Metal Detoxification:
A Special Interview with Dr. Christopher Shade
By Dr. Joseph Mercola

JM: Dr. Joseph Mercola
CS: Dr. Christopher Shade

JM: Mercury, a pernicious neurotoxin – how do you get rid of it? Hi, this is Dr. Mercola, helping you take control of your health. Today I’m joined by Dr. Chris Shade, who is probably one of the best experts in the world to help answer that question.

He’s developed some very effective diagnostic tests to differentiate exactly where your mercury’s coming from – whether it’s from the dental work you’ve had with mercury amalgams or from seafood that you’ve been eating that’s contaminated with heavy metals. He’s going to enlighten us on that and tell us some really exciting strategies that you can implement to begin an effective detoxification process for heavy metals.

So, welcome and thank you for joining us.

CS: Thank you. It’s always a pleasure to be here with you, Dr. Mercola.

JM: All right. Why don’t you provide our viewers with a little background of yourself, so that they know how you got into this field and how you developed your expertise?

CS: OK, sure. Actually I went to school for this. I got my Ph.D. a little bit south of where you used to reside, in Illinois. I was at the University of Illinois Urbana-Champaign.

There, I was studying environmental transformations of mercury – how it moves from one compartment to another compartment to another compartment. We were looking at what things the mercury was bound to. What’s it bound to in the air, in the rain, in the soil? How does it move up through the levels from bacteria to plankton up to fish, where it’s known to bioaccumulate and have up to 1 to 10 million times higher concentrations of mercury in the fish than in the water?

Doing this, we had sophisticated tools for modeling or computational tools for telling what kind of ligands (or binding molecules) are holding the mercury. What I was tasked with was developing an analytical system for separating different forms of mercury out. You’ve got methyl mercury (which is the form that builds up in the fish and what we’re exposed to as humans from the fish) and then you have inorganic mercury. In the environment, inorganic mercury is everywhere.

We needed to separate out that small amount of methyl mercury that was accumulating from the larger amount of inorganic mercury. I developed these chromatographic tools that would enable a high-throughput analysis of biological samples to separate these different forms.

Then when I moved over to doing clinical work, it’s almost different. We’re trying to separate a small amount of inorganic mercury in the body from a larger amount of methyl mercury. But all these tools that
I learned to predict what molecules are going to bind to mercury. In the body, glutathione is going to be the dominant thing binding and moving mercury out.

All this knowledge enabled me to move into the clinical realm, develop our testing for people, and then develop detoxification methods based on upregulating aspects of our chemistry that can mobilize and move mercury out of the body.

**JM:** I need to provide a personal testimony here. I actually used your diagnostic tests maybe four or five years ago. I actually went through the detox process that you recommended (which we’ll discuss in a moment), and was effectively able, at least objectively and analytically, by these methods that you just described (and we’ll describe in more detail), to get it down to normal levels, which is really…

**CS:** Really nice. We cut your levels in half pretty quick. It might have been more than a 50 percent reduction. It was slightly a little high for someone who has no amalgams and eats almost no fish. It went down to the ideal range quickly.

**JM:** Let’s finish up on what the testing involves and what it looks like, and then we can talk about some of the sources, as to why someone should be concerned, even someone like myself, who hadn’t had mercury fillings for decades and had relatively small amount of seafood content.

**CS:** Right. Absolutely. We call it the Mercury Tri-Test, because we’re looking at three different matrices or three different kinds of samples. We look at 1) blood, 2) hair, and 3) urine.

The blood, we have our reservoir, our body burden representation of the two different forms that are accumulating in your tissues. There’s always more in the tissues than there is in the blood. But there’s this steady state between what’s in the blood and what’s in the tissues. If we’re able to separate these two forms like we do, we’re able to get a very clear picture of those two forms.

The excretion indices – that being hair as an excretion marker of methyl mercury and urine as an excretion marker of inorganic mercury – they should be directly proportional to those levels in the blood. The most telling of these, the most importantly diagnostic of these ratios is looking at the inorganic mercury in the blood compared to the inorganic mercury in the urine. For a given amount of inorganic [mercury] in the blood, there should be roughly a seven-fold increase in the urine, as that’s filtered out in the urine. But what we find in people is that a lot of them have low urine, high blood.

Now, we can go back to 1973 where one of our common mentors, the late Hal Huggins, had published already in his book, *It’s All in Your Head*, that certain people had what he called retention toxicity. He couldn’t measure different forms in the blood, but he could measure the urine. He’d look in your mouth and he’d say, “This guy has 10 amalgams and that guy has 10 amalgams. But this guy’s urinary mercury output is very low and this one is high. Who did we find was the sicker of the two? It’s the one with the lower urinary mercury.”

Now that we can look at exactly what’s in the blood compared to the urine, we know what that ratio should be. If your high blood, low urine, that means you’ve got damage not to your glomerular filtration system but damage to the proximal tubule transporters.

The proximal tubules are the place where all the exchange takes place. You filter crudely everything in the blood, and then in the proximal tubules after the filtration, you pick back the things you want to keep, and you actively transport into the urinary flow toxin conjugates. This is what we’re measuring, that movement into the urinary flow of the toxic conjugates. That area in the proximal tubules is very, very easily damaged.
In mouse models, they found that a combination of endotoxin and mercury exposure can create that damage to those transport proteins. Obviously, probably the biggest thing on the radar of integrative and functional medicine right now is leaky gut syndrome and gastrointestinal (GI) problems. They are the number one cause of getting high endotoxin levels in your body.

If you have a high mercury level and a leaky gut, you’re very likely to damage the very transport system that’s getting that mercury out of the body. That’s going to lead to a pulling up of the inorganic mercury levels in the blood. That diagnostic is really important. It tells us that if that ratio’s off, we need to start by treating your kidney before we go into the main detoxification.

**JM:** As far as I recall, I believe the test you provide is really the only clinical test out there that differentiates between the organic form of mercury and methyl mercury, so that you can refine and really specify the ideal detoxification protocol.

**CS:** That’s absolutely true. People just like to look at mercury like it’s all bad. Some people will ask me, “Why does it matter if you know both of those?”

Inorganic mercury is much more of a toxin to the extracellular matrix and thus to the connective tissues. If you’re having joint problems or fibromyalgia-like pain, you really need to work on getting rid of this inorganic mercury, and you really need to make sure that those kidney transporters are working.

If you only have methyl mercury, that’s all going through glutathione conjugation to the liver to the GI tract. Frankly, it’s a less toxic form of mercury. In a cellular level, the inorganic mercury is more disruptive, because it can bind to more sulfhydryl groups and disrupt more chemistry than the methyl mercury can. It’s very important that we see what the disposition is and what those ratios are.

For instance, if somebody only has methyl mercury exposure from eating fish and has no amalgams and never had that, they’re all going to breakdown a certain amount of the methyl mercury into the inorganic mercury pool. But that’s not a fixed rate. That’s an individual reaction that we don’t really understand. I suspect it’s related to oxidative stress. But some people breakdown a lot and really build up this inorganic mercury pool despite not having amalgams; some people breakdown only a little bit.

Those people who are breaking down a lot are much more at risk from toxicity from their fish than if they’re not doing that. They have two forms of mercury building up in their blood, including the worst one – the inorganic mercury. It’s important that we divide those and see how well you’re excreting the two.

**JM:** OK. Lots of other questions. I think probably the one that’s on most people’s minds who are engaged in this discussion is what are the primary sources of inorganic mercury and methyl mercury? You had mentioned seafood, but if you can expand on that.

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**CS:** Right. Methyl mercury, pretty much the only source that you’re exposed to is seafood. But it is a very big source. It’s a big deal for a lot of people if they eat seafood. It’s very important that we don’t throw all seafood into the same basket. Because you can have a hundred- to even a thousand-fold difference in the mercury levels as you move through the food chain.

If you’re looking at the top of the food chain, a shark, he might have 4 parts per million (ppm) to 10ppm, methyl mercury in its tissue that you eat. Then you go down and you look at a sardine or an anchovy, they have 1 to 10 parts per billion. Then you move up into wild salmon – smaller salmon like coho and sockeye salmon – they might be in the 10 to 50 parts per billion ranges. That’s still a hundred-plus-fold lower than high-level shark, tuna, and swordfish.
For fish eaters, it’s important that they look down the food chain to get lower amounts of mercury coming in. In fact, a dentist I know, Dave Regiani, I looked at his mercury levels. I said, “You obviously don’t eat any fish.” He goes, “I eat fish every day.” I looked at him and I said, “Sardines and anchovies?” He said, “You got it.” It looks like he’s not eating fish at all.

**JM:** That’s a good point to expand on. I just like to interject here. Because typically, if you go into the literature, you’ll see the Environmental Protection Agency (EPA) recommends avoiding tuna, swordfish, and all the other classic ones. You kind of implied it now, but I’d like you to specifically mention it.

You said there could be a thousand-fold difference. Literally, eating a thousand pound of anchovies compared to one pound of shark, which is essentially like a two- or three-year supply versus one large meal of shark meat. Most of us don’t even eat shark meat, but whale meat would probably even be higher. I know people don’t consume whale, but I suspect whale might be 10 to 100 times more than shark.

**CS:** Yeah. And dolphin when they’re doing that. In Japan, there was a whole controversy around there. Those are 100 parts per million. It’s just crazy, crazy high. The one that we eat that’s really high is swordfish. We don’t do a lot of shark anymore, but we do do a lot of swordfish. Swordfish is routinely 1 to 5 parts per million. High-level tuna is routinely in the 1 to 2 parts per million ranges. Then low-level tuna – the small, like the skipjack and the chunk white – those will be .2 to 1 ppm.

But then you can look at those EPA numbers and they’ll give you the relative range. It seems almost like the picking and choosing, because their whole range is lower than everybody else’s range. But the relative ranking is similar. You can look at those fish that are on the low end and you could choose from there.

Sea bass is another notable one. I have a great data set on myself coming down from a mercury peak that was from sea bass. Sea bass could be quite high. But the ones that I like people to focus on are salmon, especially wild salmon, the smaller ones.

King salmon, eat that occasionally. King salmon gets to be up into the lower tuna range; whereas sockeye, coho, and pink salmon are down much lower. They’re in the 15 to 100 parts per billion. They’re pretty good. Then when you get down into kippers, anchovies, and sardines, you can eat them at will all day long, and you’re never going to build up high levels.

**JM:** This is based on your objective analytical assessment of the fish themselves, the fish samples, or people who are consuming them, those types of fish – or both?

**CS:** Both. I did so much fish analysis back when I was in graduate school and when I came here. When I came here and started my company, I was doing environmental and industrial mercury chemistry. I was commissioned by Health Canada to analyze all the different parts of a set of fish that were being sent down. I did a bunch of work of Health Canada.

We did a bunch of work in Colorado, in the state of Colorado for a grant that was given to some people at Colorado State University (CSU). We did a lot of measurements of biota. We did a lot of measurements in Texas. There were some big grants there. We did a lot of work on a polluted site in Virginia. The beautiful Shenandoah Valley contained the South River, where there was an article in *Nature*. That was where we were measuring spiders. We have measured environmental samples all over the place.

Then we also measure people now. I get to interview them about what they’re eating and how that reflects in their blood. We’ve looked at it from both angles. I have a lot to go on.

**JM:** I think that’s an incredible contribution you’ve made to the science, to actually validate and establish that these are in fact real risk. We’ll talk about the complications of those exposures in a moment. We want to first finish up with the inorganic exposures.
CS: Yes. Inorganic exposure is dominantly from dental amalgam and the breakdown of fish-based mercury into the inorganic form. I’ve seen a lot of people who once they start eating a lot of fish, they get their methyl mercury levels up above the 95th percentile – which would be, for us, in the 7 to 10 part per billion range – they start building up enough inorganic mercury in the blood, they look like they might have 10, 15, or 20 amalgams; sometimes even more than that. The amalgam is the dominant exposure; the fish breakdown is the second exposure.

Then we have smaller exposures to airborne mercury. A lot of people worry about what’s going out of coal-fired power plants. To tell you the truth, I haven’t seen people in those areas with no other exposures having high levels. Say, they have no amalgams, they eat no fish, they do live near power plants – I don’t see them with real high blood mercury levels. But we know this is one exposure.

JM: It’s mostly a contribution to increasing environmental mercury, not human mercury.

CS: Yes. Right. That form that rains down around coal-fired power plants rains down quickly and immediately methylates to methyl mercury. It’s very bioaccumulative. The people in those areas who are eating the fish near the power plants, those people express that mercury more than directly through inhalation.

I do have some cases where I’ve had some kids come in with exceptionally high inorganic mercury levels. That’s mostly traced back to spills of mercury in their houses, especially older houses. People used to have liquid mercury for a lot of different reasons, mostly medical and dental reasons. Dad brings it back. They have a bottle of it. They play around with it, they break it, it spills, and it builds up. Once it falls through the cracks of a wooden floor or once it’s in the carpet, it’s there for decades.

JM: I remember very clearly playing with that, over 50 years ago, in the basement. My dad had a bottle. It must have been about two ounces. It really is quite a very… It has some very interesting physical properties.

CS: It’s very peculiar.

JM: It’s so peculiar in a way, because it’s so dense. It comes up as this glob. It was really fun to play with. It’s not something you want to do at all.

CS: No. It’s bad. In my building at the University of Illinois, they had spilled so much mercury there, because it was an agricultural building. They used to use mercury to pull all the sulfur out of soils and then measure it. There were such high levels that we were going above Occupational Safety & Health Administration (OSHA) regulations for a workplace. There are some areas where people are exposed where they work, especially old medical, dental, agricultural, and scientific buildings, where there’s enough in the air to be a very significant contribution.

JM: Let’s go on next as to why people need to be concerned about this. As I opened up, I said it’s a potent neurotoxin but it also has other toxicities. You alluded to one earlier with the damage to the kidneys and mentioned proximal tubules of the kidneys. I’m wondering, for the kidneys, which type of mercury is more serious? Would inorganic be causing the damage?

CS: Inorganic mercury and cadmium, another heavy metal, those are the two worst ones for the kidneys. They do build up in there. It’s kind of a downward spiral where the more damage there is to the proximal tubules, the more build up around there, and the more damage is created.

As we both know, a lot of people have suffered from a lot of damage through doing chelation. If we had these urine to blood ratio tests earlier, we could have told people who shouldn’t have done chelation not
do chelation, because the same transporters are necessary for the mercury toxin conjugates to move out through these proximal tubules.

When you take a chelator, you solubilize a lot of mercury in the forms that want to get filtered out through the proximal tubules, but get bound up into the inflammatory damage around the kidneys and actually increase that problem.

That was something that I went through. I was taking dimercaptosuccinic acid (DMSA). I kept measuring all this. I didn’t have all these measurements then for the blood, kidney, and urine ratio. I was just measuring urine and taking more and more DMSA. I wasn’t seeing those levels going up, but I was seeing myself get sicker and sicker. I went into serious adrenal fatigue from that and had to dig myself out of that hole. That inorganic mercury’s very damaging to the kidneys.

JM: It can cause chronic renal insufficiency. That literally will leave you with that for a lifetime.

CS: It’s something you’ll be able to fix.

JM: I don’t think it’s fixable, [except with] a stem cell transplant. But you can control it easily with a high-quality, relatively low or moderate protein diet, typically less than 40 to 50 grams per day.

CS: Yes. I think that’s very interesting work that’s being done. I know you and I have talked about the low-protein diets. I think that’s a very important one if you’ve got kidney damage. If it happens early in life, you’re young enough and you have enough stem cell activity on those growth factors. You can bring that back later in life. You need stem cell work or you need cell extracts, which they do out in Switzerland and Germany where they’re taking animal fetal tissue and extracting growth factors from that. It’s very, very difficult to fix that kind of damage.

The central nervous system and nephrotoxicity (or kidney toxicity) are the most well-understood damages. It should be said that in neurotoxicity, the most common site for damage is the N-methyl-D-aspartate (NMDA) receptor or the glutamate receptor, which causes hyperglutamate activity (which leads to anxiety).

Glutamate excess or excess activity of the glutamate receptor makes a chronic peroxynitrite free radical cascade coming off of those receptors that causes neuroinflammation, which gives you brain fog and fuzzy thinking. It also causes a lot of anxiety. Those two go together very strongly where you can’t accomplish your test at work, and that’s giving you anxiety. That’s another downward spiral there.

Thyroid is a huge one. Causing hypothyroid activity or lack of thyroid activity. It’s mostly damaging the deiodinase, which is taking the T4 and moving it to T3. If you’re looking at your thyroid labs, and you have a high T4 but a low T3, mercury, cadmium, or arsenic are the most dominant player in breaking that chain there.

Inorganic mercury also builds up in the connective tissue, leading to a lot of joint pains. If you’re having lower back pain, a lot of hip pains, connective tissue pains, or diffused pains like fibromyalgia, and you have dental amalgams, that is a very common situation there. We see people’s joint pains and connective tissue pains clear up a lot when they get rid of their amalgams and clear all that mercury out. Those are the most common things that we see.

JM: Great. Now that we’ve explored what the problem is and how to assess or diagnose it, we can start to talk about how to repair the problem, which is always a good thing. Because not to alert and alarm people and create fear, but there is a darn solution, a solution that you didn’t have access to when you first started
this field and actually caused damage to yourself. You’re going to reap the benefits of all the hassle factors that leaders and pioneers like you had to go through to understand the mechanism to develop a protocol that actually works.

CS: Most of us are pioneers because we poison ourselves and had to figure ourselves how to get out of that. That was exactly what I did and that’s exactly how this all came about.

I was sitting at a talk. There were two in a row. One was Dr. Nigel Plummer (the former owner of Pharmax; he is one of the great probiotic leaders of the world) and then [Dr. Robert] Bob Rountree (who is one of the leaders in GI medicine and functional medicine). They were speaking here back to back at the Functional Medicine Forum, talking about how the GI tract reacts to the toxins coming through it and is signaling your immune systems on how to do things.

I was realizing that I was accumulating mercury in the GI tract and not moving that out. That was stagnating the system. I started taking strong mercury binders. We have one called Intestinal Metal Detox (IMD), which is a silica particle saturated with sulfhydryl groups. One six-gram bottle of that is equal to 3,000 to 5,000 chlorellas, which is what had been used naturopathically for that.

Once I cleared that metal out of the GI tract, it seemed to open up the liver’s ability to work with the small intestine, start moving that load out of there, and take the load away from the kidney. I did that almost on an insight. It worked so well, that provoked me to do a lot of research and figure out exactly why it worked.

I realized that from all the literature that’s been created by the scientific community, that when there’s inflammation in the GI tract, you stop the movement of toxins from the liver and the GI tract, and you shut everything to the kidneys. Unless you can open up that liver-GI path, you’re overloading your kidney with toxins. If you try to mobilize all that mercury with a chelator, boom – they all hit the kidneys and further the damage. Opening up that GI path moves stuff back into that liver GI.

In fact, a lot of people will say to us, “Wow, this IMD is so good for the kidneys,” but it’s never even absorbed; it never gets to the kidneys. What it does is it takes the pressure off the kidneys by restoring the natural dominant detox pathway – that should be the liver to GI and out through fecal excretion. The first part of the detox is to clear the metal out of the GI tract.

JM: Would that also help decrease the endotoxin by improving the leaky gut?

CS: Absolutely, especially if the metals are contributing to the dysbiosis (which they do) and contributing to the inflammatory states that are causing the leaky gut. GI binders, when you have leaky gut are huge.

You’ve got metal-based GI binders; those are the IMD and the chlorella. Then you’ve got endotoxin binders. What’s the best endotoxin binder? Charcoal, hands down. In fact, I love clay, and I’ll use a blend of all these. I’ll use IMD, charcoal, and clay. Because clay molds in food like aflatoxin. It gets 100 percent binding of aflatoxin, whereas charcoal doesn’t get any. But for endotoxin, charcoal gets all the endotoxin and clay doesn’t get any.

For each of the different toxins, you have a different binder that gets a sort of swath of that world of toxins. I like a cocktail of GI binders, including a metal-specific one like IMD or chlorella, charcoal (which gets almost all the other mycotoxins, except for aflatoxin), and then you’ve got clay (which gets aflatoxin but not the other mycotoxins). Then you’ve got the pesticides and herbicides. In that mix of different binders, you’re going to be able to get almost all of them. It’s really important in a detox to have a good cocktail of GI binders.
But when I lecture about detox, I like to talk about two things: movement of the toxin out of the cell. I call it squeezing the cell. It goes from the cell in the circulation and then filtration of circulation. That filtration is the kidneys, the liver, and the GI tract.

If people feel crappy, it means that toxins are building up in circulation faster than they’re being filtered. First, we want to make sure the filters are working. We want to support the kidney, we want to support the liver, and we want to support the GI movement, and natural binding up all of the toxins in the GI tract. That’s step one: to get the filtration mechanisms right.

Step two: turn off the squeezing of the toxins out of the cells. That involves upregulating these genes that control Phase II and Phase III detoxification.

JM: You can talk about that next. But I just want to interject here that obviously the charcoal and the clays that you referenced to are available pretty much anywhere, at almost any commercial drugstore. But the IMD is something that is peculiar. You developed it. You actually figured this thing out. It’s really only available from your company, Quicksilver.

CS: It is. Quicksilver Scientific is the only source for that. We’re working on getting some clays and zeolites to have the same kind of binding potential. That will be a little bit more patient-friendly. We’d like practitioners to oversee the ideas, because it’s so strong. But we’re working on some solutions that we’ll be able to disseminate more freely. Yes. That part is clearing up the GI tract.

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Then we need to support the kidney and the liver. We’ve got some of the classic herbs there. Liver: everybody knows things like dandelion, milk thistle, and bitters like green tea. In fact, we have an herbal bitters mix that we use and that I like myself right now. That’s very good.

For the kidney, I think people aren’t as familiar with some of the best herbs for the kidney. We all know cranberry. OK, cranberry is a diuretic. It makes you pee a little bit more. But my favorite is solidago or golden rod, which is a common weed, but it doesn’t make it into use as much. People know corn silk. Corn silk is good. But golden rod or solidago is probably the best one there.

If you don’t have access to that, go to a health food store and get any general kidney support mix. There’ll be a bunch of different goods that are in there. Try the isolates, some solidago. Maybe get that alone and take that. You can get a liver support mix. There will be a bunch of different liver herbs that are commonly known.

That will help you open up the filtration. You might add something like burdock in there as well for blood clearance. But dandelion is good. Dandelion supports blood, liver, and kidney altogether. That’s just to get you peeing and going to the bathroom well to get all that moving out. Make sure you’re drinking a lot of water. Things like tea don’t hurt you there, because they’re going to make you pee more; they’re diuretics.

Once we’ve got that accomplished, then we need the biochemistry in place for turning up the cellular reaction. That biochemistry involves glutathione, and the enzymes and transporters that work with it. That’s glutathione S-transferase (GST). That is the enzyme that’s responsible for catalyzing and moving the mercury off of the cellular proteins onto the glutathione.

There are several well-known nutraceuticals that upregulate the expression of that. The most well-known and the most reliable is lipoic acid. Of the forms of lipoic acid, there’s one called R-lipoic acid, which is the biologically active one that is much more useful. Alpha-lipoic acid does work, but that’s a mixture of R-lipoic acid and S-lipoic acid.
It’s like having D- and L-amino acids. The D-amino acids don’t work for you, and they occupy sites of the transport protein, so they work against you. That’s what the S-lipoic acid is. The R-lipoic acid is the effective one.

**JM:** You can get (R)-alpha-lipoic though, can’t you?

**CS:** When they say (R)-alpha-lipoic, it’s just us mixing words up together. But if the R is there, it is distinctly the form that you want.

**JM:** OK.

**CS:** (R)-alpha-lipoic is the form you want. But other things that hit this switch – this is a very interesting switch to talk about – is called nuclear factor erythroid 2 (Nrf2). It’s a protein that’s made to translocate into the nucleus. It hits promoter regions on genes.

Promoter regions are signals for genes to turn on. They’re families of promoter regions, because there’s a lot of… If you want to accomplish something, there’s not just one protein that does it; there’s a family of proteins. A promoter regions breaks up a family of proteins. This is called the antioxidant response element. It brings up the family of detox or chemo-protection genes. Great tool.

What does that? There are a number of different nutraceuticals and also pro-oxidants that do that. This is a very interesting thing, because we used to think that there are antioxidants that do it. We thought R-lipoic acid is an antioxidant.

Let’s look at polyphenols that do it like epigallocatechin gallate (EGCG) from green tea, a lactic acid from pomegranate. My favorite is called haritaki. It’s an Ayurvedic plant. If you ever look at a picture of the medicine Buddha, he’s holding a plant. That’s called the myrobalan. It has all of the great polyphenols in it. They all go in and they upregulate this.

Then you’ve got sulfur compounds from brassicas. Sulforaphane is a well-known one from broccoli seed extract. Ricin comes from all the brassicas. You’ve got allicin and diallyl disulfide from garlic. All of these upregulate that Nrf2. They do it not as antioxidants but as pro-oxidants. They create little free radical cascades that hit that Nrf2 and move it into the nucleus, so that you can detoxify them. They’re actually mild toxins.

Phenobarbital is a very strong upregulator. In the ‘70s, they were trying to study why phenobarbital turns up mercury detox and turns up glutathione production, because it’s a mild toxin and that invokes all this detoxification chemistry.

That is actually why you can go into the ozone literature and look at them upregulating glutathione production. They do this, because the ozonides that are formed in the blood make very small free radical stress that turns up Nrf2. I thought that was really interesting how these worlds of antioxidants and pro-oxidants collided, because we found out that the antioxidants that were really the best for us were things that upregulate our own antioxidant system. Those are all the compounds that you need to turn up the cellular detoxification.

Then, we want to support glutathione. If everything is working well in the body, you can just feed precursors to glutathione like N-acetylcysteine (NAC) or whey protein. But if things aren’t working well, you’re under a lot of cellular stress and you’re under a lot of viral pressures, what these things do is turn down the activity of the enzymes that assemble glutathione. Then we like to come in with a direct delivery of glutathione.
We use a liposomal glutathione. Importantly, we use a nanoliposomal glutathione, a very small liposome that can absorb right through the oral cavity, so it doesn’t have to be absorbed and go into portal circulation. We find excellent results on oxidative stress and on detoxification using this delivery of glutathione.

Of course, the other thing that using liposomes does for us (which we’re inevitably going to talk about), is bring in phospholipids, these membrane and liver support. Phospholipids, especially phosphatidylcholines (PC), are a key part of detoxification of the whole body, but specifically, the liver and the brain.

**JM:** A few things. Maybe we’ll just talk about the glutathione first, because you just mentioned it. It’s important to differentiate and highlight the fact that you’ve mentioned that it was liposomal. Because almost every all oral glutathione supplement is going to fail to work miserably. It just isn’t absorbed. It just won’t work. It’ll be broken down before it gets into the bloodstream.

**CS:** You break it into its constituent amino acids. It’s essentially like taking cysteine – a very expensive cysteine. The only way to bypass this is using a liposome. A liposome is used in those phospholipids to create this spherical shell of phospholipids that encloses some of the water and the solute that you have in there when you put the phospholipids in there, puts them into this little bubble that can possibly absorb through the GI tract.

If you make them small enough, they’ll absorb right through the oral cavity like a small emulsified fat would. In fact, it’s very much like you’ll absorb chylomicrons, which are little fat particles that you almost file with your bile salts and you bring into circulation. The liposome bypasses this to absorption. It’s a beautiful, beautiful way to get nutraceutical compounds into the body.

**JM:** I couldn’t recommend it more strongly. To not make the mistake of purchasing an oral one that you’re going to get the same benefit. It just won’t work that way. Also, I’m glad that you highlighted the fact that oxidant stresses are in fact indeed important. The converse of that is to indiscriminately use high doses of antioxidants may actually be highly counterproductive.

I’m wondering if you can comment on that. Because interestingly, this is one of my strategies now (I’m working for my book Metabolic Mitochondrial Therapy) to optimize the fuel that you’re taking to reduce the production of reactive oxygen species and secondary free radicals rather than using high levels of indiscriminate antioxidants.

**CS:** Right. If you use high levels of indiscriminate antioxidants before you workout, you actually block the mitochondrial biogenesis effects of exercise. You don’t want that.

In fact there was a study where there’s a nuclear transcription factor called proliferator-activated receptor gamma coactivator-1a (PGC1a) that stimulates you to make more mitochondria. That’s what we want, right? We need lots of mitochondria and we need very good health to the mitochondria.

**JM:** I think 5’ adenosine monophosphate- activated protein kinase (AMPK) and a certain one also do it, too.

**CS:** Yeah. There are genetic switches to turn this stuff on. But they’re turned on by light free radical stresses, especially the ones that are generated during exercise. Exercise creates free radical stress – light free radical stress. When you’re feeding your body with high-quality fats for fuel, instead of sugars and starches, you get the right free radical cascade to just bump up that expression of mitochondrial biogenesis without creating extra damage.
But if you indiscriminately throw the antioxidants in before you workout, you don’t get that bump to the mitochondrial expression. You want to take them later during your recovery phase to give your body all that it needs to rebuild and repair, and pick up any free radicals that you couldn’t detoxify yourself.

Indiscriminate use of antioxidants, especially vitamin E and vitamin A, was leading to increases in cancer risks – not decreases. The antioxidants you want are the antioxidants that actually promote your own expression of antioxidant activity, which you regulate to have the right level of free radicals and stop any excess free radicals.

It’s a really important point: 1) not to overuse them. I like using antioxidant later in the day. Unless you’re sick, you’ll use a lot if you’re not going to use them later in the day and after workouts. 2) To really crucially burn fat dominantly, which is what of the main things that you’re into would be mitochondrial health is burn fat in our carbohydrates.

I used to rent space to guys from Accera that made a medical food called Axona for Alzheimer’s. It was nicastrin (NCT) proteins emulsified with whey powder. They showed that when mice were burning that for fuel, they had much lower oxidative stress to their mitochondria than when they were burning carbohydrates. There was a lot of damage going on to the mitochondria. That was really, really great data to be privy to when that was coming out. It really reformed how I like to think about nutrition.

JM: I could talk all day about that, because there’s so much exciting literature on the neurodegenerative recovery with these types of interventions. But what we want to focus on now (because we have a limited time) is to continue with the detoxification protocol, maybe finish up on that, and then delve into the other heavy metals, which you had mentioned earlier (such as cadmium), some of the ways that one would assess their level in the body if in fact they needed detoxification, and if the protocol differs much from what you just described for mercury.

CS: Right. Just to follow up on the mitochondria, we talked about organ systems that are damaged by mercury. But one of the most common mechanisms for the damage is damage to the mitochondria. Lots of heavy metals – mostly mercury, cadmium, and arsenic; secondarily lead – are mopping up all that glutathione, and you’re not able to control that free radical bursts.

When you have those free radical bursts, if the metals are mopping up your glutathione, you can’t control them and you’re going to have more damage to the mitochondria. The way that you support the mitochondrial health is by supporting that internal antioxidant system and by giving it all phospholipids it needs.

Now in that view, we look at we want to support glutathione, we’re going to do that by bringing in liposomal glutathione, which is going to bring in glutathione plus phospholipids to support the membranes. If you remember, the mitochondrial electron transport is all through the mitochondrial membrane. When there’s damage to that, there’s leakage of the free radical chains out of the electron transport chains instead of driving that into adenosine triphosphate (ATP). You need the phospholipids there.

We’re going to support expression of all the intracellular detoxification free radical-controlled enzymes using polyphenolic antioxidants and lipoic acid dominantly.

I don’t use the cruciferous-based and allium-based sulfhydryls as much, because a lot of the people who are mercury toxic tend to have problems with sulfur metabolism. The Cystathionine-β-synthase (CBS) gets upregulated and they turn those sulfur compounds into sulfite. They’re not able to get them all the way to sulfate and they have sulfite toxicity. If they’re using a lot of alliums or cruciferous, they usually need to supplement with extra molybdenum, and they might want to (if they have those problems) go low on the lipoic acid until they repair that whole system.
We focus on polyphenols and lipoic acids to upregulate those systems. Then of course, we need the transport proteins. We said glutathione. Glutathione-S-transferase, linking together the metal and the glutathione. Then the transport proteins, transmembrane transport proteins that take it from the cell of the blood, blood to the liver, liver to the GI tract, or blood to the proximal tubules, proximal tubules to the urinary flow.

We control that expression of those transport proteins by making sure the toxins aren’t building up in the GI tract, and making sure that inflammation in the GI tract and the systemic inflammation is low. When you control that, all these transport proteins move, they get the signal that the coast is clear in the GI tract, they open up, and they move things down there. Our intestinal binders are key to those intestinal transporters. Glutathione, polyphenols, lipoic acid, and GI binding – those are the key for that.

JM: Quick question first. Sorry to interrupt. On the polyphenols, how do you like polyphenols from raw cacao, which seems to be one of the highest sources? There are almost 380 different polyphenols in there. I’m wondering if you have any experience with that.

CS: Raw cacao is a good way to go. Nobody’s done any research on raw cacao polyphenols upregulating. It’s like when people always ask me about cilantro.

JM: OK, we don’t know.

CS: We know cilantro works, but nobody’s ever done a research, so I can’t fit it into a scientific hypothesis.

JM: OK. Sorry for interrupting.

CS: I do support raw cacao polyphenols. The other question was how does this differ for other different metals? OK. The glutathione system is directly responsible for mercury, cadmium, and arsenic. Those are three of our big four; the fourth being lead. The glutathione system blocks all the toxic manifestation of lead, but it doesn’t seem to be able to export it.

To date, I don’t really understand how we normally export lead. I think that we don’t effectively export lead very well, which is why we build so much into the bones. Then as we get old and we get osteoporotic, a lot of it comes back in. Old people chronically have lead toxicities, especially osteoporotic women, because they mobilize all that lead.

There is a place where I do like the use of a chelator. We do use a liposomal ethylenediaminetetraacetic acid (EDTA), but that’s only through the practitioners. There, you’re starting to mobilize a lot of metal. You really need to have everything balanced. One of the most important things that we found as to why the liposomal EDTA is so intense on some people is that it’s a biofilm breaker.

We may segue way a little bit into when does the system not work? Clearly, clearly, clearly if we use the system and we’re not getting anywhere, you’re exhausted, you can’t titrate up your doses, you can’t make it work, your levels are coming down – you have a systemic infection. There is no doubt.

In fact, one of the things we see when people go on to our detox and they feel worse, we send them all for Lyme testing. Where they used to test negative for Lyme, now they test positive, because glutathione is crucial for the immune system function. Also we bring up their immune system, it starts finding all these organisms, start making the antibodies, and you test positive for Lyme.

But then when you go into the EDTA, it’s a powerful biofilm breaker. In fact, there are now intranasal sprays of antifungals that have EDTA in them to break the biofilms in the nasal cavity to access the
funguses that are growing underneath the biofilm. Now when we take it systemically, we start opening up biofilms, your immune system sees these organisms, and you start having immune reactions.

A lot of the fatigue that people felt with the detoxification in the past, we said was a first-timer reaction to the metals, which isn’t really true. First-timer reactions are always reactions to organisms. We said, “It’s just a detox reaction.” A lot of that was actually immune response to either turning up the immune response and it reacting to invaders, or you’re breaking down the biofilms that are systemic.

In fact, Dr. Stephen “Steve” Fry at Fry Labs has published a paper recently where they took arterial plaque and they found parasite biofilms in them. In fact, they’re saying that the plaque actually is a biofilm and some of your efforts to cover that biofilm in some of your own cholesterol. EDTA is releasing a lot of organisms. A lot of the fatigue you feel with EDTA is reflective of systemic biofilm-based infections. If you’re not having success with detox, you need to go after antimicrobials, almost every time.

**JM:** Are these biofilms almost always produced by infections or large doses of magnesium stearate through taking large amounts of supplements ever an issue?

**CS:** I don’t know. That wasn’t really so much on my radar. I worked with Steve a little bit on these. I sent some of my hard cases there and I sent myself there. I have a recurrent thing that goes on and on. I keep everything in control because I have so many good supplements.

[----- 50:00 -----]

At the University of Illinois, I was massively exposed to funguses. In fact, they wondered why there was no air coming to the HVAC system and they found it choked to the core with metal. They tried remediate it while we were all still in the building.

**JM:** Oh, boy.

**CS:** It was a five-million dollar disaster. That was how much they spent on it and it was all still there in the end. A bunch of us got sick. I still have that fungal infection. Sure enough, Steve Fry found biofilms going through my cardiovascular, through my blood flow. These were fungal biofilms. It cost him 1,200 dollars to do it, but he sequenced the whole genome that’s in your blood. Sure enough, these parasitic funguses were in there.

This is what he’s finding left in right now and in all the chronically ill people (the stuff comes and goes, comes and goes, comes and goes) is related to biofilm communities that are living inside you. We may find out actually that some of them aren’t so bad, that there’s a flora in there just like there is in our GI tract.

**JM:** Thank you for that great insight on the biofilms. I just wanted to also emphasize that you wouldn’t indiscriminately treat for lead unless you had it diagnosed. Even though large amounts of the population, especially most likely the segment of the population viewing this that are 60 and older, were exposed to that because of really a conspiracy issue with the introduction of leaded gasoline.

They literally put hundreds of millions of tons of this into the environment for 80 years. Even though the science was very clear, they only finally got it out in the ’70s. If you’re under 30, it’s probably not a big issue – or even 40, but anyone older than that is going to have a big exposure.

**CS:** Right. I’m 46. Anyone around my age and above all has lead. But you don’t indiscriminately treat it. If you go through the glutathione system upregulation, you’re not just getting mercury, cadmium, arsenic – you’re getting a whole host of toxins; you’re getting fluorinated, brominated, chlorinated hydrocarbons;
pesticides, herbicides. It’s great for anybody to do that if they do it right. You start low, work up, and you pulse on and off. That’s the key to making that happen. I support that for anybody.

That will stop the toxic manifestations of lead. But mobilizing lead out of the body using EDTA, DMSA, or 2,3-Dimercapto-1-propanesulfonic acid (DMPS) has to be done with a qualified practitioner. I would say you do glutathione system upregulation. Get rid of all that other junk. Really build up your body’s own ability to deal with these toxins and then mobilize the lead. Always do that with a practitioner.

**JM:** With your mercury assessment, which as I mentioned earlier, really a unique assay. There’s nothing else on the market that comes close to it. It’s, to me, beyond foolish to even consider any other assessment tool. That assay that you have to detect for mercury and to speciate them (or to differentiate the mercury species) does that also pick up these heavy metals?

**CS:** What we’ve added on is inductively coupled plasma mass spectrometry (ICP-MS) scan of blood for nutrient and toxic metals. This is really important, because you need to have your nutrient metals in order before you can go after your toxic metals. Most of the toxic metals displace zinc out of zinc finger proteins and enzymes, tons of zinc driving all kinds of metabolic reactions. The heavy metals get into the zinc spots and kick them out.

If you have low zinc, you’re not going to be able to detoxify it well. If you have high copper, low zinc, that’s going to look, feel, and taste like heavy metal poisoning. It’s going to be synergistically toxic with all your heavy metals. Calcium-magnesium ratios — high calcium, low magnesium puts you in chronically sympathetic autonomic tone, which stops detoxification and puts you chronically inflammatory. You need to get those in order and get those balanced. You need to have adequate molybdenum, adequate selenium, and adequate lithium in order to detoxify.

Then you have your major toxic metals — cadmium, arsenic, and lead. We have a couple of others in there that are sometimes toxins like cobalt, chromium, as well as strontium. Some people overdose strontium taking bone supplements. We’ve got your major toxics along with the nutrients. We’re working on blood-urine ratios for the other toxics as well. That would be a really important thing for cadmium.

We’re going to look into speciating arsenic, because there are different forms of arsenic. Arsenic from seaweed. If you eat a lot of seaweed, you can have high arsenic levels. They’re called arsenosugars, and they pee right out of you. They come in and out. They’re not toxic at all. Arsenic from well water. Inorganic arsenic is by far the most toxic part. We’re working on the speciation there.

Right now we have the Mercury Tri-Test and the Blood Metals Panel. Those two together are an excellent map of everything going on. We’re bringing those altogether and bringing urinary measures into that, too, to create a master meal.

**JM:** OK. Thanks so much for explaining all the ways that we can assess and determine if we have mercury exposure and toxicity and some of the side effects. I’m wondering now if you can go into the different heavy metals, because obviously there’s more than mercury, and you alluded to some of them earlier in our conversation. If you could elaborate on them and tell us the range that we need to be concerned about, the ones that currently we can test for, and maybe some of the detox processes also. I mean, a broad question, but it’s important.

**CS:** It is. Just to start from the testing: because we have so many different toxic metals that we’re exposed to and because the nutrient metals and their balance points are essential for us being able to detoxify these metals, we set up what we call a Blood Metals Panel, where we’re looking at nutrient and toxic metals.

In the nutrients, you’ve got balances between calcium and magnesium. When they’re out, very commonly you have high calcium, low magnesium. That’s a pro-inflammatory situation. It’s also in your autonomic
nervous system. It makes you dominantly sympathetically toned. It’s important to get into parasympathetic tone to be able to detoxify. This is one of the reasons that meditation, tai chi, yoga, and chi gong are so important. Relaxation is important to put you into parasympathetic; high calcium keeps you in sympathetic.

One of the other patterns that we see is high copper, low zinc. Zinc is an essential cofactor in hundreds of different reactions inside your body. Other heavy metals get into the binding side from the enzymes that hold zinc. There are something called zinc finger proteins. They sort of wrap around in a finger-like shape, they have little spots that hold the zinc, and they catalyze different reactions. Other metals like mercury, cadmium, and lead will get in and displace that zinc and take over its function there, and thereby disable that reaction.

Copper also, it’s not commonly known, in excess of zinc and in excess of its binding capacity becomes a toxic metal on its own. People in the industry talk about “copper heads,” because copper gives you a very neurological approach; they’re at the high end or at the far end to become psychotic. It does create the same problems with anxiety brain fog that mercury does. And delusional thinking.

But copper is also synergistically toxic with the other toxic metals. If you find someone with a high copper, low zinc, and they have moderate amounts of arsenic, cadmium, mercury, and lead – those will look exaggeratedly toxic in the face of that high copper.

We look at those ratios. We look at molybdenum. Molybdenum is essential for sulfur metabolism, for processing sulfur compounds, especially the ones that you get from food. The cruciferous family and the allium family, we already talked about them, for their benefits from their sulfur chemicals, their isothiocyanates in the crucifers. They turn up detoxification via this Nrf2 translocation into the nucleus.

But a lot of people who are toxic have a hard time metabolizing those sulfurs. They turn up what’s called the CBS, Cystathionine-β-synthase. They start spinning away those sulfurs towards sulfate where they can urinate it out. But they get so much of it moving out that it pulls up sulfite; and sulfite is a neurotoxin. When we don’t have enough molybdenum – molybdenum is required as a cofactor to move sulfite into sulfate. We look at molybdenum.

We look at selenium, which is a cofactor in most of our antioxidant enzymes, notably glutathione peroxidase and thioredoxin reductase. All of these are essential nutrient elements.

Then we look at the major toxics. You look at arsenic, cadmium, and lead. We also do mercury, but just as total blood mercury, which is more of a fish consumption measure. We also have in there silver and cobalt. These are some of the things that, under certain circumstances, become in high load.

[----- 1:00:00 -----]

All of those are important. This one blood metals test becomes a map to all of them. See which ones stick out, see which patterns are there, and see which of the nutrient elements are out of range or out of balance. This is a great adjunct test to the Mercury Tri-Test that gives you that map of nutrient toxics.

**JM:** Thank you for explaining that. It sounds like it would cover a wide range of toxins and perhaps present a relatively complex protocol. Do the results of the testing also come with specific recommendations?

**CS:** Right. In the nutrient elements, it becomes pretty self-explanatory. You need to bring up the ones that are low, and you need to stop supplementing or stop exposing yourself to the ones that are high. It’s a little bit more complex with copper. But generally, when you get the glutathione system in order and when you get methylation in order, the copper levels will come down.
Now as far as the toxics, when we do glutathione system upregulation, we handle mercury, cadmium, and arsenic – three of the Big Four. I think I mentioned before that the only one that we really want to chelate for is lead. If lead is very high, you need the guidance of a qualified licensed practitioner to use either our liposomal EDTA or a little bit of DMSA and DMPS.

In general, I don’t like DMSA and DMPS unless you’ve already cleared the system of the mercury, you’ve normalized the glutathione system, and you’ve established very importantly that your kidneys are able to filter those chelates.

**JM:** Let me just respond to that. It’s been a while since I’ve actually implemented clinical protocols with patients. But when I was doing it, those were the rage – DMSA and DMPS. That was the gold standard of alternative medicine. You were foolish if you didn’t aggressively implement those protocols. What you just explained, exercising significant caution, been widely adopted by the natural medicine community?

**CS:** It’s starting to be. There are enough refugees from those treatments. People, a lot of them come to us, because they get very sick on those treatments. We have to sort of help them reestablish the natural functioning of that detoxification system.

People overall are becoming more careful. A lot of people have just dropped away from doing those kinds of protocols. The people who are still doing them and who are successful tend to be the ones who are very careful about establishing liver and kidney function, and making sure that those are well-supported and well-functioning before and during the chelation. There are a couple of people who do know how to use it well.

**JM:** That’s great. That may not seem like an important point, but I just wanted to emphasize and stressed that it is.

**CS:** It certainly is.

**JM:** Because it really could get you into serious trouble. That’s such a common complication of following somewhat relatively complex interventions, simple diet and exercise. Even with that, you can still screw up.

**CS:** Absolutely.

**JM:** You can overdo something. You’re seeking to get a great benefit and you wind up making yourself worse than if you have never, never have implemented it.

**CS:** To have yourself fall the other cliff. One of the ways that we’ve implemented kind of a merger is that we teach people how to use our detox protocols to normalize their glutathione system. If they want to overlay a little bit of chelator, then they get good success.

Hal Huggins did this very nicely. He would use 25 milligram of DMSA three times a week. Some people think that’s an irrelevant dose, but he gets so much to patch up the biochemistry. I measure everybody’s before and after. I get to see how successful each one of these practitioners is, and he was very successful at getting mercury out of the body.

**JM:** That’s great. One of the central elements of your protocol involves improving the body’s glutathione system. I just like to spend a moment on that now. Just to emphasize some key points, as we may have mentioned earlier, when you swallow an oral glutathione supplement, it’s not going to work; it’s going to breakdown to its constituent amino acids. The body would have to put it altogether. It’s not an effective intervention.
Why don’t you, for a moment, discuss taking glutathione precursors and how that differs from the glutathione recommendations that you’re using? I believe the delivery system allows it to be absorbed intact and whole, so it bypasses those issues.

**CS:** Right. There are two things: 1) how do you get glutathione indirectly and 2) when do you need to do that versus giving precursors? To get glutathione indirectly, use very small liposomes. Some people call them nanoliposomes, because they’re down in the upper tens to hundred nanometers. This is the size of liposome that could be directly absorbed right through the oral cavity, and as you swallow it, in the gastric areas and upper small intestine.

A liposome is made out of phospholipids that are extracted from either high phosphatidylcholine extracts of either soy or sunflower lecithins. You’re able to form these little monolayered vesicles around a little volume of glutathione. To your body, this looks like a small emulsified fat like a chylomicron. When you make them small enough, they absorb right into the capillaries, in the oral cavity, and as you swallow, they continue to absorb.

We see very nice clinical results with this. We’ve seen very nice results with oxidative stress measures, F2-isoprostane, 8-hydroxy-2-deoxyguanosine. We see those numbers come down very nicely, so we know that we’re delivering glutathione in there. We also see mercury levels come down very nicely. We see this direct application through the use of these intra-oral small liposomes benefitting us. But there are times when just the precursors are going to work and times when they’re not. It’s really going to come down to how run down the body is.

Readisorb has done some good studies looking at how ell HIV white blood cells can utilize precursors versus liposomal glutathione. They took mononuclear cells from HIV patients and stressed them with tuberculosis bacteria. This is something that usually the white blood cell would be able to kill. But in an HIV patient, the reduced glutathione is very low; the oxidized glutathione is very high, because the body is not controlling the reductases, the antioxidant mechanism that keeps your glutathione fully reduced.

They found that they had to give over 1,000 times more N-acetylcysteine as a precursor to get those glutathione levels up rather than giving directly the liposomal glutathione. A thousand times more precursor than glutathione was necessary to restore the function of the cell. Now, there are two things there: 1) we see how directly beneficial the liposomal glutathione is and 2) we see what essential cofactor glutathione is for proper immune function.

That’s the thing that we don’t talk about enough. We talk about oxidative stress. We talk about detoxification. But here, you see that immune function is not happening at all until glutathione goes in there.

Another example of that is the herpes family. Cell cultures of herpes 1, the herpes that you get on your lip, will grow in a dish and kill all the cells. If you put glutathione in first, it doesn’t grow at all. If you start it and it starts killing the cells, and you throw glutathione in it, it stops it in its tracks. In fact, liposomes are a topical as well as a systemic. They were originally used in the cosmetic industry. You can use a liposomal glutathione topically to penetrate in and stop the propagation of a virus in a cold sore or any other herpes diseases.

**JM:** That’s a real interesting therapeutic and strategic intervention. I hadn’t heard before that topical glutathione would work for oral herpes sores. That’s some pretty work.

**CS:** Yeah. We see that work again and again. You hear reports from people who get their amalgams out, detoxify and bring their glutathione system up that they stop getting recurring herpes infections, because herpes is living in the situation of reduced glutathione in the immune system.
JM: Great. Let me just ask you one follow-up question for phospholipids and then I’ll let you expand on any other topics you think are worthwhile rather than answering my questions, and maybe I’ll dialogue with you on that.

You had mentioned that phospholipids are really an important and integral part of the liposomal delivery process. I just wanted to mention that there are actually two types of phospholipids: 1) omega-3 phospholipids (which are from fish oils and krill) and 2) omega-6 (which as you mentioned earlier is from safflower and sunflower). Actually we need both.

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Obviously, they’re effective, as you just mentioned, these delivery systems for nutrients, but they are independent by themselves incredibly, profoundly effective nutrient factors that actually upregulate mitochondrial function.

I’m in the process of evaluating and investigating this right now. It’s an important part of what I’m developing as a metabolic mitochondrial therapy or MMT for short. I’m wondering if you could expand on that, because not many people are even aware of this or even discuss it. It’s an emerging new and recently appreciated part of nutrition.

CS: Right. It’s really re-emerging. I think this is really the key to our success in implementing these therapies. Not only the compounds are getting in there but the phospholipids are getting in there. The only way to get them indirectly is in these liposomal forms.

When you eat phospholipids, you usually have to take them apart and reassemble them inside the body. In these vesicles, they go indirectly and they become what we call membrane therapy. Now, membrane therapy, we’re rediscovering it and using it again. But the German biological medicine uses this extensively.

JM: Interesting.

CS: Lipostabil (which came out of Germany) and Essentiale (which came out of Russia), they were both from the same phospholipid company that we get our phospholipids from. (I don’t recall their name now. I might come back.) But they were developing very high grades of phosphatidylcholine extracts from soy lecithins and now they’re doing it from sunflower. These are so pure that they made them injectable grade. They have 250 milligram ampules of this. You would also take them orally.

It was probably popularized in the US at most by [Dr. Patricia] Patty Kane and Edward Kane. They would teach membrane therapy and membrane medicine.

I love to point out to people how the cell membrane… It’s important to remember that liposomes get absorbed. They get fused into the cell membrane and used in the cell membrane. They can be used in the membranous organelles. All your transporters and all the signaling systems in the cell read the outside environment and describe to the nucleus what it’s able to transcribe and what it isn’t. You have this nucleus full of information, but you don’t use it all the time.

You use it according to what the situation is around you. Poor health of the membrane is the situation that is signaling stress. You limit how many genes you can turn on at any one time. When you feed that membrane, first, you give the cell the signal that you’re in a good environment and you can turn on some of the genes that involves rebuilding and repairing. You also are able to feed all the transport proteins that are moving good things in and moving bad things out.
Membrane fluidity or the sort of pulsing of the membrane is necessary for that. You need to move all the oxidized fats out of there and move good phospholipids in there. Then in the cell, you’ve got the membranous organelles. You’ve got the mitochondria, which is central to your thinking right now. You’ve got the outer membrane and inner membrane.

The inner membrane, that’s where the whole electron transport chain happens. These high-energy electrons are passed through these reactions. They’re generating ATP. But what happens when you have damage to that inner membrane is you can’t couple those reactions together. Some of that high energy leaks out as reactive oxygen species. When you get a little bit of reactive oxygen species, it’s good; when there’s a lot, there’s just more damage to the cell. You need to repair the membranes to do that.

Membrane therapy, feeding phosphatidylcholine and other phospholipids into the body, has been a very successful therapy for rebuilding the mitochondria.

Let’s cover the other two membranous organelles: the endoplasmic reticulum, which on the rough end of endoplasmic reticulum houses all the ribosomes that are making all proteins. Obviously, you need a good lattice to hold all of those. But what’s not recognized as much is the smooth endoplasmic reticulum. That’s where almost all of the reactions that bring your hormones – from cholesterol to sex hormones to glucocorticosteroids. Those almost all happen in the membrane of the endoplasmic reticulum. The ones that don’t happen there happen in the membrane of the mitochondria.

Effective healthy membranes are essential to house the enzymes that are creating those reactions. They create the charge separation that’s necessary to move those. The most famous charge separation is the proton-motive gradient in the mitochondria that’s generating ATP. But there are charge separations on all of these. These membranes are like depositors. The more you feed the health of those membranes, the more you feed essentially your electrical potential gradient tendencies. A lot about the electrical nature of the body and the need for the membranes to set these up.

This is what phospholipid therapy does for you. Most of the phospholipid therapy was omega-6 dominant. You and I have talked about moving over to getting more of these omega-3s into this phospholipid mix. That would be by bringing in those krill oil phospholipids.

Unfortunately, fish oils are triglycerides. The way that they process them, they take those phosphate heads off and leave you with triglycerides. Whereas, a phospholipid, it’s got two fatty acid tails (so it’s a diglyceride that way) and then it’s got the phosphate heads in place of the third fatty acid tail. That’s really the thing that we want. We get that from krill and we get that from one of the foods you like, the salmon roe.

**JM:** Yes, indeed. Hopefully you’ve ordered some too from Vital Choice.

**CS:** That’s going to happen today.

**JM:** I just ordered six pounds.

**CS:** I love it.

**JM:** But thank you for explaining that. Normally, fatty acids, they don’t just float around by themselves; some do as ketones when they’re really small. But typically, they’re attached to a molecule, three carbons, typically a triglyceride, which is the way fish oils are. But the magical ones, the phospholipids have one of those removed. The phosphate on that head actually does the magic and allows it to be absorbed so efficiently, so much more efficiently than the triglycerides because of the differences.

**CS:** And it’s able to be incorporated right into the membranes.
JM: It’s a beautiful thing.

CS: That’s the phospholipid.

JM: There’s a lot of profoundly beneficial potential there. I’m really excited about explaining that in the future. Maybe we’ll even dialogue in a future interview.

CS: Absolutely. One other thing, choline, phosphatidylcholine.

JM: Sure. It’s a beautiful piece of... Part of the reason why your approach, your detoxification protocol, is so effective is you’re using these fundamental components that are really so important for all these basic metabolic processes that really drive the body towards health. You’re hitting it at a very fundamental level. It’s not some magical snake oil, which I almost ascribe DMSA and DMPS, the other effective interventions if used wisely like Huggins did. A lot of times they just cause a lot of problems.

CS: Wham! We figured this whole system out. I took DMSA until I almost couldn’t walk. I had to dig myself out of that whole. It was necessary figure out how to rebuild the glutathione system.

JM: We’re reaching the limit of what we can effectively put in one interview. Maybe if you can tie up what we’ve already said, or maybe emphasize a new point that you’d like to and then we can reschedule another one in the future time. Because you’re a wealth of information, it’s a real pleasure to dialogue with you on these. There’s not that many people who understand this at a profoundly deep scientific basis like you do who can really come up with some profoundly effective clinical recommendations that will radically catalyze some movement towards health.

CS: Thank you. I appreciate our time together and our dialogues. Just to wrap up, I’d like to go back and just hit the sort of the three pillars of detoxification in general, but specifically, metal detoxification. You need the glutathione in there. You’re going to get that in a liposome or you’re going to use precursors. You need the enzymes upregulated inside the cell. That’s Nrf2 upregulation using R-lipoic acid, polyphenols, and sulfur-based compounds from cruciferous and alliums.

Then very crucially, you need to clear all the trash out of the GI tract. You’re either going to use a thiol-functionalized silica with a practitioner or you’re going to use chlorella. You’re also going to add in the ancillary absorbents for all the other toxins. The two most important ones are charcoal and clay. If you get charcoal, clay, and a thiol-source like IMD or chlorella, you’re going to be able to find all that up.

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If you’re detoxing and feeling crappy and heavy, you need to clear more toxins out of your GI tract, and you need to clear more out of the blood. When you do that, back off of things too upregulation, back off your Nrf2 upregulators. Take more GI binders, take more cholagogues and diuretics. Drink a lot of water, because you want to turn up the filters, the filters to the kidney, the GI tract, and the liver. Turn up those filters. Clear all that stuff out. When you’re feeling clear again, you can hit those detox upregulators a little quickly.

The last key to it – this is a two-part key – starting low, working up high. Start all your doses low. Don’t jump into this. This is more of a marathon than a sprint. This will take 3 to 12 months. It might take more, depending if you’re chronically ill. Start low, work up high, and pulse, because you can’t upregulate gene expression every day. You have to do it and then let it come down. Stimulate. Relax. Stimulate. Relax. We start with five days on, two days off. Or if it’s a little heavy for you, four days on, three days off. Once we get a little deeper into it, we move it up to 10 days on, four days off.
One last study to share regarding that: when they looked at upregulation of these genes using phytochemicals, plant-based chemicals in mice, they saw that when they gave them a high dose, they went up to a max expression in 10 days. That was three-fold their baseline. On the same dose, over the next 20 days, going up to 30 days, the expression went down, down, down, down, until it was back at baseline. Meaning, when you use these compounds that upregulate every day, they stop working for you. You’ve got to take them. Stop. Take them. Stop.

JM: How did you learn that? Was it by observation?

CS: There’s a long history of that. All of the naturopathic and the old German biological traditions would teach pulsing. They didn’t know exactly why, but they would teach that. Then I found this paper where they did this in mice. They were using the same transporter as an upregulator. They saw that from Day 1 to Day 10, there was a progressive increase. But Day 10 to Day 30, it went back down to baseline.

We had already been pulsing. Some of it was just natural to go parasympathetic, sympathetic, stimulate, and relax to give people a break from things. But then we found the biochemical basis for why to do that. That’s why pretty much the max will do is 10 days on and then four days off.

JM: OK. Great. It reminds me, too. It’s been a few years since I did your detox protocol, which as I mentioned earlier, was effectively able to normalize my mercury levels on the healthy levels. That was, I remember, clearly part of the process. You explained it again. It reminds me that you’ve probably uncovered or reemphasized a really important clinical truth that these nutrients need to be pulsed.

Based on that data, I’m going to change and modify my recommendations, because I do think it’s true. It makes a lot of sense. If you take these nutrients, really beneficial nutrients, think of curcumin and berberine… If you take them all the time, you’re going to run into problems.

I really appreciate your knowledge that you shared with us today and the opportunity to share it so effectively. I’m sure will have you on again, because you’ve got a lot to share.

CS: Thank you so much.

[END]