Introduction to Detoxification and Methylation

Hi everyone, I'm Dr. Mima and welcome back to the next episode. Today we're going to be talking about detoxification in a lot of detail. Uh, today we are going be focused on detox as a function of the body, a very important function in functional medicine.

It's probably one of most important functions in the And I'll be walking you through all the different detoxification pathways. We'll working through this information together.

And we'll really focus in a lot of detail on methylation. I know many of you who are in the functional medicine community or who are patients of functional medicine, you've heard about the word methylation.

But the majority of the population doesn't know what methyilation is. So we're going to dive really deep into that today. Probably more information than you're ever going want to know about detox and methyulation, but it'll give you the whole picture, the why behind all of this, why we check for these genes and what they really mean, and you can do to identify whether or not you might have a particular genomic need for detoxification support.

Not everyone needs to be doing a heavy detox like this, but when you do have a compromised gene, it makes a lot of sense to understand it, identify it and then start to supplement in a way that's truly targeted so that you're not just shooting in the dark.

You have an approach that is precise and accurate. So let's get started. So today we're gonna talk about the detoxification pathways from genomics to cellular renewal and how every cell in your body detoxes every second.

This is not just the liver. Every single cell is detoxifying. In methylation, this process that we are going to talk today slows down. What happens is that toxins start to accumulate inside your And as those toxins accumulate, hormones also start to recirculate and DNA repair starts to falter.

So tonight, we're going to explore how your genes, your nutrition and your daily rhythm determine your body's ability to cleanse, renew and protect itself.

Remember that every cell in your body performs detoxification. They're breaking down hormones, they're processing nutrients and they are clearing out environmental toxins all the time.

The methylation cycle is the body's master switch for these processes. and it links energy and metabolism and also hormonal balance, mood regulation, and longevity.

So all these really important functions in the body are essentially controlled by this concept of detoxification. You can imagine that us humans living in this world today We really have to understand what this is in order to support our longevity because without optimal detoxification, we really don't get to live a healthy life or a long life that's healthy.

So this a key to longevity. There are five key genes that we're gonna focus on in this particular session. Now, when you do your genomics report, we gonna have many more genes than this because there are multiple different SNPs, specifically small nucleotide polymorphisms that you can look at in the detox pathway that give you a lot of information about the body.

Case Study: Symptoms, Labs, and Genomic Clues

This is just an overview looking at five keys SNP to give some concept in general about what these mean, and how you can start to work with them. Together they're going to determine how efficiently your body can methylate,

detoxify, and renew.

So we'll start first with a case study and this might be somebody like you. There is a cases that I'm working with of a 44 year old woman who presented with fatigue, insomnia, hormonal imbalances.

She's got bloating and food sensitivities, chemical and histamine intolerance, a family history of breast cancer and has a high amount of stress and emotional exhaustion that she often carries.

We did some deep labs on her and other providers have also worked with her. Oftentimes in functional medicine, we have many labs that people have done and they're coming in with.

And part of my role is to look at that in a lot more detail as a comprehensive, inertial consultation. So we looked and saw that she had elevated MMA and FIGLU.

These are all part of the blood reproduction and clearing cycles and part hemoglobin. So MMOA and figlu were both elevated and they're blocked essentially by methylation.

I'm sorry, there's a blocked methylation pathway causing it. She also had low glutathione and a high lead and mercury, essentially signifying a detoxification overload.

And these are all the variants that were present when we looked a little further at the genomics. She also had been receiving some hormone replacement therapy to try to support her symptoms and also has some histamine intolerance that had developed.

Again, a key gene that we can test and analyze when we're looking at your genome, we could look at the DAO and the histamines inside the body. Now, what this really means is that her detox engine was underpowered and the genes that are responsible for methylation and detoxification in her body were all operating below their capacity and leading to fatigue, mood changes and toxin accumulation.

Once her methyulation and antioxidant pathways were supported, her energy, focus and her sleep started to improve. So this is an example of how when you do a deeper dive of the genomics, you can really start to understand what the causes of those symptoms like the fatigue, the mood changes, and the toxin accumulation that was leading to her feeling overwhelmed and tired.

And when treat appropriately, You can change that and suddenly have energy, focus and improved sleep. So here's what the methylation cycle really is. And again, this is a lot more biochemistry than you probably wanna know, but this the core science behind methylation pathways.

Again, these are occurring in every single cell in the body, right? So they're not just a part of the liver or part a certain organ function, they are happening in everything single cells, in this particular cycle.

So imagine that all the cells in your body are going through this. So here we have a methylation cycle, what's called the transulphuration cycle and the folate cycle.

And they're all connected. We're going to break that down and show you what that means in a lot of detail. First, there's something called a methionine synthase, which is the number one over here.

This essentially remethylates homocysteine and turns it into methione. In order to do its function as an enzyme, again, inside every single cell, it requires B12 and methyl tetrahydrofolate.

These are essential co-factors that are needed in order for this enzyme to doing its job. The next one is BHMT, which is number 2 here. That enzyme actually converts homocysteine into methionine and uses betaine.

again, a co-factor that you find in your diet and you'll find it in supplements, and this is primarily occurring in the liver and in kidneys. The third one, which is number three over here, essentially is responsible for converting

homocysteine into cystothionine over there, so that's number 3 here.

This particular enzyme requires B6 and PLP as part of the cofactors for it to function optimally. And then there's the famous MTHFR. So notice there are other enzymes also part this pathway that we don't talk about as much, but they're equally as important.

Methylation Cycle Overview and Key Enzymes

Now Mthfr produces methyl tetrahydrofolate. This is the number four over here, and that's its job over is to produce this. In order to do so, it requires riboflavin and FAD.

These are also important cofactors that are part of this pathway. And then the last but not least, this last enzyme is converting cystothionine to cysteine and glutathione.

So most of us have heard about glutothione and how important that is for detoxification. Well, in order for that to be produced properly in the body, you also need these other co-factors like B6 and PLP that are responsible for its production.

So this is again coming from some excellent science, relatively new frontiers in nutrition, 2023. And we're going to get into this in a lot more detail, but just to really emphasize that this is advanced science, it may not have made it into your primary care doctor's office.

It is a very common functional medicine focus, and it is very important part of our health and well-being. So when we think about our health and our longevity, we really should be also focusing on these detoxification pathways.

Now, I've only highlighted five key very important snips, but like I said in the beginning, there are many more that are also responsible for those other enzymes that we talked about and other aspects of this pathway in every single cell of your body and how detoxication is occurring.

So, let's get down to the details here. Now, MTHFR, that first gene we talked about, is the gatekeeper. This is methylene tetrahydrofolate reductase, and it functions by converting folate, vitamin B9, into its active methyl form, which is 5MTHF, which donates methyl groups to restart the cycle.

So without enough methylfolate, the body can't produce SAMe, which is what is called a universal methyl donor. This is important for your mood, your focus, because when MTHFR is slow, Because of genetic predispositions, you can have a homozygous or heterozygos mutation causing you to have certain variant that is actually causing the enzyme to be depleted or slower.

You're gonna have reduced methafolate production that causes sluggish methylation. you'll have elevated homocysteine which causes inflammation, poor detox of hormones and toxins in neurotransmitters, low energy.

lots of anxiety and depression, and increased cancer and cardiovascular risk. So this is not something that you should ignore. And again, I really see this time and time again that primary care doctors are not aware about this risk, but it does make you more susceptible to the things I just mentioned.

So how do you support this pathway? You support the pathway by using methylated B vitamins like methylfolate and methylcobalamin. You can also use dark leafy greens, beets, and legumes and avoid synthetic folic acid because that can actually block the receptors.

So you might be taking synthetic folic acid thinking you're doing yourself some good, but if you don't know that you have this gene, it can actually be causing problems.

So MCHFR is the ignition key of methylation. If it's slow, the whole engine is going to lag, right? So that's why it is one of the first enzymes we talk about and the set of snips that we look at when you are looking at your genome.

The other two, MTR and MTRR, are also relatively well known but not as commonly as MTHFR, but equally as important. So these specific reductase and synthase enzymes, these enzymes are used in vitamin B12 conversion to homocysteine.

So these enzymes use vitamin B12 to convert homocysteine back to methionine, keeping the methylation cycle moving. So you can be giving yourself B-12 and not be getting good results if you don't know what's happening with these particular enzymes.

MTR needs B 12 to perform its conversion. regenerates B12 to keep MTR working. When they're sluggish, the homocysteine rises and that causes inflammation and poor circulation.

When DNA repair slows, there's a higher oxidative stress and cancer risk, energy drops, and there is fatigue and brain fog. And often there are neurotransmitter and hormone synthesis that's faltering that causes mood swings and PMS.

So these are often responsible for mood swing and the neurotransmitters effects that we're looking for when we think about our health and well-being. So the gut and the brain are important, but these are also important in terms of neurotransmitter production and how you feel with your mood, how your energy is, whether you have focus and concentration, and you're repairing your DNA.

So these very important functions in the body, right? And super important for longevity. That's why looking at this part of your genome can be very helpful.

Now, we support this by using B12. B-12 is basically in the form of methylcobalamin, which is the active form, or hydroxyclobalamin which, is gentle for sensitive patients.

We can support these pathways. So, if you're sensitive to normal methylcobalamine, you might want to use hydroxylcabalamine. There's also riboflavin B2 that can help recycle B12 efficiently, and choline and betaine like the form of TMG can bypass the pathway if it's sluggish.

MTHFR, MTR, and MTRR: Folate and B12 Support

So when you're thinking about the genetics of your pathways, once you know that you might have a deficiency, not everyone has this, but if you do, then there are targeted ways that we can use nutrients and supplements to essentially promote these pathways in a way that's gonna make you start to feel better.

Next, we're going to look at another very important SNP, which is AHCY. This is considered the bridge between methylation and detoxification. So this is adenosyl homocystenase, AHcy, and its function is to convert Sa, a precursor, into homocysteine.

allowing the cycle to then continue. Now, if this particular enzyme is slow, then the SA starts to build up and it blocks methylation, like we said earlier.

It's like a traffic jam in the middle of the detox highway. Why this matters is that this AHCY connects methyulation to glutathione production. which we know from what we said earlier, glutathione is a master detox molecule in the body.

So this is the connector between these two pathways. When it's slow or low, both methylation and detoxification will stall. Things like toxins, hormones, and neurotransmitters start to accumulate in Symptoms of this slowdown essentially show that you could have fatigue despite B vitamin use, chemical or medication sensitivity, a poor response to detox supplements, histamine reactions or inflammation flare-ups, And to support it, we use magnesium, taurine, NAC and choline to open up those AHCY bridges.

We can also use sulfur-rich foods like onions, garlic and cruciferous vegetables, and glutathione precursors like vitamin C, selenium and glycine. AHcY is the biochemical bridge between clean energy and cellular waste removal.

Next, let's talk about calm T. Calm T is the calming gene. This is catechol-O-methyltransferase. The function of this gene is to use SAMi from methylation to clear cationolamines in the form of dopamine, norepinephrine and estrogen metabolites.

When calm t is slow, the stress hormones linger longer and anxiety, insomnia and irritability develop. When estrogen metabolites build up, PMS, breast tenderness and fibrocystic changes occur, and the mood may swing between focus and overwhelm.

When calm tea is too fast, catecholamines get cleared too quickly, fatigue gets resulted, as well as low motivation and low dopamine tone. So this is another enzyme that we want to focus on when we think about detoxification.

And how do we support this? Well, we can use things like magnesium. We can give you supplementary SAMe and also B2 to bring these functions back into balance.

This is also why you want a limit caffeine and stimulants. You might want add nutrients that are calming like glycine, theanine B6 and zinc. We'll also want to support estrogen clearance with dim flaxseed and fiber.

So calm tea regulates how we process life's chemistry in the gene. It's a gene basically of calm, focus, and resilience. So now there's a lot of information about these top five genes, and this is how they flow in the pathway.

You'll see here that you've got the MTRR, HCY, COMT, are all involved in the production of glutathione, as well as the methylation of nucleic acids that are involved due in DNA reproduction, neurotransmitters, and xenobiotics, So whether it's breakdown of the food that you're eating, breakdown toxins, production of neurotransmitters, or the replication of DNA, methylation is a critical part of body.

And these are the compounds and components that make up that pathway. In order for them to function optimally, we really have to be thinking about those nutrients and cofactors that we just talked about.

So how does methylation detoxification and brain chemistry connect?

AHCY and COMT: Detox, Histamine, and Hormones

Well, here's how they're connected. Folate from greens is converted to methyl tetrahydrofolate. So when you eat a bunch of green leafy vegetables, you're getting that folate, right?

So that fallate needs to then convert into methyl-tetra-hydropholate. This step requires the enzyme MTHFR. Methyl tetrahydropholate supplies the main methyl fuel that's needed to run the methylation cycle.

Methionine or the methylation cycle is the second step. So the methyl fuel converts amino acid methionine into what's called SAM. And SAM is the body's primary methyl donor.

It supports DNA repair, neurotransmitters, and hormone metabolism. So this is how the brain starts to get connected to the detoxification cycles, right?

SAM as necessary for the production of new brain neurotranmiters, as well as hormone balance. So all of this is a very important part of the different pathways around hormones as well as neurotransmitters and brain function, brain health.

Homocysteine must be recycled properly to prevent its buildup because build up of homocystein can be quite harmful. And recycling requires vitamin B12, MTR, MTRR enzymes.

And then there's the trans-sulfuration pathway or detox pathway that we talked about in the beginning, where homocysteine goes down this pathway and it turns into cystein that's then used to make methionine.

So that needs to work optimally, otherwise you have a buildup of homocysteines. Glutathione is the final production

from cysteine to glutathion, and it's the key antioxidant for detoxification and inflammation control in the body.

And for this to work properly, we need vitamin B6. So this just really emphasizes and shows how important these cofactors are within every single cell in body and how these vitamins are.

B2, B 6, B9, and B12 are critical to keep methylation running optimally. And if any part of this slows down, methylation weakens, detoxification drops, and homocysteine starts to rise.

So let's get into how all these different genes that we talked about are connected and what are some ways that can actually support them individually.

To summarize, MTHFR we've talked is one of the most important parts of these pathways. Activates folate and starts the methylation. If it's underactive, you often have fatigue, high homocysteine buildup, and hormone build up as well.

So when I often work with people's hormones, I do check the detoxification pathways I prefer to take a look at this because it gives us a lot of input and insight on how to support you when you're taking these hormones.

Otherwise, you can have hormones start to build up in the body and not clear properly if your detoxification pathways are not working well. MTHFR also supports methylfolate and leafy greens.

Next we have MTR, which converts homocysteine into methionine. Now when this is not working properly, you have fatigue, anxiety, and inflammation. And what supports it best is B12, folate, and beta-ene.

So these are things that we can get in our food or take as supplements to support this particular enzyme and to prevent the fatigue and anxiety and the inflammation.

You can see that that is a common part of the symptoms of fatigue in both the pathways. In MTRR as well, you're seeing low energy and poor detox because this is important for regenerating B-12 in order to use it in the MTR.

So to treat low M-T-R-r, we'd want to give B12, right? So B-12 hydroxymethyl forms are important, and also B2 is another enzyme that you can use, I'm sorry, another cofactor that she can used to support this enzyme.

Next is AHCY. This converts SAH into homocysteine. So this particular enzyme is responsible for detoxification and congestion of that occurs when it's not functioning optimally.

You can have a histamine overload. also when that's not functioning properly. How do we treat it? Well, oftentimes magnesium, NAC and taurine can be quite helpful in patients with this particular mutation.

And then the next one is calm tea. This clears dopamine, estrogen and stress hormones. When it's no functioning optimally, we have anxiety, PMS and sleep issues.

And to support it, we will give magnesium, salmi, B6, calm, and make sure the environment is calm.

Applying the Pathways to the Case Study

Not just calm the supplement. So calm tea can be very helpful when functioning optimally to prevent anxiety, PMS, sleep disturbances. Now let's go back to our case that we started with, that 44-year-old woman.

Now in this patient, she had MTHFR and MTR variants that were showing slow methylation, causing fatigue and also changes in the red blood cell size, mastocytosis.

AHCY variant was also present causing a methylated backup and low glutathione. COMT showed slow variants that led to estrogen buildup, causing some of her symptoms in terms of hormones, and MTR variants impaired recycling, creating elevated homocysteine and inflammation.

So what's the outcome? When these pathways were supported with methylated nutrients like B12 and folate and magnesium and sulfur foods as well as antioxidants, She had clearer energy, better sleep, improved digestion, fewer histamine reactions, and a more stable mood.

So how do you support these pathways? That's really the bottom line for this lecture is, what can we do? So certainly there are detoxification protocols, when you work one-on-one with a provider, you get your genomics done, and we can have a much more customized approach for your detoxication protocols.

In part two of our webinar series, in the Mastermind series Next year, I'll be sharing with you proprietary protocols for those who end up signing up for the Mastermind membership.

We'll get into a lot more interesting detail there as well about ways to treat these different parts of detoxification. But a very general approach that I think everyone can start with that doesn't require a genomics and customization is eating a rainbow of vegetables.

So when you eat the rainbow, you're getting all kinds of antioxidants and minerals, and we're feeding that detox enzyme pathway. You also want to hydrate very well because water is your detox transport system.

Without water, we are not able to flush out the toxins that come through the detox pathways. We need to move daily. Sweating and circulation keep that lymphatic system clear.

So exercise all the time, daily, as much as possible, sweating, going to the sauna, the steam room, all very helpful. Sleeping seven to eight hours every night.

Remember that your liver's detoxification pathways are optimal overnight. So if you're not getting that overnight sleep, you are going to be losing those key detox hours overnight, and then breathe slowly.

Stress directly suppresses methylation. You want to breathe very slowly when you working on your detoxifications and reduce that stress. Now, what are some of the things you can do from a nutrition standpoint to help support these pathways and target detoxification?

You can't forget the protein, because protein in particular in the form of amino acids, we talked about the glycine, the cysteine.

Lifestyle and Nutritional Support for Detox

These are amino acid that are needed to create those cofactors and also to the enzymes that required in detoxifications. They're actually made out of proteins and amino acids so we cannot ignore the importance of having optimal protein.

Cucifers like broccoli, kale, cabbage, These are also known as sulfurophanes. Remember, we talked about the trans-sulfuration pathway. This is why we wanna have cusifers in our diet.

Broccoli, kale, and cabbage are great for detoxification. For those who are doing the Kosher Ayurvedic Health Program, I often encourage people to cook their cusefers to reduce the impact of having the extra raw varieties on the systems of hormones like the thyroid.

Beets and greens are also wonderful and they are serving as methyl donors in these pathways. So folate and betaine are coming from the beets in the greens.

And then having healthy fats supporting bile flow like olive oil and avocado are very important. Fiber to bind to the toxins and to promote elimination.

You might want to also have some supplements to support you in the detoxification. I often recommend some basic supplements for people once I know what's happening with your genome and understanding your health.

We can get more specific with the supplements, but this is a great start. and it provides you with what you need in order to get going. So activated B complex like B12, folate, B2, and B6, magnesium glycinate can be very helpful, NAC, vitamin C, selenium for glutathione support, then having a sulfurofane like broccoli sprouts extract, as well as calcium deglutarate or DIM for hormonal metabolism.

For those of you who are part of the Mimosa community, I'll also be posting the full script link so that you can go ahead and see which supplements I recommend for the community on the Substack newsletter.

So if you're not already signed up for that, encourage you to look at MIMOSA Longevity and Substac. and you will be able to find the link to be to access these particular nutrients in case you'd like to do a detoxification for yourself.

Now, I've included some important references that are also available if you'd like to dive deeper into detoxification. Some of the ones were referenced in this article.

Other ones are just key references to think about, including the importance of methylation and oxidative stress in chronic disease and also in cancer.

So again, very important to start to around detoxification and how, although it's something you can do on an everyday basis, it does have some very deep and important roles in terms of cellular physiology, health, and longevity.

Think about it this way. Your methylation genes are your body's blueprint for detoxication and repair. When MTHFR, MTRR, HCY and COMT and also MDR are working in harmony, your body's systems become self-cleansing.

References, Takeaways, and Upcoming Hormone Lecture

Your mood, energy, hormones and longevity then start to flow together. So it's important for us to understand what's going on underneath. And this is kind of what I call looking under the hood to see what your detoxification pathways look like so that we can understand why symptoms are showing up the way they are in you, why you might be more prone to certain diseases or certain viruses or pathogens.

All of that is often controlled and moderated by the detoxification pathways. So once we know what's going on there, we can optimize those pathways and help you start to feel better.

Thank you so much for listening to today's episode on detoxification. I'm Dr. Meema Geer. Again, this is the Mastermind series. This is third of the year so far on Detoxification, the last two series were on personalized nutrition and circadian rhythm.

Those are available on the Substack as well. Please go ahead and subscribe to the Mansa Longevity Substacks so you can stay connected and see all the information that's being released.

The next week, I want to just bring to your attention that we will be talking about This is going to be November 13th lecture, how stress and hormones are important and how nourishment can actually balance those.

So we'll get into hormonal health in a lot of detail. It's going be an exciting lecture talking about hormones like cortisol, thyroid and sex hormones, their interplay between stress, diet and trauma.

And some key takeaways, like how stress reshapes hormonal balance, how food stabilizes the nervous system, and some practices for resilience. Setting your nervous back into a state of reset right before Thanksgiving.

So that'll be our November lecture before Thanksgivings, so please don't miss that one. We will not have the second November Lecture because we're taking a little break for Thanksgiving holidays.

and then we'll return for our last lecture in December, which is the fifth of the series. Looking forward to seeing you

next time when we talk more about hormones.

I'm Dr. Meemah Gheer, and today's exciting episode of detoxification, all that you'd ever want to know about how methylation pathways and the detoxication genomic snips work, I look forward seeing at the next mastermind.