#36 – Can You Prevent Preeclampsia? A Deep Dive into Root Causes and Prevention Beyond Aspirin Transcript

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Introduction to Preeclampsia

[music] Welcome to the trip lab kitchen table conversations about integrative medicine and psychedelics. [music] I'm your host and attending physician Dr. Mariela Wood.

Hi everyone, welcome back to the trip lab. Today we are diving deeper into a pregnancy condition that I am very passionate about both personally and professionally and that is because pregnancy is one of the most profound physiologic transformations the human body can go through. And one of the things that it actually reveals sometimes very early is how deeply connected the placenta is to the mother's blood vessels, immune system, metabolism, and actually long-term health. So today we are using preeacclampsia as a window into all of that. And before we jump in, I do want to mention that there is a full transcript with all of the studies that I've talked about in this episode linked that you can find on my website at dr mielawwood.com. So, d r m a r y l a w o d.com and that's also going to be linked in the episode description. I also created a companion guide, a little cheat sheet that summarizes all of the main points and recommendations because this episode is going to be a little bit longer than my other one. So, I wanted to make something short, concise if you just wanted to jump to the recommendations. So preeacclampsia is a potentially life-threatening disease of pregnancy and actually one of the leading causes of maternal and neonatal morbidity and mortality worldwide. And I know that does sound scary, but I do want to preface that this episode is actually not meant to scare you. It's meant to help you understand one of the most important pregnancy complications through a more empowered and whole body lens. So what is it? What actually is preeacclampsia? At its most basic level, preeacclampsia is characterized by new onset high blood pressure in pregnancy, plus signs that other parts of the body are being affected. And for those of you that want the specifics and the technical diagnostic criteria, that includes new onset high blood pressure after 20 weeks of pregnancy, plus either protein in the urine or evidence that the condition is affecting other organs like the platelets, kidneys, liver, lungs, brain, or visual system. And that really is the key here. So preeclampsia is not just high blood pressure in pregnancy. The blood pressure is just one sign of a much larger process affecting the placenta, blood vessels, inflammation and multiple organ systems. Preeacclampsia can progress to eclampsia which is when seizures occur or to help syndrome. [clears throat] So HL LP which stands for hemolysis, elevated liver enzymes and low platelets. Both of those are very serious and can be life-threatening if not recognized and treated very immediately. Clinically, we also classify preeclampsia as either without severe features or with severe features. And that particular distinction changes how urgently the pregnancy needs to be managed, how closely the patient is monitored, and what treatments are used in the hospital. What we do know is that preeclampsia appears to be driven at least in part by a problem with the placenta. And for a lot of reasons that we're still trying to understand, the placenta begins releasing signals into the mother's bloodstream that contributes to widespread inflammation and endothelial dysfunction. So basically that means a dysfunction or a problem of the blood vessel lining. And because the placenta is central to the disease process, the only definitive treatment is delivery of the baby and the placenta. However, common misconception that delivering the placenta quote unquote cures preeacclampsia, it definitely treats the root driver, but the blood vessel dysfunction can still happen and people can actually be diagnosed with preeacclampsia up to 6 weeks postpartum.

So, [clears throat] in the hospital, if someone has preeacclampsia with severe features, we often give IV magnesium. And another common misconception, magnesium is actually not given to treat the blood pressure. It's given to protect the brain and reduce the risk of seizure in mom. But what I really want to explore in this episode is the why. Why does this life-threatening disorder develop in pregnancy? Why can it happen even in people who are seemingly otherwise very healthy? What exactly does the placenta have to do with it?

And of course from an integrative perspective, what roles do inflammation, oxidative stress, immune tolerance, genetics, nutrition, stress, sleep, paternal health, which we will get into, and environmental exposures potentially play. Because really, if we can understand those mechanisms more deeply, we can start to think more clearly and more holistically about prevention. So one tool that we do have in modern medicine is baby aspirin. And we're

going to get all into how and why that works. then we'll extend the conversation beyond baby aspirin. And I clearly want to state that I mean in addition to baby aspirin, not in replace of it. But it turns out there actually is quite a lot that we can do to support the body potentially prevent preeacclampsia from an integrative perspective.

So this obviously is a very specific condition and episode as it relates to pregnancy and I want to share why. So I actually developed preeacclampsia with severe features which we'll get into in my pregnancy. So I do want to share a little bit of my journey with this condition before we begin because I do think it's really important and truly part of integrative medicine to understand a patient's story. So backing up, I personally had zero risk factors.

Personal Experience and Why This Matters

So common risk factors are chronic hypertension or high blood pressure, diabetes, kidney disease, autoimmune disease, obesity, and in general I I consider myself a very healthy person and I continued all of my very healthy habits in pregnancy. I am an integrative medicine physician and I truly do practice what I preach in my own life. So when I got preeclampsia I truly was baffled and I will say getting the condition that I treated so frequently in residency knowing the risks and what we had to do for treatment it really was something else being on the other side of the things as the patient this time.

So I went to my 38w week appointment, ended up having extremely high blood pressures, was sent into obtriage for monitoring, checked my blood, my urine had protein in it, blood pressures were still extremely high, so I was diagnosed. I had preeclampsia. So right then and there, I was induced at 38 weeks, so technically term. That alone threw a huge wrench in my plans of having an unmedicated birth. Because I was induced, I obviously had to get ptocin to start my labor. My water was artificially broken and I did end up getting an epidural, which we can definitely dive into in a later episode.

Fast forward, my baby was born healthy and had no complications except for maybe the breastfeeding struggle, which again we can get into in a later episode. But the absolute worst part of the experience was after I was discharged, got to go home, was at home with my husband, a fresh fresh newborn, I checked my blood pressure and I actually had even higher, alarmingly high blood pressures and had to go back to the ER and at that point was diagnosed with preeacclampsia with severe features. So I had to get admitted for IV magnesium for 24 hours. And I will be completely honest here, I had never felt so terrible in my life during that 24 hours. I did not have my son come with me to the ER for obvious reasons. You never know what's harboring in the ER. And then when I eventually got up to a postpartum room, I couldn't have my baby in the room alone with me, which is standard of care because of the seizure risk. And I knew all of this being on the doctor's side of the equation. But as a patient and a brand new mom, it is totally demoralizing to know that it is unsafe for your baby to be alone in a room with you. On top of that, I had not slept since I left the hospital. I did not sleep during the whole mag experience. Probably because I declined the fully catheter. Now I understand why they say doctors make the worst patients. And the magnesiums in the fluids they give you cause you to pee an enormous amount. So unfortunately you have to have the assistance of a nurse to use the bathroom, which I unfortunately had to do multiple times an hour. And saying that out loud still to this day, I feel so terrible for her. And it truly did hurt my soul to call the nurse button that many times.

But at the moment, there was just something in me that I knew that I did not want the fully catheter. And for all of the nurses listening, I truly am so sorry. I know how terrible of a night shift that creates for you. And I would never recommend that option to a patient. But for whatever reason, in the moment, that is what I chose. Would I choose it again? Hopefully not. But moving on. Okay, so I finally got discharged. had to take blood pressure medication for weeks after going home. I then had extreme breastfeeding struggles leading to severe postpartum depression which again I definitely will do a later episode about and did the preeacclampsia and mag cause the breastfeeding struggles. It's definitely possible that it contributed especially because I needed magnesium but again we'll get into all that in another day. So all in all my point with sharing this story is that this condition and thus this episode really hits close to home. So, I went on a deep dive rabbit hole to really understand this condition at a deeper level because I did not have any risk factors and because if there is any way to prevent this for myself and future pregnancies and more importantly for me to help other women prevent it as well, that is my goal. Beyond that experience alone, having preeacclampsia in pregnancy is associated with an eightfold higher risk of early death due to cardiovascular events like heart attacks and strokes. That is astonishing. So, I'm thinking me, someone who

technically does all the things quote unquote correct in the name of health. I now have an increased risk of early heart attack and stroke. So, we'll get into all of that, like really hashing out and distinguishing between is it the preeacclampsia alone that increases your risk or does preeacclampsia act as sort of a stress test to see how your heart and body behaves when it is under stress? And spoiler alert, it's both, but we'll get into all of that in this episode. The other part of this condition that has always made me so curious is that technically preeacclampsia only affects 3 to 5% of pregnancies worldwide. So on paper that sounds relatively uncommon but in my lived experience both personally and professionally it has been very different. So on the doctor's side in my professional life when I was in residency and working on labor and delivery preeclampsia was everywhere. There were many many times when half the patients on the floor had preeacclampsia.

Now to be fair I was working with higher risk populations and many of those patients did have known risk factors but many of them did not. And then in my personal life besides myself I know a surprising number of otherwise healthy women friends colleagues who developed preeacclampsia also without any of the classic risk factors. So even though the statistics tell us one thing, my personal and professional experience does feel very different. So of course I did some digging. So that 3 to 5% number, the most recent data we have for that number comes from 2021. But we also have to acknowledge that the world has changed. We are now several years out from the COVID pandemic and we are still learning about the downstream effects of COVID itself, long COVID, chronic inflammation, metabolic health changes, and all the other things even if you didn't have COVID, the stress, sleep disruption, lifestyle shifts that happened during and after lockdown. And we do actually have evidence that COVID infection during pregnancy is associated with a higher risk of preeacclampsia.

So, CO actually affects many of the same pathways involved in preeacclampsia. So endothelial dysfunction, so dysfunction of the inside of the blood vessel, inflammatory cytoine activation, you probably heard of the cytoine storm in COVID, oxidative stress, throboinflammation, compliment activation, and placental vascular stress. Very importantly though, this is different from the COVID vaccine. So the data that we have on COVID vaccine in pregnancy is very reassuring. So the interco analysis reported that vaccination was associated with a lower risk of preeacclampsia specifically a 33% lower risk while co infection itself was associated with a higher risk so 78% increased risk. So if we're talking about co as a possible contributor the concern is the infection itself and the inflammatory vascular burden of the virus not the vaccine. But all that being said, I still don't think that we can fully blame CO. I think it probably is one piece of the story.

How Preeclampsia Develops

But what I really want to do in this episode is dive deeper. So we are going to really dive deep into all of the leading theories on how preeacclampsia develops, why it may happen even in people who seem otherwise healthy, what the current prevention strategies are, and what else we can start to think of from a more holistic and integrative medicine perspective.

Okay, long preface, but let's dive in. We're going to start with the pathophysiology. How does preeacclampsia develop and I will preface this by saying that we are about to do a deep dive into some super interesting mechanisms, but it will take a little bit of time to explain. So, if you want to skip that and just move on over to what you can actually do to prevent preeclampsia, I do have chapter markers so you can jump ahead and the full transcript is available on my website. But I do encourage you to listen to the how and the why because it will make the recommendations make a lot more sense. There is some fascinating stuff here. And ladies, we might actually be able to partially blame the men for this one. Your partner may play a role and you developing preeclampsia. So listen on and you'll see why. But okay, if you're with me for the pathophysiology section, let's just jump right in. And right off the bat, I will state clearly that we do not fully understand preeclampsia 100% yet. And there is not one single cause, one single pathway or one single thing that explains every case. But we actually are learning a lot more and there's a lot of studies that are coming out. And understanding that will help us think more clearly about prevention and risk reduction. One of the main ways we currently understand preeclampsia is through a two-stage process. So stage one actually begins very early in pregnancy during placental development. So the placenta starts developing in the first few weeks of pregnancy and then becomes much more established by the end of the first trimester. And as a side note, this is one of the reasons the first trimester can feel so intense. Your body is not only growing a baby, it is also literally building an entire organ to support that baby, which is the placenta. So that is a huge physiologic demand. Then once the placenta is more fully established and functioning more efficiently,

many people notice that first trimester fatigue starts to lift. But okay, back to preclampsia. So the first stage is thought to involve early abnormalities in placental development and studies suggest several things may be happening. The spiral arteries may not be remodeled as completely as they should. Implantation may be more shallow than we want. and blood flow to the developing placenta may be restricted early on. So that's the setup. Then stage two appears later in pregnancy, often in the third trimester when the stressed placenta begins sending signals into the mother's circulation. So essentially what all that means is that the placenta begins releasing inflammatory and anti-angioenic signals.

Then those signals affect the mother's blood vessels, kidneys, liver, brain, platelets, and overall vascular system. So that is when we start to see the actual clinical picture of preeacclampsia show up as high blood pressure, protein in the urine, headaches, visual changes, abnormal labs, low platelets, and essentially all signs of what we call end organ involvement. Okay, so to recap, preeacclampsia happens in two stages.

Stage one, very early in pregnancy during placental development. That's when the placenta is forming and trying to establish a healthy blood supply between the mother and the developing baby. So, normally in a healthy pregnancy, specialized placental cells called trophoblasts bury into the maternal uterus to help remodel the spiral arteries. So, the spiral arteries are small blood vessels in the uterus that need to transform into wider, lower resistance vessels so that they can deliver enough blood to the placenta.

But again in pre-clampsia this process is not happening as completely as it should. So that can mean the trophoblast invasion may be more shallow. The spiral arteries may not be remodeled appropriately and the placenta may end up with more restricted or inconsistent blood flow. So that's the setup again.

And then of course as pregnancy progresses we progressively get less blood flow, less oxygen and more stress on both mom and baby which eventually leads to oxidative stress which I do want to explain a little bit more because it'll help us understand things a little bit better. Oxidative stress happens when the production of reactive oxygen species or free radicals overwhelms the body's antioxidant defenses.

So a little oxidative stress is very normal in pregnancy because pregnancy is very metabolically demanding. But in preeacclampsia the stressed placenta may produce too much oxidative stress, too much inflammation and too many distress signals. And this is also where the mitochondria enter the picture. So mitochondria, thinking back to basic high school biology, they are the powerhouses of the cell. But they're much more than that. So they help turn oxygen and nutrients into usable cellular energy called ATP. They also help redux balance inflammation, immune signaling, hormone production, and how cells respond to stress. The placenta is an incredibly energy demanding organ. So mitochondrial function is very important. And even though they are so important, they are also very vulnerable. When oxidative stress is high, mitochondria can become damaged or dysfunctional. And when they're dysfunctional, they produce more reactive oxygen species. So that's why targeting the mitochondria is one prevention strategy we'll discuss in a minute here. So all of these things are all happening behind the scenes until we finally reach the third trimester when preeclampsia starts to show up in more clinically noticeable ways. And again, I mentioned earlier, one of those ways is called endothelial dysfunction. So the endothelium is the thin inner lining of the blood vessels that helps regulate blood vessel relaxation or constriction.

Blood pressure, clotting, inflammation, and blood flow to our organs. So when it's healthy, blood vessels can relax appropriately, blood flow smoothly, and the vessel lining has anti-inflammatory and anti- clotting properties. But when the endothelium becomes inflamed or injured, the blood vessels become more constricted, more reactive, more leaky, and more prone to clotting. So clinically preeacclampsia shows up like this. High blood pressure because the blood vessels are constricted and reactive. Protein in the urine because the kidney's delicate filtration system is affected. Headaches or visual changes because the vascular system in the brain is involved. Elevated liver enzymes or right upper quadrant pain because the liver can be affected. And then low platelets because the clotting system and platelet activation pathways are involved too. So again, why why why why and of course we know there are established risk factors like chronic hypertension, kidney disease, diabetes, higher BMI, all things that we already know cause oxidative stress and endothelial dysfunction. But what I am especially interested in is this.

Why can preeacclampsia still happen in someone who is otherwise very healthy? Why would a person without the

classic risk factors still develop that abnormal placentation, oxidative stress, inflammation, all those things in pregnancy? So, one possible piece of the puzzle is genetics. So, the first known genetic mutation that actually is associated with a higher risk for preeacclampsia is the MTHFR gene mutation.

So the MTHFR gene codes for an enzyme that activates or methylates some of the B vitamins, most notably for pregnancy, folate, and supports detox processes in the body. And those pathways are essential for pregnancy because they support DNA synthesis, DNA methylation, placental development, vascular function, and normal cellular growth. And going back to activating the B vitamins, if the body cannot efficiently convert folate into methylolate, then one of the downstream reactions of that becomes less efficient, which is converting homoyine back into methionine. When homoyine is not recycled efficiently, it can accumulate in the blood and cause issues. So homoyine, not bad in and of itself. It's a normal byproduct of metabolism, but high levels actually damage walls of blood vessels, cause oxidative stress, vascular inflammation in a more pro-thrombotic vascular environment. So if you have this genetic mutation, which you can easily test for, taking methylolate in your prenatal rather than folate or folic acid, can help you bypass this step and lower your chance of homoyine buildup in the blood. And there are a few other things that can be supportive if you do have this genetic mutation which again we'll get into in the next section when we talk about prevention. So aside from the MTHFR gene mutation, there are some other genetic factors researchers are looking into as well. So MIR 155 which is a microRNA that regulates gene expression. So it can become upregulated in inflammatory states which again may interfere with normal vascularization and angioenesis or blood vessel formation. There's also genetic variations in the compliment system which is part of our innate immune system. So compliment helps the body respond to infections and cellular stress. But if it's overactivated or poorly regulated, it also can contribute to inflammation, endothelial injury and placental dysfunction. We're also seeing inflammatory gene polymorphisms like variations of TNF alpha which is a major inflammatory cytoine and excess TNF alpha can promote again endothelial dysfunction, oxidative stress and impaired placental vascular development. So genetics yes they do play a role but they are not your destiny. So knowing someone has a genetic tendency in one of these pathways may change how we think about supporting the body before pregnancy and during early pregnancy. So for example, if someone does have one of those MTHFR variants or elevated homocyine, it is very reasonable to think more carefully about folate form, B12 status, B6, riboplavin, choline, and other methylation supportive nutrients. Besides the MTHFR gene mutation, if someone has other genetic predispositions toward a higher oxidative stress or inflammatory burden, then we can also think more about antioxidant capacity, glutathione supplementation, nutrients efficiency, sleep, metabolic health, and things like NAC supplements in specific cases. Okay, genetics. And naturally from genetics, I want to talk about epigenetics, which I personally think is so cool and actually incredibly powering. So epigenetics refers to changes in gene expression, meaning how genes are turned up, turned down, silenced or activated. And this is directly influenced by lifestyle, environment, nutrition, stress, sleep, toxin exposures, infections, and general metabolic health, too. And we do have a few nutrient depletions that actually have been linked to preeacclampsia, including calcium, vitamin D, and magnesium. So later when we get into prevention, we'll get into what the studies show about supplementing these to prevent preeacclampsia. But a brief understanding of why. So calcium regulates vascular tone, muscle contraction, blood pressure regulation, and endothelial function. Vitamin D influences immune regulation, inflammation, endothelial function, placental development, and angioenesis. And magnesium helps regulate vascular tone, blood pressure, also endothelial function, oxidative stress, and neuromuscular signaling. And in addition to specific nutrients, overall nutrition quality also plays a role because that's going to influence inflammation, oxidative stress, vascular health, gut microbiome, all the things. So thinking about lifestyle which directly impacts epigenetics, exercise also plays a role.

So movement supports insulin sensitivity, vascular function, blood pressure regulation, mitochondrial health and endothelial function.

Genetics, Epigenetics, and Environmental Exposures

Sleep also important because disrupted sleep and sleep disorded breathing can increase sympathetic activation. That's that fight or flight. And again downstream effects, oxidative stress, inflammation, blood pressure, dysregulation. Substance use also plays a role like smoking and alcohol in excess amounts. So all the lifestyle things really do matter as far as epigenetics. And along the same lines, environmental toxins actually appear to play a major role as well. And in my opinion, this might actually be one of the clear reasons why preeacclampsia prevalence may be increasing, particularly in seemingly quote unquote healthy individuals. And I did recently do a

full deep dive series on environmental toxins and how they actually impact health. So if you do want more of a deep dive into that, go check out that series. It's a five-part series. But the short version as it relates to preeclampsia is this. Environmental exposures like microplastics, pesticides, heavy metals, air pollution, BPA, phalates, PFAS, and other endocrine disrupting chemicals are really not abstract concerns.

They affect hormone signaling, increase oxidative stress, disrupt the mitochondria. As you keep seeing these same pathways keep coming up. They alter immune signaling and impair the gut barrier which eventually contributes again to endothelial dysfunction. And we are increasingly seeing these exposures linked with conditions like infertility, endometriosis, POS, autoimmune disease, cancer, cardioabolic disease and cardiovascular disease. And there's actually a lot of specific studies as it relates to preeacclampsia too. So BPA has been shown to alter placental function and induce oxidative stress. Phalates affect lipid metabolism and inflammatory responses which also contribute to the overall pathophysiology of preeacclampsia. And a recent 2025 study showed that PFA specifically increase preeacclampsia risk through impaired angioenesis through VEGF signaling. Then looking at heavy metals, a 2018 systematic review found strong evidence that lead exposure is associated with increased preeacclampsia risk. And there's also broader environmental health reviews that have also found associations between preeclampsia and other heavy metals including cadmium as well as persistent organic pollutants, PCBs, and some pesticides. One of those reviews concluded that evidence was the strongest for persistent chemicals like lead, cadmium, organo chlorine, pesticides, and PCBs. Air pollution is another piece of this puzzle. A metaanalysis found that higher exposure to fine particulate matter or PM2.5 was associated with an increased preeclampsia risk. So, the studies are there. The link is definitely real. But I also don't want these facts to create fear. I'm sharing them because I want them to empower you to help you understand the modern medical landscape a little bit better. We live in a world where exposures to environmental toxins are truly inevitable and unavoidable. But that being said, there are definitely simple ways to start reducing your exposures. And preconception and pregnancy are really powerful windows that provide an opportunity to actively focus on this to not only improve your pregnancy health and the health of your baby, but also your long-term health as well. And in my recent deep dive series, I go through all the things that you can do to reduce exposures and support the body's clearance of those toxins. I also have an episode on detox supplements and protocols, which ones actually have evidence, and more importantly, which ones are actually genuinely dangerous. So, definitely check that series out if all of this is of interest to you. But again, back to preeclampsia. Next, what I think is the most fascinating and underdis discussed parts of preeacclampsia is the paternal factor. So, of course, preeacclampsia is usually only talked about as a maternal condition. And of course, it is happening to the pregnant person's body, but the placenta is actually not purely maternal. The placenta is fetal tissue, which means it carries genetic information from both the mother and the father. So pregnancy is actually to some degree an immunological negotiation between the mother and paternal genetic material. So semen actually contains paternal antigens. And an antigen is basically a molecular signal that the immune system can recognize. So it's how the immune system distinguishes self from notself or familiar from unfamiliar. So every time you have sex when semen comes into contact with the maternal reproductive tract the female body naturally mounts an immune response and in a healthy setting this response is not supposed to be aggressive or inflammatory supposed to be regulated and seinal fluid contains immune modulating factors that may actually help the maternal immune system become more tolerant of those paternal antigens. And as a quick side note, we are actually increasingly learning that some early pregnancy symptoms are actually influenced by the paternally influenced genetic material in the placenta. Specifically, increases in GDF-15, which is a hormone produced in the placenta that's directly influenced by male genetics, is linked to nausea and vomiting early in pregnancy. So, just putting that out there. But back to preclampsia. So, the semen contains antigens that the female body reacts to.

And again, most of the time in a normal way, but sometimes in a pathological way that impacts how the placenta is formed. So there are these proposed paternal antigens expressed by the placenta that may actually influence maternal immune tolerance, trophoblast invasion, and how well the placenta establishes itself.

And interestingly, repeated exposure to a partner's semen before conception may actually help prime the maternal immune system to tolerate paternal antigens once pregnancy begins. So, this is one possible explanation for why preeclampsia is actually far more common in first pregnancies, new partners, donor sperm pregnancies, and situations where there may have been less exposure to your partner's siminal fluid before conception. So basically because there's inadequate immune tolerance to those paternal antigens. So more frequent sex with your baby daddy may actually reduce your risk of preeacclampsia. But beyond that, even more interestingly, modifiable

paternal health factors also play a role. So paternal obesity has been associated with increased preeclampsia risk in the pregnant partner. And also another side note, paternal health does not just impact their partner's preeacclampsia risk. It actually influences the long-term health of the baby as well. So sperm actually carries more than just DNA. It also carries the father's epigenetic information which again shaped by things like diet, exercise, stress, BMI, smoking, and environmental exposures. And newer evidence suggests that paternal exercise before conception can actually improve baby's metabolic health, cognition, mitochondrial function, and stress related behaviors. And also, paternal depression is also associated with a higher risk of depression later on for baby too. Okay, another tangent, but I just think this stuff is so fascinating. But again, back to preeacclampsia. So, remember that MTHFR gene mutation that we talked about in mom? So the father having an MTHFR variant also increases his partner's risk of preeacclampsia. So that means that the same things that I'll recommend later on for mom can also be applied to dad. So all in all, this doesn't mean we need to blame the men sort of. [laughter] But what this really highlights is that a healthy pregnancy should not solely be focused on the person carrying the pregnancy. Male preconception health absolutely matters too. Okay, so last root cause layer that I want to talk about is the microbiome. And this one too, such a fascinating area because the microbiome is one of the major ways our external environment communicates with our immune system. So we often think of the microbiome as just gut health, but in pregnancy, you're really talking about multiple microbial ecosystems. So the gut microbiome, the vaginal microbiome, the oral microbiome, urinary tract, and even potentially microbes carried in the semen. So all of those different microbial communities can influence immune regulation, inflammation, gut barrier function, and vascular health. So [snorts] of course, how does this relate to preeclampsia? So, one of the proposed ways that researchers are looking into is through what we call gut dispiosis, which is an imbalance in the gut microbiome. So, when the bacteria in your gut are in a healthy balance, the beneficial bacteria help produce short chain fatty acids like butyrate, acetate, and propionate. So, those compounds help support the intestinal barrier, regulate inflammation, influence immune tolerance, and again affect vascular function. it keeps coming up. But when there is gut dispiosis, we have an increase in the not so good bacteria.

Not totally pathogenic or infectious, but if those not so great bacteria have increased, it inevitably means that our beneficial bacteria are lower, which means lower short- chain fatty acid production. So this ultimately weakens the intestinal barrier which makes it easier for inflammatory compounds, bacteria or endotoxins to cross from the gut into the vascular system. And once those inflammatory signals enter the bloodstream, they of course can contribute to inflammation, endothelial dysfunction, oxidative stress and impaired placental development. So same same end mechanisms and interestingly we actually do see specific differences in the microbiome of women who have preeacclampsia. A 2024 review specifically notes decreased verbaculum prevatella lactobacillus and poromonus in the microbiomes of preeacclampsia patients compared with those who did not have preeacclampsia.

But it's not just the gut microbiome. The vaginal microbiome plays a role too. So specifically a lactobacillus dominant vaginal microbiome is associated with a healthier lower inflammatory body and lower lactobacillus species has been associated with increased inflammation and increased risk for placental dysfunction in preeacclampsia oral microbiome 2. So a systematic review and meta analysis found that perodontitis was significantly associated with increased preeacclampsia risk. So when the gums are chronically inflamed that again causes widespread inflammation and interestingly the male factor strikes again in this realm too. So reviews note that because semen is not sterile it may actually be introducing microbes or microbial signals into the maternal reproductive environment and changing the microbiome. Okay, so that was a deep dive into root causes and all those are the newer areas of research and I really focused on that data to understand why preeacclampsia develops in people without risk factors. But of course there are known risk factors that do pose a more obvious risk. So if you have pre-existing hypertension or high blood pressure, this one might be a little bit more obvious because that body is already under endothelial strain if your blood pressure is already high before pregnancy. Diabetes and insulin resistance also increases oxidative stress, inflammation and vascular dysfunction. Obesity is another one that's associated with chronic low-grade inflammation, insulin resistance, and higher risk of sleep disordered breathing, which plays a big role actually, which we'll get to.

Paternal Factors and the Microbiome

Prior kidney disease also increases the risk because the kidneys are deeply involved in blood pressure regulation and are highly sensitive to endothelial dysfunction. Autoimmune conditions can also increase your risk, especially lupus and antifphospholipid syndrome because those also increase inflammation, compliment activation, clotting

risk and placental vascular problems. Sleep apnea is another known one that can contribute through intermittent hypoxia or low oxygen level when you're sleeping. That one also increases sympathetic activation that fight or flight which actually increases blood pressure too. It causes oxidative stress. And finally, other associated risk factors for various different reasons are age. Unfortunately, if you're above 35, you're considered advanced maternal age. Luckily, we have changed that term from geriatric pregnancy to advanced maternal age, but still not great. [gasps] Carrying multiple pregnancy like twins, triplets, having a family history of preeacclampsia, and then of course having preeacclampsia in a prior pregnancy also is a risk factor. So all in all, as you can see, there is a lot that goes into what actually causes preeacclampsia.

But before we move on to prevention, and I promise we are almost there, there is one more piece of this conversation that I think is really important that I mentioned earlier, and that is the link between preeacclampsia and long-term cardiovascular disease. So this is something that I keep seeing talked about online. So, I really want to dive into it because my question was, does preeacclampsia alone actually increase your risk or is preeacclampsia more like a stress test to see how your body performs under strain? So, that eight-fold risk number came from a quite large 2012 Norwegian cohort that followed more than 800,000 women, so very large study, who had preeacclampsia in pregnancy to assess later cardiovascular mortality. So the highest risk group was women who had pre-term preeclampsia and then actually did not go on to have another pregnancy. So in that group cardiovascular mortality risk was much higher. So around an 8 to 9fold increase compared with women without preeacclampsia. And I will say that pre-term preeacclampsia is often associated with other underlying health factors which also may be playing a role. So we have that data. Then a later 2017 systematic review and meta analysis found that having preeacclampsia is associated with about a four-fold risk of future heart failure and about a two-fold increased risk of coronary heart disease, stroke or cardiovascular death. So not as dramatic as the earlier 8 to9 risk, but still definitely very significant in my opinion. So yes, preeacclampsia is clearly associated with later cardiovascular disease. But again, the question remains, is preeacclampsia itself causing that long-term vascular damage or is preeacclampsia acting like a stress test that reveals a person's underlying cardiovascular risk. And luckily, we do have more data. So, a 2022 study really helped clarify this. So, it did find that traditional cardiovascular risk factors do explain a large portion of the increased cardiovascular risk after preeacclampsia. So establish risk factors like we already talked about like chronic or pre-existing hypertension or high blood pressure, existing high cholesterol, type 2 diabetes, and elevated BMI. All of those things actually accounted for about 57% of the increased cardiovascular disease rate. Then gestational hypertension, which is high blood pressure developed during pregnancy, accounted for 84% of that increased risk for those that went on to develop preeacclampsia afterwards.

So that study essentially delineates that underlying cardiovascular and metabolic risk does play a role beyond just the disease process of preeacclampsia itself. However, unfortunately it turns out that preeacclampsia itself does play a role too. A 2025 study found that the longer the interval between preeacclampsia diagnosis and delivery, the higher the long-term cardiovascular risk before the age of 55. And specifically, this paper estimates a 1 to 2% increased risk per day from preeacclampsia diagnosis to delivery. So that means if you are diagnosed with preeacclampsia and then you're induced 2 days later, your risk for early heart disease later in life increases about 2 to 4%. That also means that waiting a week before induction increases your risk about 7 to 14%. So basically these findings suggest that the longer the body is exposed to the inflammatory, endothelial, hypertensive and vascular stress of preeacclampsia before delivery, the more that may influence long-term cardiovascular risk. So this essentially makes preeacclampsia itself a vascular entry event. Okay, so obviously I took a long time to explain all of that, but I did really want to take the time to break all of this down because preeclampsia is often just talked about when it gets diagnosed later in pregnancy and then the focus is on immediate treatment and delivery and as it should be. Like I stated earlier, treatment needs to happen promptly and in some cases emerently and our top priority is protecting both mom and baby from immediate danger. But of course, as we have seen in this episode, preeclampsia is very complex. It's a placental condition, a vascular condition, inflammatory, immune, metabolic condition, and for some people, an early warning sign about long-term cardiovascular health, and we're still learning about it. And the good news is that many of the pathways involved in preeacclampsia are at least partially modifiable. So definitely not perfectly controllable and preventable but definitely definitely modifiable.

We can support vascular health, metabolic health, reduce our inflammatory load, correct nutrient deficiencies, support our stress physiology, reduce exposure to environmental toxins, and of course think about both maternal and paternal preconception health. And of course, a lot of that is going to be very foundational. So, nutrition,

movement, exercise, sleep, blood pressure control, blood sugar balance, and overall cardtabolic health. But there's also some really interesting emerging research around specific nutrients, supplements, and other supportive practices that may influence preeclampsia risk. So, let's finally get into it. What can we do to potentially prevent preeacclampsia? And I'm actually going to start with baby aspirin because this is one of the few prevention strategies with a ton of data and will likely be recommended by your OB or midwife if you meet criteria. So ACOG recommends low dose or baby aspirin which is 81 millig daily starting between 12 and 28 weeks of pregnancy ideally before 16 weeks and continuing daily up until delivery. So your OB or midwife will likely recommend this if you've had preeacclampsia in a prior pregnancy, but also if you have other high risk factors. So how does it work?

Aspirin irreversibly inhibits COX 1, which then ultimately reduces platelet production of thromboxane A2. Thromboxane A2 promotes platelet activation, blood vessel construction, and a more pro-thrombotic vascular environment or proclot. And I'm sure I don't have to repeat this, but as we talked about earlier, platelet activation, vascular constriction, endothelial dysfunction, all part of the pathophysiology of preeacclampsia. And this intervention is very safe and very well studied. So as far as safety, we have randomized control trials and large reviews that have not shown an increased risk of major hemorrhagic complications. So bleeding complications including placental abruption, postpartum hemorrhage or fetal intraanial bleeding. Now what is important to know is that this really only helps prevent pre-term or early onset preeacclampsia if started early enough. It actually appears to have pretty minimal effect on late onset or term preeacclampsia. However, early onset and preterm preeacclampsia is the more dangerous phenotype. So even a modest risk reduction is meaningful and definitely worth doing especially because aspirin is low risk, inexpensive, and very wellstied. So aspirin of course stays on my list of prevention strategies because it is one of the best supported tools that we have. And for those of you listening who feel hesitant about taking a medication in pregnancy or in general want a more holistic approach, I also think it's interesting to remember that aspirin is actually derived from a plant. It's derived from willow bark which contains salicin which is a precursor to acetal salicylic acid which is aspirin. And I say this really to paint a bigger picture. We do not need to choose between conventional medicine or holistic health. We can definitely have both and that's what integrative medicine is. And there is often much more overlap between holistic and conventional medicine than you may think.

Many of our modern medicines aside from aspirin originated from plants or natural compounds. The biggest difference though of course nowadays is that medications like aspirin are isolated, standardized, purified, studied and dosed in a way that allows us to better understand both benefit and risk. And I will also clearly state that I do not recommend willow bark as a substitute for baby aspirin in pregnancy. Willow bark has variable salicellate content. It has not been studied in the same way for preeacclampsia prevention and could carry unpredictable risks or interactions. Okay. So, aspirin, yes. Next, I actually do want to briefly mention statins. And I know I know statins are quote unquote controversial in the holistic health world. And I actually did do a full deep dive on this topic in an earlier episode.

Long-Term Cardiovascular Risk After Preeclampsia

And we looked at all the reasons why some people call statins quote unquote evil. what the data actually shows behind those claims and why statins can be genuinely life-saving for a lot of people. So, that was episode 19 all about hyper lipidmia, why both statins and cholesterol actually are not the villains that many people think they are. But, okay, statins and preeacclampsia. So there actually is a pretty interesting paper published in 2020 in the American Journal of Obstetrics and Gynecology that discusses statins as a potential strategy for reducing the risk and severity of preeacclampsia. So the proposed benefit is actually not just about lowering cholesterol. Statins also have anti-inflammatory, antioxidant, anti-thrombotic and endothelial supportive effects. So they may improve vascular function, reduce oxidative stress, stabilize blood vessels. We know they stabilize plaque and influence angioenic pathways involved in all of the preeacclampsia biology. The statin that has been most studied in this context is pravisastatin partially because it appears to have less placental transfer compared with some of our other statins. But this is still very much an emerging area. Currently, statins are not a standard recommendation for preeacclampsia prevention and as of right now they generally are not started in preeacclampsia for this purpose outside of a specialist care or research setting or if you need a stat for a different reason. Okay, had to put that out there had to talk about it. It's pretty interesting. Again, not a recommendation currently, but very interesting. Okay, now more integrative strategies. So, I'm actually going to start with supplements since that is what people seem to be the most interested in and then of course we'll get into other very important lifestyle medicine changes like

nutrition, exercise, and actually even mind body medicine too. Okay, so supplements. So, there's actually a lot that have been studied, some with quite a lot of data, I will add, some with less data, but are safe and supportive in pregnancy regardless. So, definitely considered. But, let's just jump right in. So let's start with calcium because it actually has the strongest data here. So calcium plays an important role in vascular smooth muscle function, vascular endothelial function and blood pressure regulation. It also helps regulate parathyroid hormone which indirectly influences vascular tone and blood pressure. In a 2025 review on dietary supplements and preeacclampsia prevention notes that calcium is one of the best documented strategies for reducing preeacclampsia risk, especially in populations with low baseline calcium intake, which is actually quite a lot of people. If you do a calcium calculation, many of you might actually be deficient in calcium. But back to preeacclampsia. The studies actually show that calcium supplementation may reduce the risk of preeacclampsia by about 50%. So just comparing that to aspirin, it is actually superior. Again, I still absolutely recommend aspirin as well, but I do want to point that out. Now the important nuance though is that calcium supplementation seems most relevant and most beneficial for preeclampsia prevention when someone is not getting enough calcium from food which again may be quite a lot of us. So I don't recommend anyone go out and meggose calcium. What I really want to emphasize is making sure your total calcium intake is adequate. So total meaning food plus supplements. So, this specifically is what I would recommend. First, estimate your average daily calcium intake from food. And there's actually a great online calcium calculator that can do this for you, which I'll link in the show notes. So, you calculate your average daily intake. Then, look at how much calcium is already in your prenatal. And actually, most prenatalss do not contain that much calcium, so it's probably not much at all. And a lot of them actually contain no calcium because calcium is actually pretty bulky and really hard to fit into a prenatal capsule. Okay, so you calculated your food intake. You saw how much was in your prenatal. Then use this simple formula. You take 1500 mg, which is the pregnancy RDA, minus your average daily calcium intake from food minus the calcium in your prenatal if you have some. And then that number is what you need to supplement with extra. So, for example, if you're getting 800 millig of calcium from food and your prenal has 200, then you only need to supplement 500 mg additional per day. And if all of that is way too complicated, a very reasonable starting point is 500 mg of supplemental calcium daily, especially if you know your dietary calcium intake is probably on the lower side. And 500 millig actually is very supported by newer research showing that actually in populations with very low calcium intake that lower dose calcium supplementation which is the 500 millig a day was not inferior to the traditional higher doses which are around 1500 a day. So more is actually not always better. Our real goal is adequacy. For calcium form, I typically prefer calcium citrate.

Especially if you're taking acid suppressing medication or you just want something that's easier to absorb without relying as much on stomach acid. Calcium carbonate can work usually less expensive, but it is best absorbed with food. And one other important note about calcium. So calcium can interfere with absorption of certain medications and minerals, specifically thyroid medication and iron. So, if you're going to supplement, separate your calcium from thyroid medication if you're on thyroid medication for at least 4 hours and from iron also by a couple hours if possible. Okay, next is vitamin D. So, this one the evidence is more mixed, but clinically I think it's still very reasonable to take an addition. So, vitamin D is important for pregnancy for many reasons. So it plays a role in immune regulation, inflammation, placental development, vascular function, bone health and fetal development as well. And for preeacclampsia specifically, vitamin D deficiency has been associated with increased preeacclampsia risk.

Evidence-Based Prevention: Aspirin and Statins

So how it appears to influence the placenta and blood vessels in a few ways. So we have some studies suggesting that vitamin D may increase vascular endothelial growth factor or VEGF and placental growth factor or PIGF both of which are involved in blood vessel formation and healthy placental vascular development.

And we have animal models showing that vitamin D helps lower blood pressure and improve vascular function. We don't have human studies showing that it improves blood pressure but interesting nonetheless. But the clinical trials, the data around vitamin D supplementation to prevent preeclampsia is pretty mixed. A 2020 meta analysis of randomized control trials found that starting an additional vitamin D supplementation around 20 weeks was actually associated with a reduced incidence of preeclampsia.

But then we had more recent data. A 2024 cockraine review did not find clear benefit of vitamin D supplementation

for reducing preeclampsia risk. So the data is mixed but this is how I see it. We know that vitamin D deficiency is associated with preeacclampsia risk. Vitamin D outside of preeacclampsia is biologically relevant to pregnancy support placental health vascular health. So in my mind it is very reasonable to supplement vitamin D in addition to your prenatal vitamin. So practically dosing I personally use a labg guided approach. So, I check a vitamin D level before pregnancy or very early in pregnancy and supplement based on the results. So, a lot of prenatalss do contain some vitamin D, but often not high enough to correct a deficiency. So, for most people, that means adding an additional vitamin D. So, somewhere around 2,000 international units in addition to your prenatal, but dosing is definitely very variable. Some people may actually need more depending on their baseline levels, their body size, absorption, sun exposure. So clinical guidance is really helpful for this one. Okay, next we have magnesium. So I already talked about when someone develops preeacclampsia with severe features, we actually use IV magnesium sulfate in the hospitals to reduce the risk of seizures. Again, not for blood pressure support, it's for seizure protection. But this is not the same conversation as taking an oral magnesium supplement at home. So again, IV magnesium is a medical treatment used in the setting of active disease to protect the brain. So oral magnesium as a nutritional supplement is a little bit different. So does oral magnesium supplementation prevent preeacclampsia? Unfortunately, probably not, and I'll explain here. The data is a little interesting, but right now not strong enough for magnesium to be a primary prevention recommendation. A 2022 metaanalysis of randomized control trials found that oral magnesium supplementation during pregnancy was associated with a reduced risk of preeacclampsia overall with a relative risk of.76.

But in the subgroup analysis, magnesium actually did not significantly reduce preeacclampsia risk in healthy pregnant women without risk factors. So that 2025 supplement review summarizes all of this by saying that current evidence does not support the routine oral magnesium supplementation specifically for preeclampsia prevention. So my take is this various formulations of magnesium supplements actually do support a lot of pregnancy related symptoms beyond preclampsia prevention. So magnesium glycinate can help with sleep, muscle tension, headaches and anxiety in pregnancy. Magnesium citrate can be helpful for constipation in pregnancy. So my recommendation would be consider using it as needed for those conditions, but know that it's probably not going to make a huge impact on preventing preeacclampsia. Okay. Next studied is lycopine, which is a keratenoid antioxidant found mostly in tomatoes and tomato-based foods. So lycopine has antioxidant and anti-inflammatory properties. So that's why it was studied. Of course, we already know preeclampsia involves endothelial dysfunction, inflammation, so mechanistically it makes sense that researchers have looked at it. However, the clinical data is pretty mixed. Some studies suggest lycopine may reduce preeacclampsia risk in women who already have risk factors, but it does not appear to clearly prevent preeacclampsia in otherwise healthy or low-risisk women. So, my practical take, eat more tomatoes. They're good for a lot of reasons, but probably don't waste your money on a specific lycopine supplement just yet, at least. And actually, more reason to eat tomatoes rather than taking a lycopine supplement, is that lycopine is actually better absorbed from cooked tomato products, especially if you're adding in a little fat like olive oil. So, a Mediterranean style meal with tomato sauce and olive oil, is actually probably better than buying a lycopine supplement. Anyways, all right.

Next is omega-3 fatty acids. So, specifically DHA and EPA. So, the data here on omega-3s and preeacclampsia is also mixed.

Supplements for Prevention

But again, same as the other ones, I think it's a very reasonable nutrient to consider in pregnancy because omega-3s are important for both maternal and fetal health regardless.

And actually, most prenatalss do not contain enough or most of them actually don't contain any omega-3s at all. So DHA and EPA help regulate inflammation, support endothelial function, influence lipid metabolism and reduce inflammation. So again, all mechanisms involved in preeacclampsia.

But again, the data for actually supplementing to prevent preeacclampsia is mixed. So older reviews noted that while observational studies often found lower omega-3 intake associated with higher preeclampsia risk, many of the supplementation trials and systematic reviews were were negative or mixed.

However, more recent meta analysis are a little bit more favorable. A 2023 meta analysis found that omega-3

supplementation during pregnancy was associated with a reduced risk of preeacclampsia with a relative risk of 75. A 2024 systematic review and meta analysis also concluded that omega-3 supplementation and fish oil did reduce preeclampsia risk. But even with those more favorable findings, a 2025 review concluded that although omega-3 supplementation may have beneficial effects for preeclampsia prevention, there's just not enough evidence yet to universally recommend it for preeclampsia prevention alone. So, my take again as all the other ones here, omega-3 supplements may or may not help with preeacclampsia prevention, but they are very reasonable and actually I highly recommend supplementing them in pregnancy regardless because DHA is essential for fetal brain and eye development. And there's actually some studies showing that it may reduce the risk of preterm birth. And again, like I said, most prenatalss do not contain enough or most of them don't contain any at all omega-3s. So, my rule of thumb that I give patients, if you eat 3 to four servings of fish a week, you probably don't need to supplement with an additional omega-3, if you don't, which again, 3 to 4 days a week of fish is hard to do, then supplementing with around 1,000 millig of combined DHA EPA can be helpful. Next, we have CoQ10, which I think is actually one of the more interesting supplements in this conversation. So CoQ10 or co-enzyme Q10 is a quas vitamin a vitamin-like fat soluble compound that the body actually makes naturally. It's found in cell membranes but it is especially important inside the mitochondria where it helps the body make cellular energy or ATP. It also acts as an antioxidant which helps protect cells from oxidative stress and again as we talked about earlier all things involved in preeclampsia. So really anything that supports mitochondrial function and antioxidant capacity is worth discussing in the preeacclampsia conversation. And specifically we actually do have evidence that women with preeacclampsia have significantly decreased plasma levels of CoQ10 compared with pregnant women who do not have preeclampsia. And there is one small but interesting randomized control trial. So in that study, women who had an increased risk of preeacclampsia were given 200 mg of CoQ10 daily starting at 20 weeks of pregnancy up until delivery. And preeacclampsia developed in 14% of the co-enzyme Q10 group compared with 25% of the placebo group. So meaningful difference, but it was just one relatively small trial. So we definitely need larger highquality replication before calling this a standard recommendation. So I definitely think worth considering. And additionally, CoQ10 is also something that many integrated infertility clinicians already use while trying to conceive or during IVF because of its role in mitochondrial function and egg quality.

So in that setting, fertility, preconception, doses are actually much higher. So around 400 to 600 milligs a day. So something to consider. But during pregnancy, if someone is considering using it, a talk with your OB or midwife, but I don't think you need the 400 to 600. I would recommend 100 to 200. But again, this is very personalized. This is not me giving you personal medical advice. Definitely talk to your OB midwife. That being said, CoQ10 does appear to be relatively safe and well tolerated in pregnancy, but it actually can get pretty expensive. So because the preeacclampsia prevention data is not definitive, I would treat this as a personal decision again with you and your OB or midwife. Next we have NAC or an acetylcysteine.

So NAC supports the production of glutathione which is the body's master antioxidant. So glutathione specifically helps maintain redux balance, protect cells from oxidative stress, support mitochondrial function and regulate inflammation. And of course all those things directly related to preeclampsia.

So this one may be helpful for people with higher oxidative stress burden, elevated homocyine, methylation concerns and specifically how I use it in my practice is those with MTHFR variants outside of pregnancy. But the data specifically for preeacclampsia prevention is pretty limited right now and mixed. So there was a much older 2005 study that found that NAC did reduce blood pressure and was safe. No adverse effects to baby. So that one technically not preeclampsia prevention but we have some interesting data with blood pressure in pregnancy. Then the next year in 2006 a randomized control trial looking at severe preeclampsia and health syndrome actually found that oral NAC did not stabilize the disease or prolong the time to delivery. And again in that case it was used for stabilization. So after you've already been diagnosed with preeclampsia. So not necessarily preeclampsia prevention. So overall we just don't have a ton of data yet. But there is still interest in this area. So there actually is a 2026 trial protocol preprint that will be evaluating oral NAC versus placebo in pregnant women with early onset preeclampsia. So right now I would not recommend NAC supplementation in pregnancy. But I do think it is reasonable to consider before pregnancy while trying to conceive especially if you or your partner have one of those MTHFR gene mutations and both mom and dad can take this while trying to conceive. Okay, so that was the last of the supplements and that was basically a brief overview of the ones that have the most data thus far. Obviously, not all of them have a lot of data, but the ones that have been studied. There are other ones that are currently being looked at like vitamin C, vitamin E, selenium, larginine, lcarnitine, and melatonin, but the data for

those ones is even more limited. So, we'll move on from supplements. And now, let's get into some of the other supportive practices that can also be done while trying to conceive and in pregnancy. So I have to start with nutrition. And it makes sense that the most important nutrition plan to prevent preeacclampsia is one that just in general supports a healthy pregnancy. So mostly whole foods, minimal to no processed foods, getting enough protein, eating enough fiber, healthy fats, and a wide variety of colorful plants. And there have been some specific dietary patterns that have been studied in relation to preeclampsia prevention. So, the first one is the DASH diet, which stands for dietary approaches to stop hypertension. And this one, I think, also makes a lot of sense because the DASH diet is designed to support blood pressure and vascular health outside of pregnancy. It pretty much is that healthy nutrition plan that I just mentioned, but just a little bit more specific. So, it really emphasizes fruits, vegetables, whole grains, legumes, nuts, seeds, lean protein, potassium, magnesium. And the one caveat here is that it reduces excess sodium, which may or may not be as important in pregnancy, but we can get into that in a later time, but also more importantly removing ultrarocessed foods. And a 2025 review concluded that higher adherence to a dash style diet during pregnancy was associated with about a 35 to 45% lower risk of preeclampsia. And along the same lines, we also have the Mediterranean diet, which is probably one of the most well-known and beneficial nutrition plans for many, many chronic diseases. So again, similar patterns, but this one specifically emphasizes vegetables, fruits, legumes, whole grains, but also nuts and seeds, olive oil, fish, and of course, lower take or minimal take of ultra processed foods. And a 2025 review found that Mediterranean diet adherence was associated with a 22 to 69% reduction in preeacclampsia risk. So the principles of this diet help lower inflammation, improve endothelial function, improve metabolic health. You're getting lots more antioxidants, healthy fats. So again, all things that help prevent preeclampsia pathophysiology. And then from there, getting a little bit more specific, fiber actually plays a role.

Nutrition, Exercise, Sleep, and Mind-Body Support

One study found that higher fiber intake in early pregnancy was associated with a lower preeclampsia risk. And women in the highest quartortile of fiber intake, which was in that study around 21 g a day, had significantly lower risk compared to those in the lowest cortile. And each 5 g increase in total fiber was associated with a trend toward lower risk. And fiber is great for so much. I will definitely do a whole episode on fiber cuz it's really, really important.

So, I would aim for 25 to 30 g of fiber a day. And great sources of fiber include berries, beans, lentils, chia seeds, flax, oats, avocado, nuts and seeds, and whole grains. There also is some pretty interesting research on probiotic foods, too. So, a large Norwegian cohort found that regular intake of milkbased probiotic products was associated with a lower risk of preeclampsia, especially severe preeclampsia. And this kind of goes back to that whole microbiome conversation that we talked about earlier. And there's another Norwegian cohort that found that probiotic milk intake in later pregnancy was also associated with a lower preeclampsia risk. Okay, great.

Next is exercise, which I actually have a lot of thoughts on. So, I have heard a very wide range of recommendations from obese and midwives when it comes to exercise in pregnancy. Some are extremely cautious and only recommend walking while others are more comfortable with people continuing pretty much any forms of exercise with appropriate modifications as pregnancy progresses. I am definitely on the latter side of that spectrum. So if someone has a relatively low risk pregnancy and specifically for exercise I mean no placenta pvia no significant bleeding other major placental concerns cervical insufficiency other things like that then I am very supportive of any exercise you want to do in pregnancy but my rule of thumb is listen to your body and modify as needed. When people recommend just walking or stopping exercise to pregnant women, I feel like they are just not giving women enough credit to really listen to their bodies. That being said, I don't recommend starting marathon training if you've never done a marathon in your life if you're pregnant or starting a really intense strength training program or anything like that. But movement is not something to fear in pregnancy. It's actually so supportive for so many different things. Exercise helps remarkably with many pregnancy related symptoms like back pain, pelvic pain, constipation, sleep, mood, blood sugar regulation, circulation in general. So, reducing puffiness, energy, strength, and just the physical demands of labor and postpartum recovery that are coming. But let's look specifically at preeclampsia prevention and exercise. And I will admit there's there's not a lot of data here, but something I really want to point out. Just because there's not a lot of data doesn't mean that exercise is not supportive in preventing preeacclampsia. It means that we just haven't studied it yet. But we do have a couple studies. So a 2012 randomized trial found that yoga in high-risisk pregnancy may reduce hypertensive related pregnancy complications and improve fetal outcomes. So not specific to preeacclampsia but definitely very related.

And then a newer 2024 review found that regular physical activity during pregnancy was associated with a decreased risk of gestational hypertension. So again not preeclampsia specifically but very related. Okay.

Next is sleep which is actually a huge one here for preeclampsia. So sleep is one of the most underrated parts of pregnancy health in general and it is especially relevant when we are talking about preeacclampsia because poor sleep affects all of the pathways involved in preeacclampsia. It impacts blood pressure regulation, sympathetic nervous system activity, cortisol inflammation, oxidative stress, all the things. And there also is a specific relationship between sleep disordered breathing especially obstructive sleep apnea and hypertensive disorders of pregnancy and also hypertensive disorders outside of pregnancy too. So essentially what happens is sleep apnnea causes repeated episodes of low oxygen overnight that activates the sympathetic nervous system increases oxidative stress worsens endothelial dysfunction and then ultimately raises blood pressure. So if someone is snoring loudly or waking up gasping, waking up with really bad headaches, feeling really sleepy during the day or has other risk factors like obesity, prior chronic hypertension or prior preeclampsia, I think it's worth at least considering a formal sleep evaluation or sleep study. But even for people who do not have obstructive sleep apnea, sleep definitely still matters. And a 2024 systematic review in meta analysis found that sleep disturbance during pregnancy was associated with an increased risk of preclampsia. Now yes, it's very important, but it's also really hard to get good sleep in pregnancy. And how you get there is going to be different for everyone, but some quick tips. My number one is try to prioritize a consistent sleep window. So that's bedtime and wake time as much as possible, even on weekends. To anchor your circadian rhythm, try to get morning light exposure. Dim the lights at nighttime. Limit bright screens before bed. Keep the bedroom dark and cool. And definitely make use of pillows for hip support and pelvic pain, pregnancy pillows, and then of course make sure to manage anything outside of that that may be causing you to not be able to sleep well like reflux, restless legs, anxiety, all things like that.

Okay. Last, we actually have mind body medicine. And this section really targets stress physiology and how it relates to vascular health. So chronic stress, anxiety, poor sleep, all of those things end up activating the sympathetic nervous system which ultimately also gets to the blood vessels and causes endothelial dysfunction, cortisol dysregulation and oxidative stress. So, when we're talking about mind body medicine, we're also talking about nervous system regulation and giving yourself at least times during the day where you're in that calmer parasympathetic state. We don't need to get rid of all the sympathetic state. That's actually not how our body works either. We want our bodies to be dynamic. We want them to be able to calm down when they need to and ramp up when they need to. So, anyways, the mind body stuff is really going to focus on that. and more specifically for mood disorders. A 2020 systematic review in meta analysis found that depression and anxiety were associated with an increased risk of hypertensive disorders in pregnancy. Now I do want to be clear that I don't mean that anxiety causes preeacclampsia but the mind and the body are so connected there is no separation and we really need to understand that. The good news there is also early intervention research here. So, a 2023 feasibility randomized control trial looked at mindfulness training in pregnant individuals who were at risk for hypertensive disorders and found that mindfulness was feasible. That's what they're looking for and associated with signals like lower blood pressure and improved parasympathetic that rest and digest function. We also have a few small studies suggesting that acupuncture and acupressure may also help reduce blood pressure. more evidence for symptom control related to pregnancy related hypertension but some evidence there too and similar to exercise in the mind body section the data is limited but I will emphasize again absence of evidence does not mean evidence of absence and more importantly mindbody practices like pregnancy specific styles of breath work meditation acupuncture journaling yoga and therapy counts in this section too can really be supportive of all areas of health and pregnancy health. Okay, done with the recommendations for preeacclampsia prevention. But I want to wrap things up here and bring us back to the bigger picture. Preeacclampsia is a complex, serious and potentially life-threatening disease that appears to begin at least in some part with the placenta. And as we have talked about there are many many factors that are playing a role in this.

Closing Reflections and Key Takeaways

So of course that early placental development then blood flow issues, immune tolerance issues, oxidative stress, inflammation, mitochondrial function, endothelial health, platelets, genetics, the paternal factor, nutrition, sleep, stress, microbiome, and environmental exposures. So all those things are potentially playing a role. So, what I hope you take away from this episode is that there is no perfect way to prevent preeacclampsia. And if you had preeacclampsia, it was not your fault.

Pregnancy is one of the most profound physiologic demands the human body can experience. And sometimes that demand reveals vulnerabilities that were invisible before. And yes, in one way, preeclampsia can act like a cardiovascular and metabolic stress test. It may reveal something about our underlying blood pressure regulation, vascular function, inflammation, kidney health, or it may be asking us to look at all those other things that we explored like nutrition, environmental toxin exposures, the paternal factor, making sure your partner's health is optimized, not only to prevent preeclampsy in you, but to support your whole family's health for the future.

And I know a lot of the stuff that we talked about was scary, especially the stuff around future cardiovascular risk. But I think knowing these things, understanding preeacclampsia more can be really empowering because it gives us information early. So that gives us a chance to follow up, to monitor our blood pressures, to get our labs done, to focus on prevention, and to really support women long after the pregnancy ends. And the research is growing, but it is definitely incomplete. We do have strong evidence for some interventions like baby aspirin and calcium. The others are promising but mixed and we definitely need more studies. So I hope this episode pushes the conversation forward so that we can have more broad conversations about pre-clampsy prevention beyond just baby aspirin. And I think that really means asking deeper questions. How can we better support women before pregnancy? How can we support their partners before pregnancy? How can we optimize the placenta as it's developing? How can we support vascular health, metabolic health, sleep better in pregnancy, which is really hard, stress physiology, nutrients efficiency, and inflammation? And how can we actually take a history of preeacclampsia seriously as a long-term cardiovascular risk marker instead of never talking about it again after delivery? Because women deserve more than reactive care. We deserve prevention, curiosity, follow-up exploration, and clinicians who take pregnancy complications seriously for the rest of your lives. So, if you have a history of preeacclampsia like myself, or if you're pregnant now or you're preparing for a pregnancy after a history of preeacclampsia, that was not your fault. And you are not powerless.

There are things that we know. There are things we're still learning about. And there are indeed meaningful ways to support the body while staying grounded in the evidence. And I truly think this is where integrative medicine shines.

This is not conventional versus holistic. It's a more complete model that understands pregnancy as a window into the whole body. The placenta, the immune system, the blood vessels, metabolism, the nervous system, and the long-term health of a woman. Thanks for listening to the trip lab. If you liked this episode, please subscribe and share so we can get the conversation started about integrative medicine and psychedelics to destigmatize it and fully explore what this could mean in the >> [music]