

## The Benefits Of Methylene Blue For Mitochondrial Health

**Ari Whitten, MS**  
with **Scott Sherr, MD**



**Ari Whitten, MS**

Dr. Sherr. It is a pleasure to connect with you again, my friend. It has been way too long.

**Scott Sherr, MD**

Ari, likewise. I hope you are enjoying Costa Rica and the surfing.

**Ari Whitten, MS**

I am. A lot has changed since we last spoke and we last spoke in person. You are living in Colorado. I am living in Costa Rica both of us have been exiled from California.

**Scott Sherr, MD**

Voluntarily. Maybe involuntary on some level but mostly voluntary.

**Ari Whitten, MS**

You have also started a new company. Your expertise for people listening has historically been in the realm of hyperbaric oxygen therapy. You have had a clinic in northern California and you now serve as a consultant for hyperbaric clinics all over the world.

**Scott Sherr, MD**

Indeed.

**Ari Whitten, MS**

And you are considered a renowned expert on that topic. One of the other areas that you have delved into very deeply is something you dosed me with last time I hung out, which was methylene blue.

**Scott Sherr, MD**

We have a habit of doing that. Yes.

**Ari Whitten, MS**

Methylene blue is a really interesting substance. I will let you tell the official history of it but my personal history of it is that I have been using methylene blue since I was 12 years old.

**Scott Sherr, MD**

Really?

**Ari Whitten, MS**

Yeah, because when I was young I was very into aquariums.

**Scott Sherr, MD**

Sure.

**Ari Whitten, MS**

And methylene blue is commonly used for the more recent craze of humans using it to enhance their brain and mitochondrial function. It was commonly used to treat certain diseases in aquariums and in fish in aquariums. I have been using it and staining my skin with it for almost 30 years at this point.

**Scott Sherr, MD**

Yeah. Excellent.

**Ari Whitten, MS**

But there is an interesting history much beyond my own personal history here of methylene blue more broadly. What is this substance? Where did it come from?

**Scott Sherr, MD**

Yes, we had some really great headlines for our company, actually, within the pandemic maybe about a year-end. How biohackers and the high-performance were using fish tank cleaner to optimize their health. Great clickbait headline. And actually, it plays into the history of methylene blue. Yes, it is used as a fish tank cleaner, it is still used in that way. However, there are a lot of better ways of getting your methylene blue. I promise if you are going to be taking it as a human, not as a fish.

**Ari Whitten, MS**

Actually, the headline was exaggerated, it is misguided. I can tell you as an aquarium expert or ex-aquarium expert. It is not a fish tank cleaner it is actually a treatment, a medication for specific diseases on fish and like treatment of parasites.

**Scott Sherr, MD**

Yes, exactly. Yeah. And fungal infections, etc. Yeah. And that is how methylene blue got started actually. Before it became a medical treatment or medical therapy it was actually used as a dye in textile manufacturing, this is in the mid-1800s. It was dyeing blue jeans. It is the first dye that we used to actually dye blue jeans, the color blue. But somehow, and we are not really sure, in South Africa in the 1880s they figured out that it treated malaria. I do not know how but they figured out that high doses of methylene blue orally would treat malaria. And as a result of that,

more studies were done and more interest of using methylene blue in an anti-microbial capacity started coming to the floor. Between 1897, when it was the first drug that was registered with the FDA at that time until about 1950 it was the only antimicrobial around, really. And they used it for urinary tract infections.

They gave it to World War two pilots and soldiers that were in the Pacific Theater, which they had to use prophylactically. And when they were in the jungles in the Pacific, for example. These had treated things like trench foot and fungal infections, parasitic infections. And it treated it really well. The major side effect, as you were kind of alluding to RA is that it does die things blue and it also concentrates in your urine. You urinate blue or bluish color depending on how much you have. And they used to have all these World War Two songs about peeing blue and all these kinds of things as a result of the airmen and things having to take methylene blue all the time. In the 1950's when antimicrobials came around methylene blue became out of favor. However, it became a much more prominent use in the fish tank world, in fish tank cleaner or for treating fish tank or fish infections as you described it.

It was around that time also that a lot of studies were being done on methylene blue as it became the first antipsychotic, actually. The first antipsychotic drugs were derived from methylene blue, something called chlorpromazine which is a kind of like our old school antipsychotic that used to shoot people up with that were going through psychotic breaks. It was derived from methylene blue. And not only that they had actually included methylene blue in antipsychotic drugs after that because that is how they would be able to tell if the patients were taking their antipsychotics if they were actually peeing blue, they knew that they were taking their antipsychotic along with the compounded methylene blue with it together, basically. You had this antimicrobial capacity and then you had this antipsychotic capacity. And actually, a lot of drugs were derived from methylene blue that is still on the market today in the antipsychotic world. And as a result of its work in a particular capacity called an MRI inhibitor, it basically is called a monoamine oxidase inhibitor. So very mildly, it increases serotonin, dopamine, and norepinephrine in the synapse. It gives you a bit of a mood boost on its own. And then over the last several decades, this is when it is become very interesting to people in the performance world, in people in the health and wellness field, basically. Because what do we know? Methylene blue also has been used for a stain for many decades. Laboratory people, if everybody who has been in a laboratory before they probably use methylene blue at some point to stain. And what does it stain? It actually stains your mitochondria. And that is when things get really interesting when we realized that it was staining the mitochondria itself.

### **Ari Whitten, MS**

Okay. So what is the significance of that? Why is it being, I guess, a way of phrasing that to say it is staining the mitochondria is to say that it is bio-accumulated or concentrated by the mitochondria? And what is going on there?

## Scott Sherr, MD

The accumulation of methylene blue in the mitochondria is really where the magic happens. Because what methylene blue is doing is it is one of these compounds very unique in that, it helps you make more energy in your mitochondria which is the powerhouse, the energy production center of your cell. But at the same time, it actually increases antioxidant capacity. Now, most things that give us more energy, hyperbaric therapy being one of them, actually is going to create a lot more stress on the system, a lot more what we call reactive oxygen species because the more energy you make the more waste products or the byproducts of energy metabolism that you get and these are called reactive oxygen species, it is called oxidative stress, free radicals. These are all words that, Ari and your audience, and are very used to given your work. Okay.

But it is okay to have these in small amounts because our body has a natural ability to increase antioxidant reserve. And we have all these enzymes that get induced as a result of this additional oxidative stress. However, a significant amount of people these days that are already under a decent amount of oxidative stress because of mitochondrial dysfunction, because of inflammation, infection, post, infectious autoimmunity, etcetera. They do not have that ability to increase antioxidant reserves, and you kind of give them the ability to make more energy but then you have all this oxidative stress that the body can not tolerate and that is when they feel worse than they did before. And this is something that I found actually in the world of hyperbaric therapy when I started. If I was giving them a lot more oxygen, making them a lot more energy, but they could not detox well from it, they would be in a whole world of hurt basically in the end, and they would not see the benefits.

What methylene blue is able to do is not only increase the amount of energy you make it also increases your antioxidant reserve at the same time. And on the energy side of things which is super interesting and kind of nerdy but if you have mitochondria that are not working that well like you have four complexes on it that are called the electron transport chain. If the first two are not working that well you do not make energy well. Because that is how those first two complexes are taking electrons from your food and making things like NAD and FAD. Okay. But if those are not working that well you are not going to feel good. But methylene blue can actually bypass those first two complexes. If you are not making energy well from the food that you are eating because those complexes are not working that well you can bypass it with methylene blue, continue to make energy, or regenerate the energy-producing machinery even if those are not working that well at the same time.

## Ari Whitten, MS

How does that do that?

## Scott Sherr, MD

So it does that by donating electrons, it is something that the fourth complex in the mitochondria called cytochrome oxidase. And cytochrome oxidase is called complex four. And so

what methylene blue does is it induces genes that make more of that particular complex but it also just donates electrons directly to it.

The electron transport chain real quick is just an energy gradient. It is just a gradient that is created in your mitochondria so that you can make energy. And what you need for that to happen is what are called electrons. And these come from our food but they can come from molecules like methylene blue that donate electrons to electron transport chain, induce the gradient, and that allows you to make more energy. And that is how it is working. And interestingly enough, there are other things that also donate electrons to the complex four. One of the major things is actually red light, near-Infrared light does the same thing.

Photon energy, 660 nanometers well-described, well-researched also donates electrons to your electron transport chain via photons, via the electron transportation and cytochrome oxidase to complex four. This is why we can use them together. Actually, for many people where you can synergize the work of red light therapy, for example, and methylene blue together and see an enhanced effect. I mean, you can just go out in the sun and go surfing in Costa Rica or you could have a red light device, of course, that does 660 nanometers specifically.

**Ari Whitten, MS**

Or you could have both. Not saying I know anybody who does that.

**Scott Sherr, MD**

Not saying that I know anybody here that has that either. Although I do not have as much sun here in Colorado.

**Ari Whitten, MS**

You get the sun at altitude. You get less spectrum of UV up at altitude.

**Scott Sherr, MD**

Yeah, definitely. I am at 5000 feet. Actually from the longevity research which you probably know that there is a sweet spot around for 5000 feet. That is obviously why I moved here.

**Ari Whitten, MS**

Yeah, there are interesting anti-aging effects. I had to debate with Dr. Jack Crews about this many years ago because this is a bit of a digression. But he was railing against altitude, living in altitude is very harmful to health. And talking about the benefits of being at sea level. And I have no vested interest, no fight in this whatsoever, no bias. I live at sea level. I have no bias toward arguing about the health benefits of altitude. But I went and looked at the literature and I just found study after study after study showing that living at altitude was in fact protective of many different diseases. And Colorado, where you live, was associated with some of the longest lifespans of any state in the United States. Lowest rates of the status of different diseases.

## Scott Sherr, MD

Yeah. That does play into our topics a little bit here because we are talking about energy production on some level. If you have mild hypoxia, you are mildly at a higher altitude where we have less oxygen. Up here I have 16% oxygen here compared to sea level which is 21% oxygen. Over the long term, as the body has to recalibrate to the higher altitude there are some factors that likely play into longevity. But the challenge that actually I find is that and you know this as well, Ari. If you come to the altitude it is a big deal because if you initially come to altitude you do not have enough oxygen in the air, you do not have enough red blood cells to carry out the oxygen. You have all these things that are happening with something called your oxygen dissociation curve.

And interestingly, though, methylene blue might be one of those things that can help people because it helps continue the process of making energy even if there is not as much oxygen around which is pretty interesting. Because what happens here is that when we are increasing more energy what we are also doing is stimulating the whole system to say, now we need to make more energy so the mitochondria are working more. As a result of that you dilate blood vessels, you get more oxygen to that tissue and you actually increase something called nitric oxide to do that. And you are also enhancing glycolysis or basically the breakdown of our food, our glucose into the component parts to go into our mitochondria to help you make more energy. It seems to be an altitude remedy for many people.

We are also using it for jetlag for those that are flying for long distances and have low oxygen concentrations when they are flying. For example, we have some jet lag protocols that I have developed with Dr. Ted and others at our company that we really do see a significant benefit for people that are looking to just increase their energy production when there is not as much energy to be made because they are at high altitude, for example. On the other end of that on the antioxidant side of things is also super interesting because we know that it is actually radiation protection. We know that if you use methylene blue it is going to protect you from radiation. If you are at a higher altitude if you are on an airplane, for example, you are getting more radiation when you are up on in an airplane, for example, at 35,000 feet, of course. At the same time, we also know there is some protection in the skin if you use methylene blue even orally because it enhances the antioxidant capacity. It is maybe as strong as something like vitamin C and glutathione in some of the skin studies out there. And we are using it in that capacity as something that enhances antioxidant reserve. And like a lot of people.

## Ari Whitten, MS

Orally or topically.

## Scott Sherr, MD

Both. Actually both. There are companies that are using it topically and there are companies like myself, that are using it orally. And it seems to work. I mean, there are definitely some companies that are using it topically but the challenge as we have been discussing with methylene blue is it

is a stain. So it is going to stain. And getting it to a point where it does not stain your skin blue and you do not want to look like a smurf but it still can be effective. It is still kind of a question on my mind. The way I think about using it is usually more systemically and as giving the systemic optimization, the systemic bump for antioxidant reserves that way.

### **Ari Whitten, MS**

Okay. There is a subtlety of how you are speaking which I greatly appreciate. And it is very unusual to hear people speak with this nuance. And I want to delve into this more so people understand it. You are talking about increasing antioxidant reserve as distinct from a compound acting as a direct antioxidant.

### **Scott Sherr, MD**

Right.

### **Ari Whitten, MS**

This is a distinction that I find. I think one of the big health secrets that exists today. Very few people, including very few practitioners I found actually understand this well. There are many compounds which are framed as antioxidants which are not actually antioxidants which are actually pro-oxidants which have an indirect antioxidant effect. Many different phytochemicals, things like sulforaphane, for example. Fall into this category. People refer to it as an antioxidant but it is actually a pro-oxidant that interacts with our internal antioxidant defense systems in a way that helps build them up to a more robust state. Exercise is also in this way can be an indirect antioxidant by being a powerful oxidant, a powerful source of increasing these reactive oxygen species. It then builds up our internal antioxidant system more into a strengthened state. Conversely, there is quite a bit of concern. And I have spoken to some experts in the biochemistry of this of excessive use of true direct antioxidants as down-regulating, basically, having the opposite effect of exercise or sulforaphane or some of these other things, down-regulating the internal antioxidant defense system.

Let me summarize this. This simplistic narrative that most people in the general public and most practitioners subscribe to which is wrong is the basic idea that oxidants are bad, and antioxidants are good. And we have got to get rid of these bad guys and minimize them of oxidants. We got to antioxidants them as much as possible and suppress them and eliminate them and use as many antioxidants as possible. And that is reinforced, of course, through all the marketing within natural health, and companies that produce antioxidant supplements have indoctrinated the general public into that paradigm for many decades now. Everybody accepts it as true. And I would say 99% of even practitioners and functional medicine doctors still subscribe to that sort of basic paradigm. You are part of the exception to that rule in the way that you are describing things because you are aware of everything I just said and you know that there is actually an internal regulatory system of oxidants and antioxidants that our body intentionally produces plenty of oxidants which are not bad but actually serve many vital roles in our body and produces its own supply of antioxidants. And that these need to be regulated in the proper

balance to one another rather than just supplying lots of antioxidants to kill off the bad guys, the oxidants. The way you are talking about methylene blue is as something that increases antioxidant reserve but commonly online you will find people talking about it as a direct antioxidant.

## **Scott Sherr, MD**

Right. Yeah.

## **Ari Whitten, MS**

And let me add one more layer to this just to further complicate things which is that we also know that when it synergizes with red light at 660 nanometers, that this is often used to create an antimicrobial effect due to the production of free radicals. Let us delve into this story. What is the truth about methylene blue in regards to, is it an oxidant or an antioxidant? How is it functioning in human physiology?

## **Scott Sherr, MD**

I mean, that is wonderfully said, Ari. I would say that it is actually both which is that is the crazy thing about it. It can induce an antioxidant response because of creating more energy but it also, itself can carry or pick up free electrons which are what reactive oxygen species are, and get reduced. When methylene blue gets reduced, oxidized is usually free electrons. Reduces means you are grabbing these electrons, you are no longer as volatile basically. And not as oxidized. They are not oxidized, they are not volatile they are reduced. Oxidized, reduced, oxidized, reduced, that is all we are doing really in the mitochondria at all times. Okay. A methylene blue does it is it actually changes from being a blue pigment to being colorless when it changes, when it goes to a reduced form. And one of the things that we have been looking at is that you can actually titrate somebody's dose to how blue their urine is in some ways. And now this has not been studied yet but it works and it is been working with some of my practitioner colleagues that I have worked with the products that we have, is that the more stressed you are the more that you need to give of your mitochondria support. The less stressed you are the less you need. It is like I have a dose that I take regularly and then I have a dose that I take when I am traveling, it is often going to be higher because I am not sleeping as well, I am under radiation exposure. But I have protocols for all this stuff. But I can actually titrate my dose knowing that methylene blue can work in both capacities is what it comes down to. It can work as an energy enhancer. And it works as an antioxidant reserve piece where it can give you more antioxidant reserves.

If you are creating more oxidative stress which you are because of using more methylene blue, you are also able to neutralize that at the same time and that is the beauty of this compound. And that is why I call it an antioxidant reserve because if you do not need it, it is not going to give you more. It is only going to be there if you need it. And that is what is beautiful about it, it is a self-regulatory mechanism. And the thing about methylene blue too is, as we said, it concentrates in your mitochondria. And you have the most mitochondria in where, your brain, your heart, your liver, and your muscle tissue. And we are working with endurance athletes as well that are using



methylene blue. Because it is increasing their energy production capacity in their mitochondria in their muscle tissue. And also building up that antioxidant reserves. The hormetic stress still happens but you still have extra antioxidant reserves, so you can make gains faster. And that is another interesting way that you can see the cycle. There is very few other compounds that do this. and you made a good point, though, just to reiterate what you said, the very last piece there is that we are using higher dose methylene blue with red light, for example, as an antiviral, as an antibacterial, as an antimicrobial. That is usually greater than about one milligram per kilogram of body weight. Now, our dosing at my company, TrueScripts Prescription is much lower than that because we are really looking at allowing the body to use it as it needs to. In the sense of making more energy, increasing antioxidant reserve. But if you need to have more acute need for the energy production or the oxidation piece or the piece of trying to increase antioxidant reserve, then you want to go higher dosing and then think about for infections and for and even for ischemic events and things like that where there is some interesting studies as well.

## **Ari Whitten, MS**

Okay. I wanted to ask you about dosing. But a couple of things before we get there. One is I actually did a bit of a dive into the literature recently to find if there is any studies on methylene blue use in the context of athletic performance. It is funny that you just brought that up. I found almost nothing, almost no research that exists on that topic which is surprising for a compound that is existed for so many decades and that acts on these mitochondrial pathways. It seems very odd to me that no one has thought to study it in the context of exercise performance. What have you found in your experimentation with athletes on that?

## **Scott Sherr, MD**

Yeah, I mean, it is been surprising to us too. Just knowing what we know about how this particular compound works. And I think one of the challenges with methylene blue is that it is been around for such a long time that it is forgotten about because it is not the new sexy drug on the block that everybody's looking at, it is off-patent. It is not like a pharmaceutical company can take methylene blue, put their label on it, and charge a million dollars for it. Now, there are companies, though, that are looking at methylene blue and derivatives of it. We discussed this for antipsychotics. They are using this now for Alzheimer's disease. There is a new study. I think it is in it stage three trials where they are looking at 16 milligrams of methylene blue or a compound very similar to it in Alzheimer's trials. They are using it and trying to change it in various ways for Alzheimer's, for cancer because that is what drug companies do.

## **Ari Whitten, MS**

So they can patent it.

## **Scott Sherr, MD**

So they can patent it and they can charge exorbitant amounts of money to make their margins and everything else. The challenge of methylene blue is that it is been around such a long time. And the resurgence of interest has only happened in the last couple of decades. And there was a

researcher down in Austin. His name is Francisco Gonzalez Lima and he has published many studies on methylene blue in cognitive models of Alzheimer's, basically. And he is got some really interesting work that he is done. And he is also done some studies on red light exposure along with methylene blue at low doses for cognitive enhancement. There is many studies that have looked at methylene blue for infection over the years but you do not have a lot in the performance world but what I can tell you is that we have been working with athletes, I have been working with them specifically on my end, their endurance times go to go up and their recovery times go up too. And you can use it in different ways. You can use methylene blue as something you take before you do something as an endurance enhancer. But if you decide to use it afterwards, it also can help with the after the hormetic stress of the actual activity. Then you use methylene blue as a way to help recover faster so that you can do more work the following day. And not to mention as we talked about earlier it is also an MRI inhibitor. It increases these neurotransmitters a little bit, they are dopamine, serotonin, and norepinephrine so you feel better when you are doing your exercise.

I have a couple of clients that refuse to work out without it because they just feel so much better when they are doing it and they can keep their heart rate more elevated while they are doing it. This is anybody from my athletes that are marathon runners to my moms that are on their treadmills when their kids go to school. I mean, and everything in between but and this is not only just for well people. I think that is really important, too. We are working with a lot of patients, I am working with a lot of patients. And a lot of our practitioners that are using our products for people with chronic inflammation, with autoimmunity, with everything that goes around those kinds of diagnoses like fibromyalgia and chronic fatigue and all the things that you specialize in Ari. Because if you are giving mitochondrial support everything becomes easier, especially at the lower doses of the scale of using methylene blue is what we found.

### **Ari Whitten, MS**

Very interesting. And linking things back up with the earlier conversation about acting as a direct antioxidant or not that is also relevant to combining it with exercise. Because we know that the use of direct antioxidants in tandem with exercise often actually inhibits many of the beneficial effects of exercise. That is a concern I always had with methylene blue if it is acting as a direct antioxidant then maybe it is actually inhibiting the benefits of exercise if you take it too close to that.

### **Scott Sherr, MD**

Yeah. I mean, we have been looking at that. I think a lot of it depends on the dose as well. Because the higher the dose the more antioxidant reserves you are going to create in the system. Lower dose, and so I use this in the hyperbaric context as well thinking about, "Well, do we want to give too many antioxidants right away if you are going to do a hormetic stressor?" A lot of it depends on the person. If you have somebody that has chronic inflammation, autoimmunity, fibromyalgia, or chronic fatigue, they are already under stress and they want to

get, go do exercise. That is going to make it worse for a lot of these patients. You have had this experience many times over as I have as well, hyperbaric or not.

And so if you can give them a little bit of antioxidant, a little bit of energy production, a little bit of antioxidant exposure at a time, they tend to do better and then they can do more work and then they can continue on that progress. And that is what I typically do. It really is focused on the individual, on the person that you are looking at and working with and saying, okay, this person is under a lot of oxidative stress already let us give them a little bit of methylene blue ahead of time. As opposed to your elite athlete you may think that they are not under a lot of oxidative stress but they are because most of these people are overtraining, they are not sleeping as well as they need to. And they are usually under more oxidative stress than you actually can realize. And some of my most highly inflamed people that I work with are elite athletes, actually, that are just about to fall off that cliff. I am sure you know exactly what I am talking about.

### **Ari Whitten, MS**

Yeah. Let us talk about dosing briefly. Because many years ago when I first started not playing with methylene blue for my fish tank but playing with methylene blue for myself. The common recommendations that were out there were to use doses that were, I forget the exact numbers, but very small doses in the neighborhood of like one, two, three, maybe four or five milligrams per day and it was like point one milligram per kilogram. And I kind of accepted that as fact or as based on good science and then I decided at some point to delve into the research and start looking at some of the studies myself. And I started finding these animal studies with vastly higher dosages. I mean, talking about one, maybe in animals it is like four or five milligrams per kilogram, something like that. And then in humans, there were many human studies where they were using one or I want to say roughly one maybe on average one milligram per kilogram per body weight. And here I was experimenting with two, or three, or four, or five milligrams, thinking that I was like taking a big dose. I remember taking four drops or five drops, thinking, wow, this is a really big dose. And then I found these studies saying that there were 10 and 20 times higher dosages that are being used in the studies on depression or in the studies on various diseases where these methylene blue have been studied. Then I started experimenting with a bit higher doses. But I am curious about what you guys have settled on as far as ideal dosing parameters.

### **Scott Sherr, MD**

Yeah, a lot of it depends on what you are using it for as you were kind of alluding to in the sense of we have higher dosing which is typically on the average of that greater than one milligram per kilogram body weight in the anti-viral acute ischemic kind of world. Those doses can be very effective but you do not want to take them for long periods of time because they do have potential side effects. I mean, the major side effects would be. So we are using that higher dose for things like infection, for example, or gut biofilms. Bartonella is one of the more common co-infections in Lyme. It is being used more commonly. Methylene blue is as a synergistic tool but it is affecting gut biofilms. At higher doses, you are going to start killing off things that you

do not want to kill in your gut is what we think. There is also a higher risk of gastric ulceration and higher doses of oral forms. And in addition, the other thing you have to think about is the half-life of methylene blue. Methylene blue half-life is about, which it means how much of the drug is going to be about half the potency in a certain amount of time, is about four to six hours. If you are taking a very high dose like a hundred milligrams a day which some people are which I do not recommend that is going to build up in the system over time and that is going to cause pure oxidation at some points. You are not going to get any of the benefits you are just going to get all that. I mean, although oxidation is not necessarily a detriment but if it is over oxidized it can cause a significant downregulation or just dysregulation of the system.

So one milligram per kilogram is where a lot of that work has been done. But we have a lot of the new work is being done is at lower dosing for more mitochondrial optimization, for brain optimization, nootropic function, so brain optimization function. When we were creating dosing we wanted to create a dose that was more in line with the nootropic capacity of methylene blue. And because we knew that if that was the case that was very likely going to be the sweet spot for what we have been describing before which is this electron cycling capacity, energy production, antioxidant reserves. I call it energy and resilience. It gives you energy and resilience at the same time. And that is what I was alluding to in some of the studies earlier on the 16-milligram dosing. And that is when we decided to create a troche, which is a dissolvable lozenge that goes between your upper cheek and gums and dissolves there or you can swallow actually if it is just pure methylene blue itself. Pure methylene blue is so highly bioavailable. We made these troches or our company because troche is a really great delivery device to create a direct vascular diffusion into your brain, basically from up in your cheek and it is highly vascular in here. It works faster if you do it that way but you can still swallow them as well.

The other reason is actually in some of the other products that we have, some of the ingredients are not as highly bioavailable which means that they will get digested by the system, by the liver, and make them less active or deactivate them. If you dissolve it in your mouth it does not happen. We have two products that have a combination of things that are better dissolved in the mouth for that reason. But methylene blue in a troche form is, whether you swallow it or whether you dissolve it in your mouth it is going to get all in your system because methylene blue is one of those other interesting molecules, very few like this that are very highly bioavailable no matter if you swallow it, if you get an IV. It is almost the same which is very unusual. Most things that you get orally, if you take orally like NSAID or cysteine, for example, is only about 10% bioavailable which means that 90% of it gets deactivated by your liver. But if you take an IV NSAID it is 100% bioavailable. I do not recommend that but just as an example for people. But anyway, we used the 16-milligram dosage because of what was being studied in Alzheimer's disease. And our troches are very easy to dose instead of the drops which are very difficult to direct to dose, as you probably remember and they are very, very messy. You can take our troches and cut them into quarters, into halves and fours or take a full troche. And I have been surprised. I mean, some people will get massive effect with just a four mg square of our full troche. And I think it depends on their mitochondrial optimization status and also what they

need in the sense that. Sometimes you just want to get a little bit of support when people are really sick as well, you do not want to give a whole lot because it is going to cause more dysregulation potentially as well. That is how we got to our dosing which is very low dose. It is lessened point five milligrams per kilogram. But there are reasons to use higher dosings as I described.

## **Ari Whitten, MS**

Okay. Lower dosing is you are going to see more of the mitochondrial-enhancing, brain-enhancing effects.

## **Scott Sherr, MD**

Right. And synergy with red light as well in that capacity but if you want to go higher dose like higher methylene blue. In the kind of COVID world, post-COVID world we were using a lot of these things even though we were not supposed to and we were helping a lot of people in combination with red light and high dose methylene blue and hydro adaption therapy and all these kind of things that we could not talk about or else we would all get sued or fired or whatever. That is why you live in Costa Rica, nobody can touch you now. Anyway, for me, this is all a big deal as a clinician. But we do know that lower doses of methylene blue with red light is a fantastic mitochondrial optimization synergizing thing.

## **Ari Whitten, MS**

Okay. Let us talk more about that piece. Why? Why is it synergistic? Because what I have seen there is plenty of research on the fact that there is some kind of interesting synergy between methylene blue and red light specifically at 660 nanometers.

## **Scott Sherr, MD**

Right.

## **Ari Whitten, MS**

And typically what we find research on is the production of singlet oxygen, free radicals, basically. That end up being selectively toxic to for example, viruses. And there is even research on this in the context of COVID and using in blood transfusions. Taking the blood and putting methylene blue in it, you are irradiating it with red light and it killing the COVID, SARS-CoV-2 virus among many, many, many other studies.

## **Scott Sherr, MD**

Right. And other viruses too.

## **Ari Whitten, MS**

And also in photodynamic therapy in the context of cancer being selectively toxic to cancer cells. So there is this, again, methylene blue, red light synergy production of free radicals, toxicity to these harmful things, viruses, cancer cells, and so on. But the way that I am hearing a lot of

people talk about it now is that there is this allusion to a magical synergy. The red light activates the methylene blue and makes it better, makes it more effective at boosting your brain function or your energy levels, and so on which I am open to the idea that is true. I just do not know the scientific mechanisms that underlie that. Is it a hormetic effect from the production free radicals or what is going on there?

### **Scott Sherr, MD**

It is simply a synergistic effect in the sense that they are both working on the same complex in the mitochondria that is all we know. In the sense that, if you have energy coming and being produced because you have more red light you are going to get more energy produced also because you have methylene blue around at the same time. That is all the research that we have thus far, at least on low doses. And that is why we think people will subjectively feel better when they are using them in combination. I do not think that the oxidative load piece is really playing a huge part in this at the lower doses of methylene blue. In fact, it might be that because we are using it at low doses, we are kind of we are neutralizing some of that oxidative stress that is happening in a very, almost equal kind of term in the sense that you do not have a lot of stress that is happening because you do not have as much methylene blue around or as high of intensity red light or photodynamic therapy. Now, if you had it at a higher intensity photodynamic therapy, red light, or your higher dose methylene blue that is when you are going to create more of these singlet oxygen as you are describing. And that is how it is being used in things like cancer and infection. I think that is the difference is that lower dose you have enough capacity either on your own right because of your antioxidant reserve along with methylene blue to protect you from stress from that system, from that synergistic effect, I think.

### **Ari Whitten, MS**

Got it. When it comes to the brain side of this and the altering of levels of neurotransmitters like dopamine and serotonin in the brain and MAO inhibition. Do you see any potential consequence for long-term use? For example, the chronic use of caffeine, the most widely used drug in existence absolutely has massive negative effects on neurotransmitters and systems in the brain with chronic use, with short-term use, acute use, or intermittent use it works wonderful to create those short-lived effects but when you use it, especially multiple times a day every day you really disrupt the adenosine system in the brain in a way that where it becomes dysregulated and you have side effects. Most people are, of course, unaware of what those side effects are. But for people listening, it lowers your baseline levels of energy and mood, and cognitive function and makes you dependent on the caffeine in order to function normally.

### **Scott Sherr, MD**

It screws your hormones up over time and things like that too.

### **Ari Whitten, MS**

Yeah. Do you see any issue like that occurring with methylene blue?

## Scott Sherr, MD

Well, a couple of things come up. I think the first thing that I like to describe is something that we call at our company health optimization nootropics versus performance optimization nootropics. Dr. Ted, who you know is the founder of the Troscritptions Company. Dr. Ted Achacoso, a very smart guy by using methylene blue nicotine, caffeine, all these other kinds of ingredients that we use in our products for various reasons and multiple years before they were cool kind of thing. And what we realized, though, is that the definition of nootropic is really focused on the performance side. People think of nootropics as something that is going to help make them perform better. But what they do not think about is, is it something that is healthy for the brain or is it something that is going to clock your brain over time? A good example of a performance optimization nootropic, you just nailed, it is caffeine.

Caffeine enhances the production or the release of a number of neurotransmitters. It plays with the adenosine receptors and the adenosine pathways. And it does all these kinds of things to the brain and hormonal systems as well. In the short-term, it can help you make more energy, make you feel more awake and alert but over the long-term, it can clock the system and make things just regulate. Same goes with another product that we use in one of our products called Blue Cannatine. We use nicotine in that one. And we use nicotine and caffeine along with CBD and methylene blue and something called Blue Cannatine that helps with focus concentration, it is your Adderall equivalent basically without the jitters. And it is fantastic for three to five hours.

But is it something you want to use all the time? The answer is no because it has these performance-optimizing nootropics in there like nicotine and caffeine that are great for short-term benefits or maybe even some long-term benefits. But over the long term, it can still be an issue. Now, the thing about methylene blue is it actually has both capacities. As we were describing before, I just now actually with neurotransmitter release, this is what I would put into the category of performance optimizing because it is increasing serotonin, dopamine, and norepinephrine in your synapse. It is increasing your energy production systems as a result of that but at the same time, it is increasing energy production in your mitochondria directly as we described in detail already. And it is also increasing antioxidant reserve.

It is not necessarily just a performance optimization nootropic but it is also got health optimizing capacity as well. It is protecting the system at the same time it is helping make more energy. This goes along with its use in our blue canteen, for example. We use methylene blue in there because it is got both capacities. And we use CBD in there too because CBD as well has what we would call a health optimization nootropic capacity. It is increasing the production or the circulating numbers or the amount of something called anandamide which is a neurotransmitter that is responsible for bliss and for decreasing inflammation, etc. What it comes down to is that we think that methylene blue is protecting itself from itself, basically because it is got this ability to cycle, to increase antioxidant reserve. I do not see it as an issue over the long term. Now, of course, you want to measure what people need over time. And I am not saying that everybody's taking methylene blue for the rest of their life either. I think that it is

something that could be great as something that people use regularly for health optimization. But I also think it is really helpful when people have a lot of inflammation, a lot of antioxidant need and they have a lot of, they have brain fog, they are dealing with long COVID symptoms, they are having lots of inflammation. And it can be used in low doses to help support the system while you are doing the harder work of helping, optimize the system over the long-term.

## **Ari Whitten, MS**

Very well said. Is there any aspect of this that you think we have not touched on that is important for people to hear?

## **Scott Sherr, MD**

Yeah. We talked a little bit about contraindications but not a lot. When it comes to methylene blue it is a very safe compound. It is been around since 1897. The FDA put its stamp on it. It is now grandfathered in and you can get it over the counter, you can get it by prescription as well, and still possible to use.

## **Ari Whitten, MS**

Does not it have some distinction as the first store, one of the first prescription drugs ever something like that.

## **Scott Sherr, MD**

The first, yes. The first drug that was registered with the FDA. The first prescription drug. Yeah, absolutely. And now it is used in hospitals and used in clinical practice all the time. It is still on the World Health Organization's list of essential medications, actually. And this is for cyanide poisoning which hopefully nobody will get, that is listening, but also carbon monoxide poisoning. If you do not have a lot of oxygen around, you do not have a hyperbaric chamber around, this is a very significant remedy for that because it helps oxygen bind to the hemoglobin molecule and red blood cells better as opposed to if you did not have methylene blue around. It is been around a long time. It is very safe. But there are certain populations that should not take methylene blue. And the major ones are if you are pregnant or breastfeeding.

There are some studies that if you are pregnant and taking methylene blue it could be a teratogen, it can cause deformities in fetus, do not take it. In breastfeeding is a little more iffy but probably not. And then also there have been studies that looked at high-dose methylene blue and high-dose SSRIs or drugs that block serotonin reuptake whether the SSRIs or some of the newer drugs that are combination drugs. And that potentially has a theoretical risk of something called serotonin syndrome and that is when you get too much serotonin in your synapse and basically can cause a dysregulation of everything and people can die from that. But there is only been one reported that in the literature and it was very high dose of methylene blue, something like 40 milligrams per kilogram or something ridiculous like that, very high. But as a company, we say that you really need to think about if you are taking an SSRI drug we really need to talk to your practitioner before you think about adding it to your regimen. I mean, there are some



ongoing studies now using methylene blue as an antidepressant itself. Now, again, it is a derivative of methylene blue because nobody can patent methylene blue itself but it is being used in studies with depression and bipolar disorder and other mental health issues because we know it has this capacity. That is the major thing to be thinking about is that. And then the other thing is a very high dose methylene blue. If you have a genetic inherited genetic disorder called G6PD deficiency which is rare but not terribly rare if you live in the Mediterranean area, North Africa, Mediterranean, Greece, Italy, etc., very high dose of methylene blue can cause your red blood cells to start breaking, now, very rare. Again, in our dosing, not an issue but if you are thinking about using a higher dose, a greater than one mg per kilogram, it is something to consider before you would start a regimen of a very high dose, at least for.

**Ari Whitten, MS**

If somebody had G6PD.

**Scott Sherr, MD**

Yes. G6PD. Yeah. If you had that you want to make sure you got tested for that.

**Ari Whitten, MS**

People would know if they have that presumably most likely.

**Scott Sherr, MD**

They may not, no. That is the thing, they may not. This is not something that may cause an issue. In most people, actually, it does not unless they get very sick for another reason. And if you are thinking about taking high-dose methylene blue for a long period of time I would get that tested. Yes. It is like if you are going to take a high dose IV vitamin C, it is the same thing, people will get checked for G6PD deficiency before you take IV vitamin C at high doses for that same reason. But again in general very safe across multiple. It is still used in Africa. Now it is coming back as a treatment for malaria actually because a lot of the drugs that we now use or have been using are now resistant against or the malaria is resistant against the drugs itself. It is coming back for that reason.

**Ari Whitten, MS**

And Dr. Sherr, there is one thing that I want to make sure we communicate adequately and that is simply the subjective benefits of using this. What kinds of things are people using this for and what kinds of results are people seeing as a result of using methylene blue?

**Scott Sherr, MD**

Yeah. Thanks, Ari. I think that is really important. What I said as we were discussing is really the key and that is just two words, energy, and resilience. People feel more energy and they feel more resilient to day-to-day stressors, operations, whatever it be. And within that, I have been working, I am the head of all the practitioners that use our products at our company. And I work with other practitioners that will take our products and use them with their patients. And I have

been amazed at some of the things that I have heard honestly. I mean, sometimes it is symptoms that have been going on for six or eight months from long haul kinds of COVID things with brain fog fatigue and they take methylene blue, and a couple of days their symptoms are gone, are vastly reduced. I have had people with. What it comes down to is that when we are increasing energy production, what are you going to see as a result of that? You are going to see people's focus get better, their concentration get better, their brain fog get better, their energy overall get better, and they feel better in these capacities.

But outside of that, I have had people with joint pain go away. I have had people with blood pressure problems see significant improvements. That is often if there is an inflammatory component to a lot of these things. And then I have had people also talking about endurance and their athletic activity is getting better, their recovery scores getting better. Oftentimes people are using methylene blue in the mornings because it gives them more energy but in some people, actually, they are using it before they go to bed because it helps them sleep better. Because sleep is not a time when we are just kind of relaxing and our brains are very highly metabolic, especially during REM sleep. Their REM goes up and their recovery gets better as a result of it.

I think in essence, the way I think about methylene blue with the work that I do in clinical practice is do my patients need more energy or resilience? The answer is yes. And the question just becomes, when is methylene blue something that I could consider using, is it something I should use now, or should we look at optimizing mitochondrial function a little bit beforehand? But oftentimes it is whether I am using it before or after a certain technology which is hyperbaric oxygen therapy. Am I using methylene blue before, I am using it after, and how am I using it? Because almost everybody, I feel like we can see that a part of why they do not feel as well as they want to feel is because their mitochondria are not working as well as they want them to work or as they used to work when they were 20 or 30 years of age.

And this is when I think about using in the context of optimizing your health, not just taking a simple pill or a compound or a troche in our case is going to make you feel better for the rest of your life. It really is the context of the nonprofit organization that we have that we donate money to at Tropcriptions at my company is called Health Optimization Medicine in practice. This was developed by the same people that developed my company, our company. This is founded also by Dr. Ted Achacoso, who we are talking about before.

But the idea is that we are looking to help people through a journey of optimizing their health rather than just treating a disease, looking at foundational biomarkers via vitamins, minerals, nutrients, neurotransmitters, and gut health hormones and then creating a health optimization plan for patients or clients that creates all of these things in a very holistic way. And then that is when it is best to use things like methylene blue because then you can help support the system while you are doing the hard work of shifting vitamin-mineral and nutrient hormone networks and things like that. The context is key. I do not think I have a magic blue pill for everybody, blue

troche in my capacity here because of our company but I do think it could be added to regimens, especially when somebody is on that path to optimizing their health.

**Ari Whitten, MS**

Dr. Sherr. This has been a pleasure. Brilliant stuff. Thank you so much for coming on and sharing your expertise with our audience. And the last thing is where can people learn more about your products?

**Scott Sherr, MD**

Yes. Thank you, Ari. This has been great. I really appreciate the time and your interest in something since you were 12, methylene blue and very cool. You can find more about my company at Troscriptions the word prescription and TRO in the opposite capacity. Tro abd Prescription combined into the word Troscriptions And we are on Instagram where you can find us on our website troscriptions.com. There also be an available book, e-book for you for this summit that you will be able to download that gives you more information on methylene blue as well that I wrote a while back. That really gives a good rundown of what we discussed today in more detail. Those are the places.

**Ari Whitten, MS**

Beautiful. Thank you so much, my friend. Great catching up with you. I look forward to our next conversation.

**Scott Sherr, MD**

Likewise. Ari. Thank you so much.