your brain? And it's quite dramatic how many years of research that we have in the field of psychiatry demonstrating that, yes, systemic inflammation affects mood disorders in particular, and actually could be a predictor if someone has inflammatory markers that they're not depressed.

We have research that we've demonstrated in the next few years is more likely to demonstrate depression. And we actually know the mechanism. We understand how some of these inflammatory markers affect serotonin synthesis in the brain.

And the reason that there's been so much research is not that people are looking at the underlying cause of the inflammation. But guess what? We can develop a pharmaceutical and anti-inflammatory medication is being looked at for the treatment of depression.

Wow. That's like a whole new way of looking at it now in terms of like neurotransmitters. You mentioned serotonin, so maybe you could just explain to our audience a little bit about the role of neurotransmitters and what they mean for mood issues.

Sure. We have hundreds of neurotransmitters in the body that most of them are synthesized from amino acids we get in our diet. So a diet with adequate protein is critical.

And to make these neurotransmitters, many people have heard of serotonin, dopamine, norepinephrine. Not only do we need an adequate protein in our diet, but we need vitamins and minerals to convert that amino acid into that neurotransmitter and many of these micronutrients are what are commonly deficient in patients with PCOS.

Inflammation, Neurotransmitters, and Nutrient Deficiencies

And these would be nutrients like the B vitamins, folate and B12. I mentioned Vitamin D is actually one of the most important steps in the synthesis of serotonin.

So without those nutrients being adequate, these the synthesis of these neurotransmitters are not optimal and can result in depression. Well, that's really important.

And I know serotonin is a precursor to melatonin, isn't it? Absolutely. So obviously for sleep disturbance, you need melatonin, you need adequate serotonin, and you also need a trace mineral zinc, which is also not uncommonly deficient that we see in patients with inflammation and PCOS.

So do you do a lot of micronutrient testing or some of these are not common? Like you mentioned, B12 is commonly measured vitamin D. But what about these other like trace minerals?

You just assume people are deficient in them or do you actually measure them? You know, for most psychiatric patients, being seen in our clinic or our that we teach in our training programs.

Yes. The more testing, the more we can develop a personalized kind of treatment plan. But for so many patients with PCOS, we know there is inflammation, insulin resistant and very likely nutrient deficiencies.

We can get a lot of information from routine tests like vitamin B12, Vitamin D, iron and a genetic test looking at MPH of our variants. But ideally those that they can afford it more micronutrient testing can be valuable.

Well, let's talk about some of these different vitamins and minerals and more specifically what they might do. So you mentioned B12, so maybe just tell a little bit more about the different role that B12 can play in terms of mental health.

Sure. The the important link, I think, with PCOS is I believe metformin is a common medication used and that medication can result in in lower levels of B12.

So it's one of the reasons that we want to check B12 levels regularly. There could be other reasons someone is deficient like a vegan diet or just genetic and higher needs for B12.

But B12 is one of these vitamins that the there's not one classic symptom picture of deficiencies. We know it affects every major psychiatric illness we've seen low B12 associated with depression, anxiety, panic attacks, even major psychiatric illnesses like bipolar disorder.

So it's a simple blood test and it's very simple to replete and it's commonly deficient in patients with PCOS. And in addition to metformin, which depletes B12, a lot of women with PCOS are on oral contraceptives, which can also be depleted.

So what about some of the other things that I know that can be low in women with PCOS? And do they have a role, for example, magnesium? Yes, I believe in our practice in a mental health practice, magnesium is the most common deficiency that we see across all psychiatric diagnosis, anxiety, depression, ADHD.

But again, that's a subset of the metabolic disturbances in people with PCOS makes them. In my experience, I don't know if there's research more likely to be deficient in some of these trace minerals and that magnesium and zinc are the two most common that I've repeatedly seen in our micronutrient evaluations.

So it's so interesting because zinc is also given to help heal wounds and it can help with acne. So zinc actually has another role in terms of brain health and mood.

Maybe you could like is it involved in creating enzymes or is it involved in the immune system or what does zinc do? Do we even know? Yeah, most of my career is looking at zinc with many kinds of eating disorders, particularly, and anorexia and binge eating disorder.

And what we find is that some of the enzymes in the brain, both structural and functional, require zinc.

B12, Magnesium, Zinc, and Trace Minerals

So to make all those neurotransmitters that we talked about, to make melatonin, to support sleep. You mentioned the immune system, wound healing, but also digestion.

And this is something that's not often discussed is zinc, is the cofactor in making hydrochloric acid to digest acid in the stomach, to break down protein.

And every other pancreatic enzymes break down fats and carbohydrates and proteins, utilize zinc. So so many of our patients, both with PCOS and other metabolic disturbances, you know, complain about poor digestion, bloating, distention.

And zinc, again, is a cofactor. And all these enzymes that can support optimal digestion, it's really essential. And there's too many people rush to a vegan diet as an attempt for help.

They often go further, further away from getting adequate zinc. Yeah, there aren't that many foods that people eat that have a lot of zinc. I always come back to oysters, but I don't know anyone that's eating a lot of oysters.

So it sounds like zinc would be a good supplement. Do you have an eye recommendation in terms of dosing? Sure. Yeah. As you said, it's primarily available in animal products.

So, you know, meats, you know, have zinc and oysters have the most. And so when we're looking at zinc supplementation, it's not high dosages. It's typically 15 to 30 milligrams a day or twice a day.

You want to take zinc with food so someone doesn't get nauseous. And you want to be careful taking zinc by itself for long periods of time because it can set up a copper imbalance.

So for short periods of time, 15 to 30 milligrams of zinc can be very helpful. If someone is taking it for more than 46 months, you'd want to make sure there's a copper in the diet or in a multivitamin.

Well, it sounds like zinc should be on everyone's radar. And what about some of the other trace minerals? Like, do we have any data on their relationship to mental health, like selenium or manganese or lithium or iodine?

Any of those play a role. Not that I've seen in the literature. In my experience. I think the one that would keep coming up in my thinking would be chromium.

So chromium is a is a trace mineral that we often see deficient in some of our diabetic patients or even family histories of diabetes or PCOS patients.

So chromium helps regulate blood sugar, but it's also been helpful for mood. So chromium would be one of the trace minerals that we'd be looking at as a supplement for those with PCOS and mood disorder.

Well, so this is really fascinating. So in terms of diet, do you work with diet or mostly with supplements or a blend of the two? You know, a blend of the two.

Most of the patients have been told a thousand times and it's in their head about, you know, just eat better and exercise. So as a psychiatrist, I try to work with our patients.

Doing the testing has been incredibly helpful because they can see and see their B12 level might be lower. Their D level or their chromium. So the objective testing just and I think is is a better therapeutic alliance to help people get motivated because doing the right thing is, I think, challenging.

And there's many roadblocks in changing behaviors. So by doing the testing and sitting across from a patient and letting them see, you know, this level is low and then helping them maybe pick one to supplement at a time to begin to replete as they begin to understand the role of diet as well.

Now I know that with PMS and many women with PCOS have who do have more regular cycles, some do they do often have PMS, sometimes they talk about the role of B6.

So what does B6 do? Yeah, B6, you know, is required again for the synthesis of all these neurotransmitter players. So it's pretty critical. And particularly there's been research for many years around the PMS symptoms and B6.

So I would think one of the we were going to give a general supplement for PCOS patients, you know, a B-COMPLEX would be certainly a strong recommendation because you wouldn't have to do any testing.

So you would want to do testing for vitamin D. When you're testing for B12. But for things like magnesium, zinc, b-complex and maybe even omega threes, it wouldn't need to be any expensive testing to recommend those supplements to support some of the both the inflammatory markers and the mood changes so many patients experience.

Well, clearly deficiency is play a role. What about when people eat chemicals in their diet? You know, they're eating a lot of processed foods. Do you see that linking to anxiety and depression as well?

Yes. Most of us, including our grandparents, you know, been talking about diet. And you know what we eat and how it affects our behavior. But now it's very clear we have research that clearly articulated across academic journals.

Ultra processed foods increases the rate of anxiety, depression, even dementia. So now it's not, you know, your mother. It is now clearly documented in the research.

And hopefully this will trickle down to mental health professionals beginning to help patients make changes, particularly with their children and young adults.

Diet, Sugar, and Processed Foods

Well, so, yes, for sure. And with way back from quite many years ago, they talked about the Twinkie defense, right. Like the I did the crying because I was eating too many Twinkies and so actually eating too much sugar can that you know, in addition to the chemicals and the processed foods just having a lot of sugar in the diet, can that affect your mood?

Yes. Again, when I started my career, you know, it was clear to me and to parents, but I didn't have the research in the early nineties. But then we now have clearly documented research on how sugar affects behavior, behavior, mood as well as a host of other kind of mental health problems.

You know, we talked about B vitamins for patients with PCOS. And, you know, I kind of referred to sugar as a nutritional vacuum cleaner, just depleting our B vitamins.

So the amount of refined sugar that has no micronutrients to help digest it is just going to rob the B vitamins that we have and create these deficiencies.

Well, so we know that it's what you eat. It's what you don't eat. What about the time you eat? Does that affect your mood? Like what if someone's like eating mostly at night or they get up in the middle of the night and have a snack?

Can that affect mood as well or is that just a reflection of mood? I think it's both a reflection of mood. I think, you know, there's not a lot of research looking at timing in terms of mood.

There's certainly research on eating at night and insulin resistance and some of the other problems that might exacerbate PCOS. But we don't have a lot of good research on that timing of diet and mood.

And what you talked about like anorexic. So the vast majority of people who suffer from eating disorders are women, and women with PCOS often suffer from binge eating disorder.

Is that linked to nutrients in some form or fashion or that it's considered a mental health problem? Yeah. Binge eating disorder is actually the most common eating disorder in the United States.

It's more common than anorexia and bulimia combined. And as you said, it is not uncommon in patients with PCOS. And what we found over many years of studying this is they're very common nutritional deficiencies.

We can think of appetite regulation as kind of an optimal environment with a break in control of hunger and satiety and without optimal nutritional support for these neurotransmitters like serotonin, people get hungry and they don't feel full.

So that mechanism is just off. And it it is very demoralizing. It's that yo yo diet is a shame. It's a stigma. I have patients with binge eating disorder who do not share the stories with their spouse because it's too embarrassing or their doctors because they've tried.

And they just kind of internalize this shame and and feel the low self esteem. So my career around eating disorder has been built around helping individuals with binge eating disorder understand it is biologically based and too many patients with PCOS struggle with binge eating disorder.

And where would you begin if a woman came to you and and says, you know, I have PCOS and like I just sit there

and the bag of chips keeps calling my name and I just think about it.

And I would hold, you know, I keep myself away from those chips. And then after a while, I just give up and I eat the whole bag and then I hate myself.

So like, where would you begin for someone like that? And there are many patients I see like that. Sure. I mean, the first step is just reassuring them that we can help, that it is treatable, it is a biological abnormality, a little genetics and a lot of kind of hormonal environmental factors that we can treat.

And we have medications that can be very helpful. And the first step would be looking at nutritional deficiencies. Many of we already described we've seen very, very significant low levels of vitamin D in our binge eating disorder patients.

Binge Eating, Sleep, and Compulsive Behaviors

And as we said, you need vitamin D to make serotonin. Serotonin regulates appetite. So we look at a comprehensive nutritional panel and if needed, we have medications that can provide some relief.

So I'm quite confident someone with binge eating disorder can get control over appetite. So that's welcome news because so many people, like you said, they just keep it a secret.

But they they have such low self-esteem because of it. And you mentioned vitamin D. What about in terms of like sleep, like some people talk about, you know, you eat a turkey dinner, you have tryptophan and then you fall asleep.

But a lot of women with PCOS have sleep disorders and they have trouble falling asleep. Insomnia are there are certain foods that can help them because sleep is essential for mental health, correct.

So are there certain foods that or nutrients that may be deficient and then they can't sleep? Yeah, absolutely. I mean, I don't think there's a we can argue between exercise and sleep as the two best antidepressants that we have.

So exercise and it's hard if you're depressed and not motivated, but it works better than any medication. And optimizing sleep has to be the number one priority for someone's struggling with depression.

And a lot of the nutritional deficiencies we've discussed today will support sleep, zinc, helping to make melatonin, magnesium, supporting sleep and B12 and folate.

So all those micronutrients will support sleep. But for someone with PCOS sleep disturbance, I'll use any nutraceutical or if needed short term pharmaceutical to help adjust that sleep cycle because have you, as you describe it, is critical for mental health.

Now there are many people I see with PCOS who have other habits that are somewhat self-destructive, like skin picking, especially because they have acne and they just can't like keep their hands off their their face or they sometimes pull hair that now those count as mental illnesses as well.

Is that part of anxiety? Is that how they release anxiety or what's going on and what can you do to help people who like won't stop picking at their face and or pulling hair?

Yeah, those are, you know, not uncommon things that we see in a mental health practice. It's certainly often times anxiety, but some of these repetitive compulsive behaviors oftentimes need to be treated differently.

Again, some of the micronutrients we discussed can be very helpful, but we also may dig deeper. And there's a nutritional supplement called and acetyl cysteine that can help with skin picking and the hair pulling.

So that's important. And there are also medications that can help. But again, that kind of ongoing compulsive behavior, one just reinforces this low self esteem.

And I'm weak and I can't stop. And the most important message I can share and it is biologically driven compulsive behavior and there is, you know, cognitive behavioral therapy that could help.

But my first step is always to try to relieve some of that with a biological intervention, be it a nutraceutical like a skill system or a medication. So NASA is assisting, is composed of like three different amino acids.

So do you use amino acids as a distinctive type of treatment? Different types of amino acids. Amino acids been a huge part of my practice for a depression for for many years because regardless of diet, we've just found those with poor digestion have low levels, amino acids.

And we started the conversation talking about that. It's these amino acids that are the building blocks to neurotransmitters. So I have people spending millions of dollars and all these fancy organic foods and flown in from Alaska and they're, you know, grass fed beef.

And then we look at amino acid levels and they're very low. You're essentially not digesting and absorbing this expensive food. So by providing these amino acid supplements and more importantly, providing digestive enzymes with acid, they can now break down the protein, absorb the amino acids.

But that is often a common deficiency that we see in some of the of the cutters, the self-injury. And oftentimes in some of these compulsive pictures, as you described as well, amino acid deficiencies.

Well, so you're saying that people can have these measured like is that a commonly done test to measure your amino acids? It's you know, it's common in the world of functional medicine in terms of, you know, our psychiatric practice.

It's not common in terms of your PCP doing these tests. It was probably not covered by insurance, but oftentimes it can be very revealing and kind of point to a treatment path that can relieve many of these symptoms.

So you mentioned, which is really critically important, it's not just what you eat, it's how you digest and absorb it. And that gets to something that's been talked about.

The gut brain axis, maybe you can comment is that some is who's talking to who in the gut brain axis? Well, it it's a two way highway. It goes both ways.

So, you know, the food we eat affects our gut and the trillions of organisms in our gut that communicate with the rest of our body and particularly our brain.

So it is a very powerful, we call symbiotic relationship between what happens in our gut and what happens in the brain. There is some more brain tissue or nervous tissue in our gut than in our brain.

And I think we're just beginning to understand this relationship. So we we both we all understand in stress, you know, we can get knots and feel our gut.

But we also know that this can communicate back to the brain. So a poor diet affects the gut bacteria, it can affect mood and behavior and antibiotics and a whole host of other environmental factors and really kind of wreak havoc on our gut.

And we're just beginning to understand how that affects mental health and mental illness. So you mentioned antibiotics. Now many women with PCOS who have acne, they go to the dermatologist and they're put on antibiotics sometimes for very long periods of time.

Is that something that could be a problem for changing the gut microbiome? Oh, absolu. I mean, when I started

practice as a child psychiatrist, these were the days where kids were put on antibiotics three or four times a year for many, many years.

And we would see very abnormal gut bacteria. So yeast overgrowth and bacteria overgrowth. And now we understand it affects mood, depression and anxiety.

So, yes, someone who's been on antibiotics, the simplest is probably take a good probiotics, but sometimes they're permanent changes to the gut that when we look at through various again, functional medicine testing, we can determine what's wrong and and have a little more precision based targeted treatment approach.

Well so definitely probiotics then have a role is there a particular type of probiotic or just like you go to the store and you buy a general probiotic?

Yeah. I mean, I think I think this every company has their favorite and they, you know, but I call that label therapy. I mean, I'm not sure the science is there as to what's the best.

So I just recommend a multi strain, you know, probiotic. So not just one isolated strain.

Gut-Brain Axis and Microbiome Health

I know there's been talk about some of the products of metabolism of the of the bacteria in the gut, like these short chain fatty acids, maybe you could say, like do they have a role in mental health as well?

Or just for maintaining gut health itself? I think probably the gut health and which indirectly, you know, will affect, you know, mental health. I think if there's a breakdown in the integrity of the gut, then, you know, immunological complexes of food allergies can be more common and a whole host of other kind of inflammatory actions could develop.

So gut health based on both our diet, our stress level is critical to mental health. And there's a distinction between depression and anxiety. So why would it be that one person has more anxiety and another person has more depression?

Is it related to their diet, their individual deficiencies or or something else? You know, the longer I practice psychiatry, the more important I can use words like, you know, family history.

So much of what happens to us, you know, is dependent on our kind of genetic vulnerability. So I can try to 30 year old women with very low B12 and one might have anxiety and panic attacks and one might be depressed, unable to get out of bed.

Both have B12 deficiencies. They both feel better with B12. So I think there's not a path to a depression or anxiety. You know, stress and trauma is a path to both mental health disorders.

And I think so much is dependent on genetic vulnerability. So to look at your family history, it sounds like. Absolutely. And go back a couple of generations.

And don't forget, aunts and uncles, because that kind of liability is passed across many generations. So do you think that going way back to like when you're born, like the mode of delivery or if you were a bottle or breast fed, does that seem to link into childhood and then subsequent depression and anxiety when Tom was an adult.

You know, the research says yes, but as a psychiatrist, I try to avoid the topic because then people just feel guilty. The parents feel guilty. And in breastfeed or I had the C-section and but yes, I think, you know, both birth trauma not being breastfed certainly does create, you know, a higher likelihood for some of these mental health challenges and certainly inflammation, which can affect all mental health issues.

And sort of a slightly separate topic sometimes in integrative medicine, they talk about like energetics, like the

power of touch or feeling or sending signals, you know, of goodwill between people.

Do you think there's a role in psychiatry for utilizing energetics on energy, medicine or just like touch and or do you think there's like something that's really to that?

You know, absolutely. I mean, I think that the problem I guess I can complain about the field is a country. The problem with our field is that people just get compartmentalized into the one aspect of treatment.

There's the psycho pharm community is the integrative community. There's everyone should just do yoga and mindfulness and it's very hard to put the entire package in front of a patient to understand everything that's involved in mental health.

But certainly the studies have been quite clear for hundreds of years that human connection and whatever that means, both bio energetically as well as hormonally, is critically important for mental health.

So that has been a powerful tool that we all know about it and there shouldn't researchers that are making a deep dove into those connections and how those relationships help longevity and mental health.

It's just been harder for colleagues to put that into practice, but it's a very important. So do you recommend different mind body practices like you should listen to soft music or do guided imagery or of some form of meditation?

Is that something that more PCOS patients out there listening would want to make part of their mental health regimen? Yeah, I mean, so if we put exercise and sleep as the top of the lifestyle list, if they can, and then, you know, I've used the term like vitamin M for mindfulness, it is very easy to learn and understand.

Mind-Body Practices, Family Support, and Resources

And I think the more you can appreciate it, the better. And I think every patient should take a course and understand it. What I don't practice is a particular style, so a mindfulness practice can be just as easily done while exercising or walking or being with your family.

So I think it's a it's a quality, a state of health and being that's important to understand. But everyone's different. So I don't tell patients to sit and meditate for 30 minutes because many of our patients can't.

But I do, you know, help patients support and understand. It's something like meditation or mindfulness. And again, I show them how we can change the brain, both structurally and functionally.

And when they see that they're a little more motivated to least learn about it and find a path that works for them. I think that's beautiful advice. And what about nature or being out in sunlight?

What's the data on that for? Improving mental health. Is certainly increasing and that's why we do a lot of work with ADHD kids and ADHD adults. And so our mindfulness recommendations are walking in nature because we also know there's improved attention and improved brainwave patterns.

And when individuals are surrounded by nature, it's pretty dramatic. And do you work with the families? I mean, so hard sometimes my PCOS patients, their families are not that sympathetic.

They just say, like you said, the doctor says, why don't you just eat less and exercise more and goodbye, you know? So like, how do you deal with the family dynamic if you have a woman and her spouse is like doesn't really get it, like what she's going through or the parents don't get it.

Like, do you have any like suggestions for how to get the family unit to kind of work together to be supportive? Yeah. I mean, I think for PCOS, like so many of the major psychiatric illnesses that that I deal with and as a child psychiatrist, the family system is, you know, the path towards healing.

And, you know, my approach is step one, getting everyone in the room and understanding what we've discussed, that this is biology. And once we can do that, whether we should pictures of the brain or insulin resistance or hormone paths, whatever we can do to help people understand the biology, then we step two is eliminating the blame game.

You know, this is not because your child is lazy. This is not because your child ate too many potato chips. This is, you know, a hormonal, biologically based illness.

The depression results from this. And then we can fix it. But we need to work together. So once we can eliminate the blame game, I think there is a more therapeutic path to work with the family supporting each other.

I think this whole conversation, we had just so much hope and also, like you said, takes the blame off of the individual when you have PCOS or any other issue that's going on that's affecting your health and your mental health that, you know, stop blaming yourself.

Look for the solution. Like you said, nutritional sleep, exercise, find, find the real pathway. And for people out there who don't have doctors or health care providers that really understand what you just told to them, what would you suggest?

I mean, can they do a lot of this on their own? How would they know? It's like, well, I can handle this myself now that I've heard all this or maybe like this is like beyond that point, they need to have a professional get involved like how how can they decide what to do?

Well, I think it's it's always best to work with a health professional. But some of the things we talked about are just available now. And consumers are getting better educated and there are now easier access to clinicians online and testing so people can really take control of their health and make these important changes.

Right. So a lot people can really take charge themselves. And I know that you've written several books. Maybe you could share that with our audience. Like how can they access more information and get a hold of your books and learn more about this whole area of integrative and functional medicine Psychiatry?

Sure, yeah. I've written about books, but for PCOS, probably the most important would be the books on integrative medicine for binge eating disorder and our book on integrative Medicine for depression.

That covers all the things that we've talked about. And then we have an educational platform, psychiatryredefined.org where we go into details where people can learn about nutrition affects brain function and mental health.

Well, everyone listen to this again and be sure to get those books. I can tell you that I've read many of your books and they are fantastic and I've participated with you in your great platform and it really is just a gem.

Everyone who's interested in mental health and that should be everyone should definitely take a look. Dr. Greenblatt, Jim, thank you so much for joining me for this really, really informative deep dive into the role of nutrition and other lifestyle issues and how it relates to mental health and really positive steps that every woman with PCOS can take to improve her mental health status.

So thank you again so much. My pleasure. It's good to be with you, Felice. Take care.