



Jessica Drummond, MPT, CCN, CHC

Hi and welcome. I'm Jessica Drummond, founder of the Integrative Women's Health Institute. And welcome, welcome. I am here to speak with you today about how to recover, how to help your clients recover from long COVID using an integrative recovery strategy. And just to introduce myself, for those of you who don't know me, my name is Dr. Jessica Drummond. I am the founder of the Integrative Women's Health Institute. And my background is that I have a master's and - Hi and welcome. I'm Jessica Drummond, founder of the Integrative Women's Health Institute.

And welcome, welcome. I am here to speak with you today about how to recover, how to help your clients recover from long COVID using an integrative recovery strategy. And just to introduce myself, for those of you who don't know me, my name is Dr. Jessica Drummond. I am the founder of the Integrative Women's Health Institute. And my background is that I have a master's and license in physical therapy, and a doctorate and license in clinical nutrition. I am also a board certified health coach, and I work training health and wellness coaches, training clinicians of all types, all backgrounds, all over the world actually, in functional nutrition strategies for women's health. And I also run an Integrative Health Clinic for Women's Health. So, let's dive right into our presentation on long COVID.

All right, so long COVID is a topic that is near and dear to my heart, unfortunately, because I am a person who has lived with long COVID for just over the past year and have learned a heck of a lot through my own journey about how to heal this condition. And it so resonates with everything that we do in functional nutrition and functional medicine to help people with chronic illnesses of all sorts. And I've been working with women with chronic illness for 25 years, most specifically, endometriosis, vulvodynia, other chronic pelvic pain conditions. And so, I've been steeped in this literature for decades, and it's been really valuable for my recovery from long COVID. So, let's get started. So, to tell you a little bit about my story to keep it interesting. My story began Christmas morning of 2020 when it was about day nine of my super mild COVID infection.

I had a very easy case, I had no fear of COVID., I wasn't worried about COVID at all in the sense that I was mindful, I was concerned to protect people in my life who were more medically fragile, but I was a very healthy 46-year-old woman. I was an athlete, I was a working mom, I had awesome vitamin D levels, right? I had everything that you could ask for, I had the best blood type, right? I had everything you could ask for according to literature to be low risk. And yet, that morning something shifted and I literally just couldn't breathe, it was as if someone poured hot tar in the lower parts of my lungs and my resting heart rate just skyrocketed into the 130s, the 150s, I couldn't sleep, I couldn't breathe, I couldn't relax. So, I went to the hospital and was given steroids, and hydration, and IV fluids. And the expectation was that, "You know, you're healthy, you'll be fine in a week or two, ready to be back to recovery by New Year's." And this is when I first began to recognize within my own mind and heart, ableism.

I really had always valued health, I've been a very healthy person my entire life. I had one other kind of brush with mystery illness, if you will, after the birth of my first daughter almost 20 years ago. And even that though, once I understood it, I was able to recover really quickly. And so, going into having this

COVID infection, this was pre-vaccine, so I was unvaccinated at the time, but I really was very fit, I was working out, you know, most days every week I was running a global company, I'm a busy working mom. You know, I was all in and I've eaten gluten-free, dairy-free, soy-free, sugar free, tons of vegetables, you know, low carb, my blood sugar was perfect. I was a great sleeper, I've been wearing fitness tracking devices for years. And by all measures, my metabolic health was perfect. And I really was shocked by how sick I got in terms of not so much how sick I got with my COVID infection 'cause I did have that couple of days with pretty intense symptoms. But beyond that, the problem was I never really got better from it.

So, like most people with long COVID, I walked into this experience saying, "Hey, Hey, you know, I was really fit, really healthy. I was busy, working full time, prime of my life, help me, what the heck's going on?" Right, and so I had to see in my own mind, my tendency to believe that people really had the capacity to avoid something like this, my own internalized ableism. And I think many of us experienced this, and I really was not aware of it until this experience. So, let me back it up and show you how fit and healthy I was. So, in November of 2020, I spent the weekend hiking ski mountains with my family. We didn't have any snow at that weekend, so we didn't ski, but we were hiking the ski mountains.

I was taking miles long walks several times a week, I was doing HIIT classes, hot yoga, tons of I was meditating once or twice every day, I was outdoors much of the time, I had total autonomy over my schedule. So, I was in a really good place to confront this virus from a host resilience standpoint. But one thing that I think about when I think about how I functioned in the world prior to COVID versus after is that I was really a hundred percent dedicated to no sugar, no dairy, no gluten, you know, eating really, really perfectly, exercising, going to bed on time. And it's funny that year was the first Thanksgiving I had without my grandmother, who lived to be well into her late 90s, she died at age 97 without being sick

very much at all, other than the last year or so of her life when there was a bit of a decline, but she cooked and was active and vibrant, and her brain was vibrant till really very near the end. And I brought turnips, mashed turnips to our Thanksgiving celebration in honor of her, but left out the butter. And now, I understand that having a clean diet and a fit body is helpful, but not sufficient for avoiding long COVID. And in fact, women of middle age who are very fit may be at higher risk for this condition women in particular, although certainly many, many men have this as well. And from a nervous system standpoint, I started to realize the error of being so aggressively committed to a super clean lifestyle that I perhaps wasn't toning my nervous system to be flexible enough to not be concerned when something kind of rocked the perfection ship, if you will.

So, as I said, it's a complex, it's a really complex risk calculation in long COVID. There are more and more insights as to risk factors for COVID, but you absolutely can be fit and healthy and still become disabled from this virus. In fact, heavy exercisers may be at higher risk than those who don't exercise heavily, and we'll get to that research in a moment. So, what is long COVID? Well, long COVID is defined as the presence of various symptoms even weeks or months after acquiring SARS-CoV-2 infection, irrespective

of the viral status. It's continuous or relapsing and remitting in nature. Post-COVID 19 conditions occur in individuals with a history of probable or confirmed SARS-CoV-2 infection. And that's important because especially in the first wave, a lot of people weren't able to get positive COVID tests and we don't want them to be discriminated against in terms of treatment. Usually, three months from the onset of COVID-19 with symptoms that last for at least two months, and cannot be explained by an alternative diagnosis. Common symptoms include fatigue, shortness of breath, cognitive dysfunction, but also many, many others. And these symptoms generally have an impact on everyday functioning. Symptoms may be new onset following this initial recovery from the acute COVID 19 episode, or people might get sick from COVID 19 and essentially stay sick, although they may have some relapse and remitting timeframes.

So, it is not unusual, and I do see this in my practice, where people had COVID, fully recovered, went back to their lives, maybe were a little tired, little short of breath, still kind of recovering, or a hundred percent back to normal. And then somewhere between a few weeks to a few months later present with long COVID symptoms, that also occurs. There can be the persistence of one or more symptoms of acute COVID, or the appearance of brand new symptoms, unfortunately. The time lag between the microbiologic recovery, so your PCR negative, your COVID test is negative and clinical recovery can be pretty vast.

You know, you can have had a negative COVID test within a week or so of your initial positive test or initial symptom presentation, and then one year, even almost two years now, from our experience with people who had COVID in that initial first March 2020 wave, February, March 2020 wave are still experiencing issues. There are two main patterns of symptoms in people with long COVID. One pattern is fatigue, headache, and upper respiratory complaints. More like shortness of breath, sore throat,

persistent cough and loss of taste or smell, or even bad taste or smell. Or the more multi-symptom complaints, including ongoing fever, GI symptoms, cardiovascular symptoms. I think less and less is the literature really showing kind of two separate symptoms, two separate syndromes, although we are kind of starting to see a divergence from post acute COVID, if you will.

So, people who had really more challenging COVID experiences, they were hospitalized, they were sicker, they had worse, high fevers, worse cough, prolonged shortness of breath, prolonged heart rate issues, blood clots, sicker initial presentations. Those people can recover not necessarily more easily, but in a different way than people who had this sort of more mild presentation, but still present with these very haphazard symptoms that are much more multi-organ systems. So, I don't know, I think there's overlap and divergence the more we understand about various presentations of long COVID.

In patients with long COVID and some of the symptoms in patients with long COVID, sometimes the symptoms are first reported three to four weeks after the onset of acute symptoms. And again, I've seen this also months later as well. So, there are hundreds of symptoms of long COVID, which makes it really interesting and challenging to figure out what the root causes are. Lots and lots of things, fatigue, pain, vascular issues, joint pain, muscle pain, GI issues, cardiac issues, blood clots, vascular vasculitis, shortness of breath, you know, oxygenation challenges at the cellular level, for some people pulse ox challenges, insomnia, neurocognitive symptoms, chronic cough, sleep apnea, fibrosis, myocarditis, pericarditis, clotting issues, falls, anxiety, depression, weakness, dysautonomia, poor exercise tolerance, and on and on.

And again, more and more research is coming out about these plethora of symptoms. So interestingly, there is a sex specific, so male versus female, auto antibody activation picture that varies. So, in males there's a higher risk of severe illness and death, and more auto antibodies are activated, but not quite as high levels in general. And in women, there are less risk of severe illness and death, but a higher risk of specific autoimmune activation.

Keep that in the back of your mind because there is certainly increasing evidence that long COVID or SARS-CoV-2 infection is triggering an autoimmune response. And there also can be serious organ injury, even in very mild presenting cases in individuals at low risk of COVID 19 mortality, so not obese, no metabolic syndrome issues, no asthma, no other preexisting conditions, younger people, 70% have impairments in one or more organs four months after initial COVID 19 symptoms, even if their case was asymptomatic. And again, who's most at risk for long COVID? Females ages 35 to 64 with a history of allergies or atopic conditions. Active and highly fit people, and these are a very distinct demographic from those most at risk risk of death. Although, just this week a new paper came out showing that people with diabetes, type two diabetes, also are at higher risk.

And with certain auto antibody presentations, which is related to this, and people that have activated Epstein-Barr virus concurrent with SARS-CoV-2. So, all of the above. Now, there are many, many possible causes of long COVID, but we can start to narrow these down into distinct categories. For each client, there's likely more than one cause. So, my story was after that initial about two weeks of acute infection, I presented with post-COVID pericarditis. So, I was one of those people who didn't get better, after two weeks I went right on in to my long haul experience. So, I presented with post-COVID pericarditis, that took about three months to fully recover from with medical treatment, ibuprofen, colchicine, rest. I had a lot of air hunger initially though I had normal pulmonary function tests, normal chest x-rays, so no lung injury per se, but difficult perfusing my cells at the cellular level with oxygen.

I had constant full-body burning vascular pain, probably a vascular epithelial inflammation, brain fog and reduced cognitive endurance, and some visual changes, which may or may not have been caused by taking ivermectin, or viral persistence, or something else. So, who knows? I did do all of these sort of functional medicine things, if you will, high dose vitamin D, zinc, coesartin, hydration, antivirals. So, it's hard to say what might have exacerbated the situation. There is actually evidence that taking steroids can activate Epstein-Barr virus. So, one thing may have helped COVID may have also set me up for more long COVID symptoms, who knows? I have kind of a mild case of REM sleep apnea, is that a cognitive, a brain organ issue, if you will? Elevated resting heart rate, reduced heart rate variability, dysautonomia, exercise intolerance.

And we're gonna talk about the research that's come out from invasive cardiopulmonary exercise testing and more. So again, there are many theories about the root causes, one of which is that there's actual organ damage from initial infection, and many people do have this. This is kind of the easiest thing to identify and treat because it's something that conventional medicine is good at looking for and providing treatments for. So, heart issues, kidney issues, pancreatic issues, immune system issues, and brain issues. A little more tricky if you end up with an immune system dysregulation, autoimmunity, elevated D-dimer, you know, persistently increased inflammatory cytokines, or changes in white blood cell counts or platelet counts. We don't know as much to do with these, it's challenging, but with some of the other, you know, kind of recognizable organ damage, there is more easily accessible conventional treatment.

Now, let's look at damage to the skeletal muscles. This is really fascinating. This is a young female pain patient who her organs are showing necrotic fibers being replaced by macrophage right in the actual skeletal muscles. You're also seeing atrophic angulated fibers and disrupted mitochondrial networks within the muscle cells themselves. ATPase-reacted sections, so type one fibers at high pH here in the slide labeled C and in slide labeled D. You have changes in the ATPase, so the enzyme that helps make energy in the mitochondria. So, these cellular level changes of skeletal muscles post-COVID 19 infection resemble kind of what heart failure looks like in the cardiac muscle. This is not being seen in long COVID

cardiac muscles, but it's being seen in skeletal muscles, which again may be one of the reasons for exercise intolerance.

And then, so as I said, something akin to heart failure may be occurring in the muscles with people with long COVID and also people with ME/CFS, which is a very similar condition, which we're not gonna talk about much today, but we can learn a lot from. So, what we are seeing through this study and invasive exercise testing studies is that for many people, the heart and lungs recover just fine. So, that happened for me after my initial bout of pericarditis, that was treated, fully recovered, my lung function tests have been fine all along. my oxygenation, very good, so plenty of oxygen in the blood. But the problem is plenty of oxygen in the arterial blood, but also in the venous blood.

So, the oxygen at the level of the capillaries is not perfusing into the cells normally, and it's circulating right back up to the heart and lungs, which is triggering a hyperventilation or a breathing pattern disorder, which lowers carbon dioxide levels, which makes it even harder for that cellular oxygen uptake, and you get lowered filling pressures on the left side of the heart, which can change blood pressure and the ability for people to be active upright without fatiguing. Why is this happening? Well, one of the theories is that at the level of the capillary, so we've got these arterial and venous capillaries meeting, at the cellular level they're innervated by small nerve fibers. And that helps those little capillaries vasodilate and vasoconstrict without you having to consciously think about this, right? So, such driven by the autonomic nervous system. And it looks like in some of this amazing work that's been done out of South Africa and Germany, of essentially a hundred percent of long COVID patients that they've studied have very tiny micro clots that could be kind of gumming up the works and triggering a small fiber neuropathy locally, which makes it even harder for those nerves to function correctly. So, what can we do to improve

these possible mechanisms? Well, first of all, autonomic nervous system retraining is huge. Then we wanna support the peripheral neurons with nerve and mitochondrial nourishing nutrition. So, this is where nutrition comes in and we can learn a lot from things like concussion, also from what we do from a nutritional standpoint to support Epstein-Barr virus or any other mitochondrial dysfunction. We also see this in things like fibromyalgia. Also pacing and a very cautious return to exercise. Exercise in these patients is not treatment. We do wanna help people get back to exercise, but the way we wanna think about this is as people heal, their window of energy each day expands, and they can start doing more exercise, which is good for them in general, but is not a treatment to actually fix this.

Exercise when they don't have enough mitochondrial function, when they're hypoxic, essentially at the cellular level, is going to make this worse and actually exacerbate the condition because you're forcing the body to do things, certain functions at the cellular level that would be aerobic to do them anaerobically, which is very difficult and stressful to the system. So, we wanna save that anaerobic action

for things that are necessary for survival, not for exercise. So, as people feel better, their window of energy expands and they can exercise more, but exercise is not a treatment other than starting to just do movement practices in horizontal positions, things like Pilates or dysautonomia exercise protocols that can help train the autonomic nervous system to start gently functioning more appropriately in terms of vasodilation, vasoconstriction, and heart rate regulation, and things of that nature. So, think exercise to support dysautonomia recovery is appropriate, but not like strength training, endurance training, things like that.

What we're trying to do is heal and retrain the autonomic nervous system, just like people with something like postural orthotic hypertension, or things like that, POTS or other dysautonomia conditions. Now, this is where when we start thinking about the autonomic nervous system, this is a huge driver in long COVID. So, healing autonomic nervous system signaling and toning the vagus nerve is a huge piece of the puzzle. It's very difficult, so if someone is living in fight or flight, which they may be 'cause this experience of being a perfectly healthy person, or even a pretty healthy person, or a person that felt fine and perfectly functional before COVID, didn't expect to end up, you know, thought they were gonna have a mild case 'cause there's this whole narrative that the case is either mild or hospitalized and deadly, right?

But instead they end up in this sort of traumatic purgatory may have had some traumatic days or nights where they weren't sure they were gonna survive this infection and very unexpectedly. So, a really big shift, just the same kind of posttraumatic stress symptomology that we might see for someone who got in a car accident or something like that, a really abrupt health change with a lot of question marks about prognosis, and treatments, and causes. So, many of these people are stuck in a sympathetic nervous system activation, fight, flight, freeze for very good reason. And so, we have to retrain that autonomic nervous system to spend so much more time in parasympathetic activation, rest, digest, heal. All right, so

research definitely supports the presentation of POTS in some cases of long COVID, and clinically I'm not seeing that everyone is presenting with clearly diagnosable POTS, but certainly dysautonomia-like presentations, poor vertical exercise tolerance, vasomotor symptoms, and things like REM sleep apnea. Like in chronic fatigue syndrome, long COVID patients often display what's called sickness behavior in the literature. These are really symptoms. So, sickness behavior is not behavior, it's actual symptoms. And these symptoms are dysautonomia, diffuse pain, sleep problems, flu-like symptoms, trouble concentrating, and nausea as an example.

So, the body, the autonomic nervous system actually triggers these sickness behavior symptoms, or these sickness symptoms to encourage the human organism to rest. Now, that's very difficult to do in

modern life to take any time off to rest. And it's very difficult for people who are healthy and vibrant to wrap their head around this. But rest thing is really important because it helps, it's what the autonomic nervous system is telling the body to do, and it helps in that recovery. And then we have to kind of untangle what the autonomic nervous system is asking, you know, the rest that it really needs to sort of heal those mitochondria, to calm inflammation, resolve the infection, but then also when it kind of gets stuck in this sympathetic activation pattern, how to untangle that from some of the traumatic response of just the experience itself, and then the inflammation and the stuck nervous system response that's triggering continued inflammation from progressing as a person spends more time just living with these myriad of symptoms that they don't know where they've come from.

So, the central role of the brainstem in the sickness behavior response, autonomic control and arousal suggests that dysfunctional brainstem signaling may be an important driver of long COVID symptoms, and the ones especially that overlap with ME/CFS. So, if we look at all the functions of the vagus nerve, the vagus nerve itself, this absolutely aligns with the most common symptoms of long COVID. So, the vagus nerve innervates visceral sensation to the heart and abdominal viscera, so we're seeing heart rate irregularities, heart rate variability irregularities, slowed gut motility, SIBO, bloating, things like that. This, the vagus nerve, provides taste sensation.

Bing, bing, bing, right? Also motor innervation to the majority of the muscles of the pharynx, soft palate, and larynx. Really common in long COVID to see dysphagia issues. So, all of my sleep, I mean, speech-therapy colleagues, this slide is for you, keep an eye out for this. Also the parasympathetic activation of the vagus nerve innervates the smooth muscle of the trachea, bronchi, the GI tract, and regulates heart rhythm, as we talked about, controls smooth muscle of the esophagus, gallbladder, pancreas, and small intestine. So, I'm seeing a lot of gastrointestinal, GI dysbiosis, slow gut motility, which we can work on.

So, what we're also seeing is not only is SARS-CoV-2 irritating the vagus nerve, causing immune inflammatory response, and at the level of brainstem, but you also have this virus that is disseminated throughout the entire body, including can cross the blood-brain barrier. And this viral replication in the brain can occur early in COVID 19, even in asymptomatic and mild cases. So, you have a person, even a child, who has an asymptomatic or mild case, but unbeknownst to the person, the virus has snuck into the brain and started replicating there and infecting the brain tissue directly. So, you can have this sort of direct infection of the brain stem and the autonomic nervous system, and also we're seeing a lot of things like cognitive, focus issues, brain fog, reduced cognitive endurance, dementia-like presentations, things of that nature.

So, if the virus itself can get into the brain, it can have this neurologic effect systemically. And also, as we'll talk about in the minute, this is a vascular disorder that can spread throughout the entire body

through the circulatory system. And there is evidence that there is persistence of this virus all over the body, respiratory tract, cardiovascular, GI, renal, reproductive, eye, CNS, muscles, you know, and so forth and so on, lymph system, for up to 230 days post-infection, and that's just because that's when they stopped the study, I'm sure it's for as long as people have had it. So, okay. So, what's my story around non-specific dysautonomia?

So initially, I presented with a lot of sharp pains in my hands, and feet, and head when I would just try to walk, a lot of squeezing sensations. I couldn't even tolerate driving up and down a ski mountain, my blood pressure was kind of all over the place, dizziness, which was exacerbated by ivermectin, but also I think in the long term, ivermectin has some beneficial effects for some people, hot flashes, poor upright exercise tolerance, tachycardia, especially triggered by REM sleep. I initially I had poor cognitive endurance, that's pretty well resolved at this point. Less tolerance for screens at that time and visual changes, which may or may not be related to a side effect of ivermectin or could be a direct infectious issue. So, what about dysbiosis and virus reactivation?

So, as I've been saying all along, just like we do with every chronic illness, don't chase symptoms, optimize systems. When it comes to long COVID, the system I'm starting with is nervous system and vascular system, but I'm quickly roping in the digestive system, you know, if not all concurrently. As I said, vagus is a huge driver, and the vagus nerve can sense the microbiota metabolites. So, the metabolites left by the bacteria in the gut through its afferents to transfer this gut information to the central nervous system. So, if you have vagus nerve issues, you're going to have gut issues, and vice versa. It's the role of the vagus nerve to dampen peripheral inflammation, to decrease intestinal permeability, and it can probably modulate the composition of the gut microbiome, so we want to support both.

The oral microbiome of patients with prolonged symptoms falling under the ongoing symptomatic COVID-19 or long COVID states demonstrates a dysbiotic pattern of increased pathobionts, those are essentially viruses that can infect the gut bacteria and increase in inflammation-inducing and LPS-producing microbiota, and a reduction of anti-inflammatory metabolic pathways. In one study of African Americans with COVID-19, controls, and those recovered from COVID-19, the intestinal microbiota is sensitive to the presence of SARS-CoV-2 with increased relative abundance of campylobacter and klebsiella associated with GI diseases.

In this study, the gut microbiome did recover fully post-infection. We have other studies of gut microbiome alterations, including things like Candida infections post-COVID. We also have some data, and this is not a really well designed study, but it's still useful in terms of the body of evidence that a certain probiotic blend and with a prebiotic inulin can help heal long COVID. There are so many mechanisms as we can see here of how healthy gut microbiome and how dysbiotic, how COVID can dysregulate the gut microbiome. So, there are tons of potential mechanisms, there are about 10 right

here on this slide, that show us how COVID can both dysregulate the gut microbiome and how probiotics can help eliminate COVID from being such a problematic factor in the gut because gut persistence can be months and months and months post-infection and that could keep irritating or keep kind of triggering this pathologic immune response.

When it can also reactivate any bacterial kind of reservoirs that COVID may be living in while either the COVID reservoirs, or bacterial reservoirs, or any other hidden viruses like Epstein-Barr. So, probiotics could be a really powerful tool in this fight. Now, which probiotics are going to depend on your client. You wanna access keystone species, I mean, assess keystone species and assess the other probiotic species that have been shown to be most important in long COVID and COVID recovery. Lots and lots of potentially beneficial bacteria, and you want to personalize this depending on what kind of bacterial irregularities your clients have. Now, related to this, a note on histamine. So, as we know, histamine, there are four distinct histamine receptors. These are G-coupled protein receptors, H1, H2, H3, H4, and they each have different functions. So, H1-receptor, cellular migration, nociception, vasodilation, and bronchoconstriction.

This is the one very much involved in allergic responses. H2 is much more involved in gastric acid secretion, airway mucus production, and vascular permeability. And there's a lot of excitement about H1 and H2 antagonists really helping to heal long COVID symptoms. H3 is more involved in Alzheimer's, and it plays an important role in inflammatory diseases of the brain in general, although histamine in this case can be somewhat beneficial and function as an anti-inflammatory. And then the H4-receptor is more involved in mast cell activation, which can be a problem in long COVID. So in COVID-19, post-COVID illness or long COVID may be rooted in mast cell activation. And again, you can see here how much, so just like in dysautonomia, how many of the symptoms overlap between mast cell activation issues or histamine intolerance with long COVID across a wide variety of systems.

And also, it has been found that again everybody with long COVID that they studied in this study presented with functional autoantibodies against G-protein coupled receptors. Different from the histamine receptors, but similar types of receptors, so you could have some molecular mimicry going on there. So again, all 31 of these clients that have long COVID, these research subjects, had between two and seven different GPCR autoantibodies that acted as receptor agonists. So, they could, they're just blowing up this system without even having an issue of excessive histamine. And there is some research underway for treatments coming at this through this angle. BC 007 is one drug that's in studies, and HELP Apheresis is another procedure that's in studies.

And then we also, this paper just recently came out in February 2022 of two antihistamine or H1 H2 antagonists that are also antiviral being really beneficial for people with long COVID. And of course, we can use our nutritional and lifestyle medicine,

and nutritional supplementation strategies. I have a whole course on this, where I talk about nutrition and supplementation and how to use what, and which probiotic to use, and all of that. And we also talk a lot about the menstrual irregularities and hormone issues of long COVID because I work with women's health so I see a lot of female patients.

But I'll give you a quick clinical pearl here, while bacillus subtilis can be really valuable in sort of fighting off that SARS-CoV-2 living for the long term in the gut, sometimes I'm seeing them in my practice raising histamine levels, or at least exacerbating elevated histamine symptoms, so just be aware of that. And as we just talked about, one of the triggers that's most common for people having long COVID is that their initial SARS-CoV-2 infection activated dormant pathogens, specifically Epstein-Barr is kind of a research darling right now, but there are lots of other infections that have also been shown to be reactivated, herpes, cytomegalovirus, and so forth. So, then let's get to the cardiovascular and pulmonary healing. Thank you, Harvard.

Finally, in October, well, let's see, this says October of 2020, but oh, it wasn't published. Here we go, it wasn't published until January 2021, but I knew this like the first day I had long COVID, the most distinctive experience of long COVID for me was a sensation of my entire vascular system hurting, being on fire, and feeling weird. And I could like almost imagine all the vessels through my body. And interestingly enough, literally a couple of days after my second mRNA vaccine dose, that pain in May of 2021 cleared, just literally turned off. It's the most interesting experience I've ever had in my body. Well, maybe not, but it was very surprising.

So, I had my second vaccine dose, actually after the first vaccine dose, my heart rate stabilized, so that was lovely. After the second one, my pain literally turned off and has not turned back on again. However, you know, the symptoms didn't a hundred percent resolve at that point, but some of the most problematic symptoms did resolve pretty immediately after a few days of intense vaccine symptoms. So, you know, it's a double-edged sword with that vaccine. We can have that conversation all day, but not right here. So, COVID-19 is a vascular disease, and I would say because of that also a neurologic disease and a gut microbiome disease.

As I said, my vascular pain just resolved despite the fact that I was telling doctors, "This is and my vessels hurt, it's in my vessels." My doctors were like, "What?" But because I could feel this, so while I got no treatment from a conventional sense or even a functional sense at that point, I was like, "Okay, here's what we're gonna do. We're gonna treat the vascular epithelium from a nutritional standpoint," and that's exactly what I did. And more and more now we're seeing this crosstalk between platelets, key clotting factors. So, people with potentially these micro clots, and pathogens, and this sort of gumming up of the vascular works by aging monocytes, residual viral proteins, creating these little gunky things

that irritate and gunk up the vessels in addition to, or potentially, you know, these are both the same things that different research groups are looking at it differently. These micro clots at the level of the capillary circulation. So, why? We don't know, but here are some things to test and evaluate over time. And again, maybe it's sticking monocytes all bound up with viral proteins. We'll see as the papers out of Bruce Patterson's lab continue, and, you know, the papers out of these other labs and also Resia Pretorius' lab, and Germany and South Africa are also showing us the micro clotting theory.

So, what's gumming up the works is still in discussions from a research standpoint, but we can still use our functional nutrition strategies to keep help clearing and cleaning the blood, keep healing the vascular epithelium, to and no matter what some of the drivers of this might be, and to keep kind of resetting and resetting the nervous system and the immune system to clear any persistent virus or clear any persistent viral proteins, you know, kind of pieces of the virus. And also the autoantibodies, right? So optimizing, again if we come at this from a system by system approach, optimize nervous system, immune function, vascular or epithelium, blood health, you know, lack of excessive clotting factors, antioxidants, anti-inflammatories, it doesn't really matter, we don't have to know the a hundred percent answer to this yet to get people symptom relief and actual root cause healing.

So, in the meantime, we will keep the inflammation low, nourish, the vascular epithelium, nourish the small fiber neurons, regulate the autonomic nervous system, and keep studying the vagus nerve. And don't forget the number one symptom that people present with in long COVID is fatigue. Anytime I think fatigue, especially interacting with Epstein-Barr virus, I start to think what's going on in the mitochondria? So again, because I had an experience of Epstein-Barr reactivation almost 20 years ago, I had the experience of taking care of my mitochondria before, during, and after my acute COVID experience. And I've never experienced fatigue from this, despite it being the number one symptom. So, I really think this is an important toolkit in our perspective as lifestyle medicine and functional nutrition practitioners, we know everything to do.

And, you know, I teach all of this in a lot more detail in our training course, the Immune Bundle at the Integrative Women's Health Institute, but exercise with appropriate pacing and think about thinking about the autonomic nervous system, really movement, breath work, autonomic nervous system retraining from a movement standpoint, plant-based diet, although low carb, you know, good quality animal protein is also beneficial too for protein absorption, intermittent fasting, even longer term fasting may help reset the immune system function.

Mitochondrial support nutrients, testing mitochondrial function, Metformin and/or steroids can also help. But again, this can exacerbate histamine responses or reactivate dormant viruses, so not my favorite way to do it. And then reducing the toxic load to activate healthy detox systems. And again, we've seen acutely in the literature, multiple studies have shown an interaction between mold and acute COVID 19 severity. So, we don't know, but certainly microtoxins could exacerbate long COVID. So, testing

for that and just cleaning up, lowering the viral, I mean, lowering the toxic load is going to be helpful. And then specifically for your female clients, we are seeing that long COVID is potentially associated with estrogen and/or progesterone depletion. We see it most commonly in intense athletes of childbearing age, male and/or female, but certainly female is more common. Also, we see this in children, about 10% of children up to 30% of children who have an initial COVID infection, and in perimenopausal women. Now also though, there if people have higher levels of estrogen, that can mediate autoimmunity. So, at this point, kind of like for my endometriosis patients, there's no one-size-fits-all direction that we wanna sort of push hormones in.

What we wanna think is how can we get each individual's hormonal picture more optimized so that they're not depleted, they don't have HPA, and HPT, and HPO access dysregulation. They're not depleted, their levels aren't low, but they're also not high. So, their liver is supported, estrogen is being appropriately metabolized. And there is some research currently looking at the benefit of hormone replacement therapy in long COVID, but the jury is still out on that because don't forget, there's an elevated risk of blood clotting with hormone replacement therapy in certain women and in certain cases that we have to consider given this exacerbated risk of elevated blood clots. So, we wanna support HPA access, resilience, thyroid assessment.

And as I said before, so fascinating that we're seeing this lack of oxygen exchange, this like this kind of inefficient hypoxia at cellular level. So, I've had some temperature regulation issues with my long COVID and they chased down my thyroid, my medical team chased down my thyroid. Everything looked normal, very, very mild subclinical hypothyroidism, but not anything significant. And I'm actually way more hot than I am cold, no hair loss, no nail flimsiness, nothing like that. But on ultrasound, my thyroid is hypervascularized, which would lend evidence to that theory that for some reason there's not this cellular oxygen exchange going on at an efficient level in my body because it's being extremely well supported is, and there's a little bit of ableist perspective on that, but it is being extremely well supported and thus it's adapting appropriately.

So again, using supportive hormone replacement therapy or hormone support nutraceuticals can be valuable, but be mindful of clotting risk, and consider that estrogen can exacerbate mast cell activation syndrome, and progesterone can actually inhibit mast cells. So, there are kind of cost-benefit analysis to whatever direction you wanna take your hormone or endocrine system support with that from a functional nutrition standpoint. So, the root cause is still a bit elusive, I expect there to be a flurry of research papers in the next three to six months.

So, what do we need to do? Search and destroy residual virus, reverse autoimmunity, clean up monocytes and residual spike and other like new capsid proteins that are just gumming up the vascular works. Do we need to clean up micro clots? Do we need to address histamine issues and mitochondrial

function? Let's address it all. From a functional nutrition and lifestyle medicine standpoint, we absolutely can, and we can start at the level of the autonomic nervous system. And there are lots of medical therapies under consideration, all of which I think are really important to keep in mind. We want to be integrative, and there's some real value here in some of these medical therapies. But what we can do with our tools in functional medicine, functional neutral lifestyle medicine is help people to use what we know now to start actively healing, help them focus consistent attention to the activation of the ventral vagus parasympathetic nervous system state as a key to healing.

Stop-rest-pace. Convalescence time for recovery, pacing their return to work, probably the most valuable thing we can offer, nourish the central nervous system and peripheral nerves, lower inflammation systemically, optimize digestion, the gut microbiome health, and nourish the vascular epithelium, mitochondrial support, immune modulation, MCAS and kind of help with the processing of histamine and quieting mast cell activation. Explore on a personalized health basis the role of hormones, and consider this likely interaction between residual virus and/or viral particles and activation of or interaction with environmental toxins.

Thank you so much for spending this time with me today. If you have any questions or wanna dig deep more into our strategies for doing all of those things 'cause there are many, many, many available tools from a nutrition standpoint, a nutraceutical standpoint, a lifestyle medicine standpoint, and behavioral modification standpoint. All of these treatment tools are available, and we talk a lot about that in our Immune Bundle course. So, feel free to reach out to me with any questions, you can send me a message on Instagram @integrativewomenshealth. You can download our free Immune Boosting Soups and Stews Cookbook at integrativewomenshealthinstitute.com/immunity-soup-cookbook.

That's integrativewomenshealthinstitute.com/immunity-soup-cookbook. And the most thing I wanna say as we wrap up this presentation is long COVID is challenging, it's traumatic, it happens to people who are very healthy or felt absolutely fine before their COVID infection, and people who had comorbidities, and we need to be caring for all of them exactly the same, not one person deserves more care than another. People can have this whether they've been vaccinated or not, though the likelihood of having it post-vaccine infection is about 50% less. Some people who have had a COVID vaccination will have a very similar symptom picture triggered by the vaccination itself, or both, or the in infection and the vaccination.

So, there's no morally superior human that's going to walk into your office. Some will be vaccinated, some will be unvaccinated, some will have brilliant thriving prior to COVID 19 health, some will have preexisting conditions, some will be taking care of their health, some will be at the pinnacle of their health, others will be not taking as good of care of their health, some will be struggling with chronic underlying illnesses that they either know about or don't know about. It's really important to put aside and be aware of your own ableism as you help take care of these people because absolutely each and

every one of them deserves your help. There is help. And the other most important thing to be aware of is there is absolutely hope for complete to recovery from long COVID, though, it might take a little while for many people. And that hope is really important and vigorously needed right now because people with long COVID after a year or almost two years are becoming a bit hopeless, and some of them have even committed suicide. So, it's time for us to step up and show people that there is help available for all of us in this long COVID, but we are healing together. All right, thanks so much for your time, enjoy the soups and stews, and I'll see you there. See you later, bye-bye.

License in physical therapy, and a doctorate and license in clinical nutrition. I am also a board certified health coach, and I work training health and wellness coaches, training clinicians of all types, all backgrounds, all over the world actually, in functional nutrition strategies for women's health. And I also run an Integrative Health Clinic for Women's Health. So, let's dive right into our presentation on long COVID.

All right, so long COVID is a topic that is near and dear to my heart, unfortunately, because I am a person who has lived with long COVID for just over the past year and have learned a heck of a lot through my own journey about how to heal this condition. And it so resonates with everything that we do in functional nutrition and functional medicine to help people with chronic illnesses of all sorts. And I've been working with women with chronic illness for 25 years, most specifically, endometriosis, vulvodynia, other chronic pelvic pain conditions. And so, I've been steeped in this literature for decades, and it's been really valuable for my recovery from long COVID. So, let's get started. So, to tell you a little bit about my story to keep it interesting.

My story began Christmas morning of 2020 when it was about day nine of my super mild COVID infection. I had a very easy case, I had no fear of COVID., I wasn't worried about COVID at all in the sense that I was mindful, I was concerned to protect people in my life who were more medically fragile, but I was a very healthy 46-year-old woman. I was an athlete, I was a working mom, I had awesome vitamin D levels, right? I had everything that you could ask for, I had the best blood type, right? I had everything you could ask for according to literature to be low risk. And yet, that morning something shifted and I literally just couldn't breathe, it was as if someone poured hot tar in the lower parts of my lungs and my resting heart rate just skyrocketed into the 130s, the 150s, I couldn't sleep, I couldn't breathe, I couldn't relax.

So, I went to the hospital and was given steroids, and hydration, and IV fluids. And the expectation was that, "You know, you're healthy, you'll be fine in a week or two, ready to be back to recovery by New Year's." And this is when I first began to recognize within my own mind and heart, ableism. I really had always valued health, I've been a very healthy person my entire life. I had one other kind of brush with mystery illness, if you will, after the birth of my first daughter almost 20 years ago. And even that

though, once I understood it, I was able to recover really quickly. And so, going into having this COVID infection, this was pre-vaccine, so I was unvaccinated at the time, but I really was very fit, I was working out, you know, most days every week I was running a global company, I'm a busy working mom. You know, I was all in and I've eaten gluten-free, dairy-free, soy-free, sugar free, tons of vegetables, you know, low carb, my blood sugar was perfect. I was a great sleeper, I've been wearing fitness tracking devices for years. And by all measures, my metabolic health was perfect. And I really was shocked by how sick I got in terms of not so much how sick I got with my COVID infection 'cause I did have that couple of days with pretty intense symptoms. But beyond that, the problem was I never really got better from it. So, like most people with long COVID, I walked into this experience saying, "Hey, Hey, you know, I was really fit, really healthy. I was busy, working full time, prime of my life, help me, what the heck's going on?"

Right, and so I had to see in my own mind, my tendency to believe that people really had the capacity to avoid something like this, my own internalized ableism. And I think many of us experienced this, and I really was not aware of it until this experience. So, let me back it up and show you how fit and healthy I was. So, in November of 2020, I spent the weekend hiking ski mountains with my family. We didn't have any snow at that weekend, so we didn't ski, but we were hiking the ski mountains. I was taking miles long walks several times a week, I was doing HIIT classes, hot yoga, tons of I was meditating once or twice every day, I was outdoors much of the time, I had total autonomy over my schedule.

So, I was in a really good place to confront this virus from a host resilience standpoint. But one thing that I think about when I think about how I functioned in the world prior to COVID versus after is that I was really a hundred percent dedicated to no sugar, no dairy, no gluten, you know, eating really, really perfectly, exercising, going to bed on time. And it's funny that year was the first Thanksgiving I had without my grandmother, who lived to be well into her late 90s, she died at age 97 without being sick very much at all, other than the last year or so of her life when there was a bit of a decline, but she cooked and was active and vibrant, and her brain was vibrant till really very near the end.

And I brought turnips, mashed turnips to our Thanksgiving celebration in honor of her, but left out the butter. And now, I understand that having a clean diet and a fit body is helpful, but not sufficient for avoiding long COVID. And in fact, women of middle age who are very fit may be at higher risk for this condition women in particular, although certainly many, many men have this as well. And from a nervous system standpoint, I started to realize the error of being so aggressively committed to a super clean lifestyle that I perhaps wasn't toning my nervous system to be flexible enough to not be concerned when something kind of rocked the perfection ship, if you will.

So, as I said, it's a complex, it's a really complex risk calculation in long COVID. There are more and more insights as to risk factors for COVID, but you absolutely can be fit and healthy and still become disabled from this virus. In fact, heavy exercisers may be at higher risk than those who don't exercise heavily, and

we'll get to that research in a moment. So, what is long COVID? Well, long COVID is defined as the presence of various symptoms even weeks or months after acquiring SARS-CoV-2 infection, irrespective of the viral status. It's continuous or relapsing and remitting in nature. Post-COVID 19 conditions occur in individuals with a history of probable or confirmed SARS-CoV-2 infection. And that's important because especially in the first wave, a lot of people weren't able to get positive COVID tests and we don't want them to be discriminated against in terms of treatment. Usually, three months from the onset of COVID-19 with symptoms that last for at least two months, and cannot be explained by an alternative diagnosis. Common symptoms include fatigue, shortness of breath, cognitive dysfunction, but also many, many others.

And these symptoms generally have an impact on everyday functioning. Symptoms may be new onset following this initial recovery from the acute COVID 19 episode, or people might get sick from COVID 19 and essentially stay sick, although they may have some relapse and remitting timeframes. So, it is not unusual, and I do see this in my practice, where people had COVID, fully recovered, went back to their lives, maybe were a little tired, little short of breath, still kind of recovering, or a hundred percent back to normal. And then somewhere between a few weeks to a few months later present with long COVID symptoms, that also occurs. There can be the persistence of one or more symptoms of acute COVID, or the appearance of brand new symptoms, unfortunately.

The time lag between the microbiologic recovery, so your PCR negative, your COVID test is negative and clinical recovery can be pretty vast. You know, you can have had a negative COVID test within a week or so of your initial positive test or initial symptom presentation, and then one year, even almost two years now, from our experience with people who had COVID in that initial first March 2020 wave, February, March 2020 wave are still experiencing issues. There are two main patterns of symptoms in people with long COVID. One pattern is fatigue, headache, and upper respiratory complaints. More like shortness of breath, sore throat, persistent cough and loss of taste or smell, or even bad taste or smell.

Or the more multi-symptom complaints, including ongoing fever, GI symptoms, cardiovascular symptoms. I think less and less is the literature really showing kind of two separate symptoms, two separate syndromes, although we are kind of starting to see a divergence from post acute COVID, if you will. So, people who had really more challenging COVID experiences, they were hospitalized, they were sicker, they had worse, high fevers, worse cough, prolonged shortness of breath, prolonged heart rate issues, blood clots, sicker initial presentations.

Those people can recover not necessarily more easily, but in a different way than people who had this sort of more mild presentation, but still present with these very haphazard symptoms that are much more multi-organ systems. So, I don't know, I think there's overlap and divergence the more we understand about various presentations of long COVID. In patients with long COVID and some of the symptoms in patients with long COVID, sometimes the symptoms are first reported three to four weeks

after the onset of acute symptoms. And again, I've seen this also months later as well. So, there are hundreds of symptoms of long COVID, which makes it really interesting and challenging to figure out what the root causes are. Lots and lots of things, fatigue, pain, vascular issues, joint pain, muscle pain, GI issues, cardiac issues, blood clots, vascular vasculitis, shortness of breath, you know, oxygenation challenges at the cellular level, for some people pulse ox challenges, insomnia, neurocognitive symptoms, chronic cough, sleep apnea, fibrosis, myocarditis, pericarditis, clotting issues, falls, anxiety, depression, weakness, dysautonomia, poor exercise tolerance, and on and on.

And again, more and more research is coming out about these plethora of symptoms. So interestingly, there is a sex specific, so male versus female, auto antibody activation picture that varies. So, in males there's a higher risk of severe illness and death, and more auto antibodies are activated, but not quite as high levels in general. And in women, there are less risk of severe illness and death, but a higher risk of specific autoimmune activation. Keep that in the back of your mind because there is certainly increasing evidence that long COVID or SARS-CoV-2 infection is triggering an autoimmune response. And there also can be serious organ injury, even in very mild presenting cases in individuals at low risk of COVID 19 mortality, so not obese, no metabolic syndrome issues, no asthma, no other preexisting conditions, younger people, 70% have impairments in one or more organs four months after initial COVID 19 symptoms, even if their case was asymptomatic.

And again, who's most at risk for long COVID? Females ages 35 to 64 with a history of allergies or atopic conditions. Active and highly fit people, and these are a very distinct demographic from those most at risk risk of death. Although, just this week a new paper came out showing that people with diabetes, type two diabetes, also are at higher risk. And with certain auto antibody presentations, which is related to this, and people that have activated Epstein-Barr virus concurrent with SARS-CoV-2. So, all of the above. Now, there are many, many possible causes of long COVID, but we can start to narrow these down into distinct categories. For each client, there's likely more than one cause. So, my story was after that initial about two weeks of acute infection, I presented with post-COVID pericarditis. So, I was one of those people who didn't get better, after two weeks I went right on in to my long haul experience. So, I presented with post-COVID pericarditis, that took about three months to fully recover from with medical treatment, ibuprofen, colchicine, rest.

I had a lot of air hunger initially though I had normal pulmonary function tests, normal chest x-rays, so no lung injury per se, but difficult perfusing my cells at the cellular level with oxygen. I had constant full-body burning vascular pain, probably a vascular epithelial inflammation, brain fog and reduced cognitive endurance, and some visual changes, which may or may not have been caused by taking ivermectin, or viral persistence, or something else. So, who knows? I did do all of these sort of functional medicine things, if you will, high dose vitamin D, zinc, coesatin, hydration, antivirals. So, it's hard to say what might have exacerbated the situation. There is actually evidence that taking steroids can activate Epstein-Barr virus. So, one thing may have helped COVID may have also set me up for more long COVID

symptoms, who knows? I have kind of a mild case of REM sleep apnea, is that a cognitive, a brain organ issue, if you will? Elevated resting heart rate, reduced heart rate variability, dysautonomia, exercise intolerance. And we're gonna talk about the research that's come out from invasive cardiopulmonary exercise testing and more. So again, there are many theories about the root causes, one of which is that there's actual organ damage from initial infection, and many people do have this. This is kind of the easiest thing to identify and treat because it's something that conventional medicine is good at looking for and providing treatments for. So, heart issues, kidney issues, pancreatic issues, immune system issues, and brain issues.

A little more tricky if you end up with an immune system dysregulation, autoimmunity, elevated D-dimer, you know, persistently increased inflammatory cytokines, or changes in white blood cell counts or platelet counts. We don't know as much to do with these, it's challenging, but with some of the other, you know, kind of recognizable organ damage, there is more easily accessible conventional treatment. Now, let's look at damage to the skeletal muscles. This is really fascinating. This is a young female pain patient who her organs are showing necrotic fibers being replaced by macrophage right in the actual skeletal muscles. You're also seeing atrophic angulated fibers and disrupted mitochondrial networks within the muscle cells themselves. ATPase-reacted sections, so type one fibers at high pH here in the slide labeled C and in slide labeled D. You have changes in the ATPase, so the enzyme that helps make energy in the mitochondria.

So, these cellular level changes of skeletal muscles post-COVID 19 infection resemble kind of what heart failure looks like in the cardiac muscle. This is not being seen in long COVID cardiac muscles, but it's being seen in skeletal muscles, which again may be one of the reasons for exercise intolerance. And then, so as I said, something akin to heart failure may be occurring in the muscles with people with long COVID and also people with ME/CFS, which is a very similar condition, which we're not gonna talk about much today, but we can learn a lot from. So, what we are seeing through this study and invasive exercise testing studies is that for many people, the heart and lungs recover just fine.

So, that happened for me after my initial bout of pericarditis, that was treated, fully recovered, my lung function tests have been fine all along. my oxygenation, very good, so plenty of oxygen in the blood. But the problem is plenty of oxygen in the arterial blood, but also in the venous blood. So, the oxygen at the level of the capillaries is not perfusing into the cells normally, and it's circulating right back up to the heart and lungs, which is triggering a hyperventilation or a breathing pattern disorder, which lowers carbon dioxide levels, which makes it even harder for that cellular oxygen uptake, and you get lowered filling pressures on the left side of the heart, which can change blood pressure and the ability for people to be active upright without fatiguing.

Why is this happening? Well, one of the theories is that at the level of the capillary, so we've got these arterial and venous capillaries meeting, at the cellular level they're innervated by small nerve fibers. And

that helps those little capillaries vasodilate and vasoconstrict without you having to consciously think about this, right? So, such driven by the autonomic nervous system. And it looks like in some of this amazing work that's been done out of South Africa and Germany, of essentially a hundred percent of long COVID patients that they've studied have very tiny micro clots that could be kind of gumming up the works and triggering a small fiber neuropathy locally, which makes it even harder for those nerves to function correctly. So, what can we do to improve these possible mechanisms? Well, first of all, autonomic nervous system retraining is huge. Then we wanna support the peripheral neurons with nerve and mitochondrial nourishing nutrition. So, this is where nutrition comes in and we can learn a lot from things like concussion, also from what we do from a nutritional standpoint to support Epstein-Barr virus or any other mitochondrial dysfunction.

We also see this in things like fibromyalgia. Also pacing and a very cautious return to exercise. Exercise in these patients is not treatment. We do wanna help people get back to exercise, but the way we wanna think about this is as people heal, their window of energy each day expands, and they can start doing more exercise, which is good for them in general, but is not a treatment to actually fix this. Exercise when they don't have enough mitochondrial function, when they're hypoxic, essentially at the cellular level, is going to make this worse and actually exacerbate the condition because you're forcing the body to do things, certain functions at the cellular level that would be aerobic to do them anaerobically, which is very difficult and stressful to the system. So, we wanna save that anaerobic action for things that are necessary for survival, not for exercise.

So, as people feel better, their window of energy expands and they can exercise more, but exercise is not a treatment other than starting to just do movement practices in horizontal positions, things like Pilates or dysautonomia exercise protocols that can help train the autonomic nervous system to start gently functioning more appropriately in terms of vasodilation, vasoconstriction, and heart rate regulation, and things of that nature. So, think exercise to support dysautonomia recovery is appropriate, but not like strength training, endurance training, things like that. What we're trying to do is heal and retrain the autonomic nervous system, just like people with something like postural orthotic hypertension, or things like that, POTS or other dysautonomia conditions.

Now, this is where when we start thinking about the autonomic nervous system, this is a huge driver in long COVID. So, healing autonomic nervous system signaling and toning the vagus nerve is a huge piece of the puzzle. It's very difficult, so if someone is living in fight or flight, which they may be 'cause this experience of being a perfectly healthy person, or even a pretty healthy person, or a person that felt fine and perfectly functional before COVID, didn't expect to end up, you know, thought they were gonna have a mild case 'cause there's this whole narrative that the case is either mild or hospitalized and deadly, right?

But instead they end up in this sort of traumatic purgatory may have had some traumatic days or nights where they weren't sure they were gonna survive this infection and very unexpectedly. So, a really big shift, just the same kind of posttraumatic stress symptomology that we might see for someone who got in a car accident or something like that, a really abrupt health change with a lot of question marks about prognosis, and treatments, and causes. So, many of these people are stuck in a sympathetic nervous system activation, fight, flight, freeze for very good reason. And so, we have to retrain that autonomic nervous system to spend so much more time in parasympathetic activation, rest, digest, heal. All right, so research definitely supports the presentation of POTS in some cases of long COVID, and clinically I'm not seeing that everyone is presenting with clearly diagnosable POTS, but certainly dysautonomia-like presentations, poor vertical exercise tolerance, vasomotor symptoms, and things like REM sleep apnea.

Like in chronic fatigue syndrome, long COVID patients often display what's called sickness behavior in the literature. These are really symptoms. So, sickness behavior is not behavior, it's actual symptoms. And these symptoms are dysautonomia, diffuse pain, sleep problems, flu-like symptoms, trouble concentrating, and nausea as an example. So, the body, the autonomic nervous system actually triggers these sickness behavior symptoms, or these sickness symptoms to encourage the human organism to rest. Now, that's very difficult to do in modern life to take any time off to rest.

And it's very difficult for people who are healthy and vibrant to wrap their head around this. But rest thing is really important because it helps, it's what the autonomic nervous system is telling the body to do, and it helps in that recovery. And then we have to kind of untangle what the autonomic nervous system is asking, you know, the rest that it really needs to sort of heal those mitochondria, to calm inflammation, resolve the infection, but then also when it kind of gets stuck in this sympathetic activation pattern, how to untangle that from some of the traumatic response of just the experience itself, and then the inflammation and the stuck nervous system response that's triggering continued inflammation from progressing as a person spends more time just living with these myriad of symptoms that they don't know where they've come from.

So, the central role of the brainstem in the sickness behavior response, autonomic control and arousal suggests that dysfunctional brainstem signaling may be an important driver of long COVID symptoms, and the ones especially that overlap with ME/CFS. So, if we look at all the functions of the vagus nerve, the vagus nerve itself, this absolutely aligns with the most common symptoms of long COVID. So, the vagus nerve innervates visceral sensation to the heart and abdominal viscera, so we're seeing heart rate irregularities, heart rate variability irregularities, slowed gut motility, SIBO, bloating, things like that. This, the vagus nerve, provides taste sensation. Bing, bing, bing, right? Also motor innervation to the majority of the muscles of the pharynx, soft palate, and larynx.

Really common in long COVID to see dysphagia issues. So, all of my sleep, I mean, speech-therapy

colleagues, this slide is for you, keep an eye out for this. Also the parasympathetic activation of the vagus nerve innervates the smooth muscle of the trachea, bronchi, the GI tract, and regulates heart rhythm, as we talked about, controls smooth muscle of the esophagus, gallbladder, pancreas, and small intestine. So, I'm seeing a lot of gastrointestinal, GI dysbiosis, slow gut motility, which we can work on. So, what we're also seeing is not only is SARS-CoV-2 irritating the vagus nerve, causing immune inflammatory response, and at the level of brainstem, but you also have this virus that is disseminated throughout the entire body, including can cross the blood-brain barrier. And this viral replication in the brain can occur early in COVID 19, even in asymptomatic and mild cases.

So, you have a person, even a child, who has an asymptomatic or mild case, but unbeknownst to the person, the virus has snuck into the brain and started replicating there and infecting the brain tissue directly.

So, you can have this sort of direct infection of the brain stem and the autonomic nervous system, and also we're seeing a lot of things like cognitive, focus issues, brain fog, reduced cognitive endurance, dementia-like presentations, things of that nature. So, if the virus itself can get into the brain, it can have this neurologic effect systemically. And also, as we'll talk about in the minute, this is a vascular disorder that can spread throughout the entire body through the circulatory system. And there is evidence that there is persistence of this virus all over the body, respiratory tract, cardiovascular, GI, renal, reproductive, eye, CNS, muscles, you know, and so forth and so on, lymph system, for up to 230 days post-infection, and that's just because that's when they stopped the study, I'm sure it's for as long as people have had it.

So, okay. So, what's my story around non-specific dysautonomia? So initially, I presented with a lot of sharp pains in my hands, and feet, and head when I would just try to walk, a lot of squeezing sensations. I couldn't even tolerate driving up and down a ski mountain, my blood pressure was kind of all over the place, dizziness, which was exacerbated by ivermectin, but also I think in the long term, ivermectin has some beneficial effects for some people, hot flashes, poor upright exercise tolerance, tachycardia, especially triggered by REM sleep.

I initially I had poor cognitive endurance, that's pretty well resolved at this point. Less tolerance for screens at that time and visual changes, which may or may not be related to a side effect of ivermectin or could be a direct infectious issue. So, what about dysbiosis and virus reactivation? So, as I've been saying all along, just like we do with every chronic illness, don't chase symptoms, optimize systems. When it comes to long COVID, the system I'm starting with is nervous system and vascular system, but I'm quickly roping in the digestive system, you know, if not all concurrently.

As I said, vagus is a huge driver, and the vagus nerve can sense the microbiota metabolites. So, the metabolites left by the bacteria in the gut through its afferents to transfer this gut information to the central nervous system. So, if you have vagus nerve issues, you're going to have gut issues, and vice versa. It's the role of the vagus nerve to dampen peripheral inflammation, to decrease intestinal permeability, and it can probably modulate the composition of the gut microbiome, so we want to support both. The oral microbiome of patients with prolonged symptoms falling under the ongoing symptomatic COVID-19 or long COVID states demonstrates a dysbiotic pattern of increased pathobionts, those are essentially viruses that can infect the gut bacteria and increase in inflammation-inducing and

LPS-producing microbiota, and a reduction of anti-inflammatory metabolic pathways. In one study of African Americans with COVID-19, controls, and those recovered from COVID-19, the intestinal microbiota is sensitive to the presence of SARS-CoV-2 with increased relative abundance of campylobacter and klebsiella associated with GI diseases. In this study, the gut microbiome did recover fully post-infection. We have other studies of gut microbiome alterations, including things like Candida infections post-COVID.

We also have some data, and this is not a really well designed study, but it's still useful in terms of the body of evidence that a certain probiotic blend and with a prebiotic inulin can help heal long COVID. There are so many mechanisms as we can see here of how healthy gut microbiome and how dysbiotic, how COVID can dysregulate the gut microbiome. So, there are tons of potential mechanisms, there are about 10 right here on this slide, that show us how COVID can both dysregulate the gut microbiome and how probiotics can help eliminate COVID from being such a problematic factor in the gut because gut persistence can be months and months and months post-infection and that could keep irritating or keep kind of triggering this pathologic immune response.

When it can also reactivate any bacterial kind of reservoirs that COVID may be living in while either the COVID reservoirs, or bacterial reservoirs, or any other hidden viruses like Epstein-Barr. So, probiotics could be a really powerful tool in this fight. Now, which probiotics are going to depend on your client. You wanna assess keystone species, I mean, assess keystone species and assess the other probiotic species that have been shown to be most important in long COVID and COVID recovery. Lots and lots of potentially beneficial bacteria, and you want to personalize this depending on what kind of bacterial irregularities your clients have.

Now, related to this, a note on histamine. So, as we know, histamine, there are four distinct histamine receptors. These are G-coupled protein receptors, H1, H2, H3, H4, and they each have different functions. So, H1-receptor, cellular migration, nociception, vasodilation, and bronchoconstriction. This is the one very much involved in allergic responses. H2 is much more involved in gastric acid secretion, airway mucus production, and vascular permeability. And there's a lot of excitement about H1 and H2

antagonists really helping to heal long COVID symptoms. H3 is more involved in Alzheimer's, and it plays an important role in inflammatory diseases of the brain in general, although histamine in this case can be somewhat beneficial and function as an anti-inflammatory. And then the H4-receptor is more involved in mast cell activation, which can be a problem in long COVID.

So in COVID-19, post-COVID illness or long COVID may be rooted in mast cell activation. And again, you can see here how much, so just like in dysautonomia, how many of the symptoms overlap between mast cell activation issues or histamine intolerance with long COVID across a wide variety of systems. And also, it has been found that again everybody with long COVID that they studied in this study presented with functional autoantibodies against G-protein coupled receptors.

Different from the histamine receptors, but similar types of receptors, so you could have some molecular mimicry going on there. So again, all 31 of these clients that have long COVID, these research subjects, had between two and seven different GPCR autoantibodies that acted as receptor agonists. So, they could, they're just blowing up this system without even having an issue of excessive histamine. And there is some research underway for treatments coming at this through this angle. BC 007 is one drug that's in studies, and HELP Apheresis is another procedure that's in studies. And then we also, this paper just recently came out in February 2022 of two antihistamine or H1 H2 antagonists that are also antiviral being really beneficial for people with long COVID.

And of course, we can use our nutritional and lifestyle medicine, and nutritional supplementation strategies. I have a whole course on this, where I talk about nutrition and supplementation and how to use what, and which probiotic to use, and all of that. And we also talk a lot about the menstrual irregularities and hormone issues of long COVID because I work with women's health so I see a lot of female patients. But I'll give you a quick clinical pearl here, while bacillus subtilis can be really valuable in sort of fighting off that SARS-CoV-2 living for the long term in the gut, sometimes I'm seeing them in my practice raising histamine levels, or at least exacerbating elevated histamine symptoms, so just be aware of that. And as we just talked about, one of the triggers that's most common for people having long COVID is that their initial SARS-CoV-2 infection activated dormant pathogens, specifically Epstein-Barr is kind of a research darling right now, but there are lots of other infections that have also been shown to be reactivated, herpes, cytomegalovirus, and so forth. So, then let's get to the cardiovascular and pulmonary healing. Thank you, Harvard. Finally, in October, well, let's see, this says October of 2020, but oh, it wasn't published.

Here we go, it wasn't published until January 2021, but I knew this like the first day I had long COVID, the most distinctive experience of long COVID for me was a sensation of my entire vascular system hurting, being on fire, and feeling weird. And I could like almost imagine all the vessels through my body. And interestingly enough, literally a couple of days after my second mRNA vaccine dose, that pain in May of 2021 cleared, just literally turned off. It's the most interesting experience I've ever had in my body. Well,

maybe not, but it was very surprising. So, I had my second vaccine dose, actually after the first vaccine dose, my heart rate stabilized, so that was lovely. After the second one, my pain literally turned off and has not turned back on again. However, you know, the symptoms didn't a hundred percent resolve at that point, but some of the most problematic symptoms did resolve pretty immediately after a few days of intense vaccine symptoms.

So, you know, it's a double-edged sword with that vaccine. We can have that conversation all day, but not right here. So, COVID-19 is a vascular disease, and I would say because of that also a neurologic disease and a gut microbiome disease. As I said, my vascular pain just resolved despite the fact that I was telling doctors, "This is and my vessels hurt, it's in my vessels." My doctors were like, "What?" But because I could feel this, so while I got no treatment from a conventional sense or even a functional

sense at that point, I was like, "Okay, here's what we're gonna do. We're gonna treat the vascular epithelium from a nutritional standpoint," and that's exactly what I did. And more and more now we're seeing this crosstalk between platelets, key clotting factors. So, people with potentially these micro clots, and pathogens, and this sort of gumming up of the vascular works by aging monocytes, residual viral proteins, creating these little gunky things that irritate and gunk up the vessels in addition to, or potentially, you know, these are both the same things that different research groups are looking at it differently. These micro clots at the level of the capillary circulation. So, why? We don't know, but here are some things to test and evaluate over time.

And again, maybe it's sticking monocytes all bound up with viral proteins. We'll see as the papers out of Bruce Patterson's lab continue, and, you know, the papers out of these other labs and also Resia Pretorius' lab, and Germany and South Africa are also showing us the micro clotting theory. So, what's gumming up the works is still in discussions from a research standpoint, but we can still use our functional nutrition strategies to keep help clearing and cleaning the blood, keep healing the vascular epithelium, to and no matter what some of the drivers of this might be, and to keep kind of resetting and resetting the nervous system and the immune system to clear any persistent virus or clear any persistent viral proteins, you know, kind of pieces of the virus.

And also the autoantibodies, right? So optimizing, again if we come at this from a system by system approach, optimize nervous system, immune function, vascular or epithelium, blood health, you know, lack of excessive clotting factors, antioxidants, anti-inflammatories, it doesn't really matter, we don't have to know the a hundred percent answer to this yet to get people symptom relief and actual root cause healing. So, in the meantime, we will keep the inflammation low, nourish, the vascular epithelium, nourish the small fiber neurons, regulate the autonomic nervous system, and keep studying the vagus nerve.

And don't forget the number one symptom that people present with in long COVID is fatigue. Anytime I think fatigue, especially interacting with Epstein-Barr virus, I start to think what's going on in the mitochondria? So again, because I had an experience of Epstein-Barr reactivation almost 20 years ago, I had the experience of taking care of my mitochondria before, during, and after my acute COVID experience. And I've never experienced fatigue from this, despite it being the number one symptom. So, I really think this is an important toolkit in our perspective as lifestyle medicine and functional nutrition practitioners, we know everything to do.

And, you know, I teach all of this in a lot more detail in our training course, the Immune Bundle at the Integrative Women's Health Institute, but exercise with appropriate pacing and think about thinking about the autonomic nervous system, really movement, breath work, autonomic nervous system retraining from a movement standpoint, plant-based diet, although low carb, you know, good quality animal protein is also beneficial too for protein absorption, intermittent fasting, even longer term fasting may help reset the immune system function.

Mitochondrial support nutrients, testing mitochondrial function, Metformin and/or steroids can also help. But again, this can exacerbate histamine responses or reactivate dormant viruses, so not my favorite way to do it. And then reducing the toxic load to activate healthy detox systems. And again, we've seen acutely in the literature, multiple studies have shown an interaction between mold and acute COVID 19 severity. So, we don't know, but certainly microtoxins could exacerbate long COVID.

So, testing for that and just cleaning up, lowering the viral, I mean, lowering the toxic load is going to be helpful. And then specifically for your female clients, we are seeing that long COVID is potentially associated with estrogen and/or progesterone depletion. We see it most commonly in intense athletes of childbearing age, male and/or female, but certainly female is more common. Also, we see this in children, about 10% of children up to 30% of children who have an initial COVID infection, and in perimenopausal women. Now also though, there if people have higher levels of estrogen, that can mediate autoimmunity.

So, at this point, kind of like for my endometriosis patients, there's no one-size-fits-all direction that we wanna sort of push hormones in. What we wanna think is how can we get each individual's hormonal picture more optimized so that they're not depleted, they don't have HPA, and HPT, and HPO axis dysregulation. They're not depleted, their levels aren't low, but they're also not high. So, their liver is supported, estrogen is being appropriately metabolized. And there is some research currently looking at the benefit of hormone replacement therapy in long COVID, but the jury is still out on that because don't forget, there's an elevated risk of blood clotting with hormone replacement therapy in certain women and in certain cases that we have to consider given this exacerbated risk of elevated blood clots.

So, we wanna support HPA access, resilience, thyroid assessment. And as I said before, so fascinating that we're seeing this lack of oxygen exchange, this like this kind of inefficient hypoxia at cellular level. So, I've had some temperature regulation issues with my long COVID and they chased down my thyroid, my medical team chased down my thyroid. Everything looked normal, very, very mild subclinical hypothyroidism, but not anything significant.

And I'm actually way more hot than I am cold, no hair loss, no nail flimsiness, nothing like that. But on ultrasound, my thyroid is hypervascularized, which would lend evidence to that theory that for some reason there's not this cellular oxygen exchange going on at an efficient level in my body because it's being extremely well supported is, and there's a little bit of ableist perspective on that, but it is being extremely well supported and thus it's adapting appropriately. So again, using supportive hormone replacement therapy or hormone support nutraceuticals can be valuable, but be mindful of clotting risk, and consider that estrogen can exacerbate mast cell activation syndrome, and progesterone can actually inhibit mast cells.

So, there are kind of cost-benefit analysis to whatever direction you wanna take your hormone or endocrine system support with that from a functional nutrition standpoint. So, the root cause is still a bit elusive, I expect there to be a flurry of research papers in the next three to six months. So, what do we need to do? Search and destroy residual virus, reverse autoimmunity, clean up monocytes and residual spike and other like new capsid proteins that are just gumming up the vascular works. Do we need to clean up micro clots? Do we need to address histamine issues and mitochondrial function? Let's address it all. From a functional nutrition and lifestyle medicine standpoint, we absolutely can, and we can start at the level of the autonomic nervous system.

And there are lots of medical therapies under consideration, all of which I think are really important to keep in mind. We want to be integrative, and there's some real value here in some of these medical therapies. But what we can do with our tools in functional medicine, functional neutral lifestyle medicine is help people to use what we know now to start actively healing, help them focus consistent attention to the activation of the ventral vagus parasympathetic nervous system state as a key to healing. Stop-rest-pace.

Convalescence time for recovery, pacing their return to work, probably the most valuable thing we can offer, nourish the central nervous system and peripheral nerves, lower inflammation systemically, optimize digestion, the gut microbiome health, and nourish the vascular epithelium, mitochondrial support, immune modulation, MCAS and kind of help with the processing of histamine and quieting mast cell activation. Explore on a personalized health basis the role of hormones, and consider this likely interaction between residual virus and/or viral particles and activation of or interaction with environmental toxins.



Thank you so much for spending this time with me today. If you have any questions or wanna dig deep more into our strategies for doing all of those things 'cause there are many, many, many available tools from a nutrition standpoint, a nutraceutical standpoint, a lifestyle medicine standpoint, and behavioral modification standpoint. All of these treatment tools are available, and we talk a lot about that in our Immune Bundle course. So, feel free to reach out to me with any questions, you can send me a message on Instagram @integrativewomenshealth. You can download our free Immune Boosting Soups and Stews Cookbook at [integrativewomenshealthinstitute.com /immunity-soup-cookbook](https://integrativewomenshealthinstitute.com/immunity-soup-cookbook).

That's [integrativewomenshealthinstitute.com immunity-soup-cookbook](https://integrativewomenshealthinstitute.com/immunity-soup-cookbook). And the most thing I wanna say as we wrap up this presentation is long COVID is challenging, it's traumatic, it happens to people who are very healthy or felt absolutely fine before their COVID infection, and people who had comorbidities, and we need to be caring for all of them exactly the same, not one person deserves more care than another. People can have this whether they've been vaccinated or not, though the likelihood of having it post-vaccine infection is about 50% less. Some people who have had a COVID vaccination will have a very similar symptom picture triggered by the vaccination itself, or both, or the in infection and the vaccination.

So, there's no morally superior human that's going to walk into your office. Some will be vaccinated, some will be unvaccinated, some will have brilliant thriving prior to COVID 19 health, some will have preexisting conditions, some will be taking care of their health, some will be at the pinnacle of their health, others will be not taking as good of care of their health, some will be struggling with chronic underlying illnesses that they either know about or don't know about. It's really important to put aside and be aware of your own ableism as you help take care of these people because absolutely each and every one of them deserves your help. There is help. And the other most important thing to be aware of is there is absolutely hope for complete to recovery from long COVID, though, it might take a little while for many people. And that hope is really important and vigorously needed right now because people with long COVID after a year or almost two years are becoming a bit hopeless, and some of them have even committed suicide. So, it's time for us to step up and show people that there is help available for all of us in this long COVID, but we are healing together. All right, thanks so much for your time, enjoy the soups and stews, and I'll see you there. See you later, bye-bye.