



MIGRAINE WORLD SUMMIT

INTERVIEWS WITH WORLD LEADING EXPERTS

# TRANSCRIPT



**CBD OIL FOR MIGRAINE**

**STEPHEN SILBERSTEIN, MD**



**Introduction (00:04):** I think the crucial issue is the fact that the body makes its own marijuana. Think about it. Why does a drug work? It only works if there are parts of the brain to which it interacts, and then the body makes endogenous chemicals called anandamide and 2-AG. And there are receptors in the body for anandamide and for 2-AG. THC (tetrahydrocannabinol) goes to the same receptor as anandamide; the CBD (cannabidiol) doesn't. And what's interesting is the fact it probably is involved in receptors throughout the body that are involved in inflammation. So it's not really part of the endogenous system.

**Kellie Pokrifka (00:53):** It seems like CBD is now everywhere: in makeup, coffee, and dog treats. It's being called a cure-all for just about every medical condition. How much of this is hype versus reality? Are there legitimate health benefits to CBD? If so, how can this help with migraine? The number of CBD products has also grown rapidly to service the dramatic increase in use. How do we know which products are safe and effective? To help answer these questions and more is Dr. Stephen Silberstein. Dr. Stephen Silberstein is the former president of the American Headache Society and has since been honored with their lifetime achievement award. He's the current director of headache medicine at Jefferson in Philadelphia. He has published over 300 articles and he lectures around the world on neurology and headache medicine. Dr. Silberstein, welcome back to the Migraine World Summit.

**Dr. Silberstein (01:37):** Thank you so much for having me. It's my pleasure to be here.

**Kellie Pokrifka (01:41):** So what is CBD and is it the same as medical cannabis or marijuana?

**Dr. Silberstein (01:45):** OK, let's start at the very beginning. Marijuana is a plant that contains tons of different chemicals, and this is crucial. The things that most people know about are CBD and THC, which are chemicals. What people forget: that in addition to that there are other chemicals in marijuana that are just as important. Let me give you an example. The odor of marijuana is related to these terpenes. What's a terpene? You smell a lemon: what gives it the lemon odor is a terpene; a violet. So the fundamental issue is the fact that people take these two chemicals out of context and forget everything else that's in the marijuana plant. So, for example, if somebody were making a cocktail, and they left one of the ingredients out, would it taste the same? No. So it's the difference between just having one component and together. And this is synergy. Where more of them together act better than one alone. Now, over the years, the people that cultivate marijuana have made different strains. One strain of marijuana is not the same as the other. So, for example, one tomato doesn't look or taste like another tomato, and those strains which have had reduced amounts of THC are called hemp. The extract of that is called hemp oil, which is CBD. So CBD is just one of the hundreds of components found in marijuana.

**Kellie Pokrifka (03:28):** So, can CBD be derived from both hemp and marijuana?

**Dr. Silberstein (03:32):** The difference between ... OK, here's the easiest way to look at it. This is the plant. If you make a variety of the plant that has low THC, the same plant is called hemp. If you increase the THC content, the same plant is given a different name. That's part of the problem with the nomenclature. It's the same plant, but depending on the concentration of one of the components of the plant, the name changes.

**Kellie Pokrifka (04:01):** And that will determine the legality?



**Dr. Silberstein (04:02):** That is correct. A certain amount of THC makes it no longer hemp, but marijuana; and according to the federal government, it's illegal.

**Kellie Pokrifka (04:14):** And can the body tell the difference between CBD derived from hemp and CBD derived from marijuana?

**Dr. Silberstein (04:19):** The difference between CBD derived from hemp and CBD derived from marijuana depends on how it's purified. So if you have a marijuana plant which has lots of THC in it and you don't purify it, you're going to get some THC. The hemp plant has less THC so you're less likely to be contaminated. But that's not because THC, excuse me ... not because CBD is different, but because of the fact it's how purified it is.

**Kellie Pokrifka (04:47):** Let's talk about the health benefits of CBD.

**Dr. Silberstein (04:52):** It is quite clear now that CBD has proven to be safe and effective for the treatment of certain types of epilepsy, including Dravet syndrome. End of discussion for epilepsy.

**Dr. Silberstein (05:05):** The fundamental problem is, when you go online to buy CBD, you never know what you're getting. I think Consumer Reports had an article about the contaminants that you get in over-the-counter and nutraceutical products. So what do you know that you're getting? I mean it could be olive oil, it could be anything; there is no control of what you're getting. The reason I mention that is ... CBD for epilepsy is quite expensive. Why wouldn't people just buy a CBD oil online and use it? Because you don't know what you're getting. You don't know what the contaminants are.

**Dr. Silberstein (05:47):** My bias is the following — I have little problems with people using CBD creams and oils because it's not getting deep into your body. And in fact, there was an interesting article in the New York Times about a year or so ago, where they're talking about the models on the runway applying CBD before they put their shoes on to give them relief. So I think there's good suggestions that CBD is anti-inflammatory, that CBD is good for epilepsy. My major concern is not CBD, but how safe and pure it is.

**Kellie Pokrifka (06:28):** So, you said that it's been FDA approved for certain types of epilepsy.

**Dr. Silberstein (06:31):** Correct.

**Kellie Pokrifka (06:31):** Is there any connection between epilepsy and migraine and how that might be connected?

**Dr. Silberstein (06:38):** It is known that people with epilepsy have more migraine and people with migraine have more epilepsy. And some people believe in the fact of the migraine brain is overactive in a different way. And in fact there are many drugs called anticonvulsants or anti-epileptic drugs like divalproex acid and topiramate that are used to treat both migraine disease and epilepsy. So, we know that there are drugs that are used to treat both disorders, that are effective.

**Kellie Pokrifka (07:07):** In 2017, the World Health Organization issued a statement saying that CBD does not pose a risk for abuse, dependence or health issues. With that being said, can we discuss the side effects or health risks?



**Dr. Silberstein (07:18):** The issue, to me, with CBD is not CBD but the contaminants. It appears to me that CBD, if adequately purified, has little or no health risks. The issue to me is: Are there contaminants that will prove a risk? And the problem I have with most of the over-the-counter products is we don't know if there are contaminants. They're not regulated and they're not analyzed. That, to me, is the problem with CBD.

**Kellie Pokrifka (07:50):** When CBD is used for migraine is it typically acute or preventive?

**Dr. Silberstein (07:54):** In general ... it depends on the route of administration. Some people might take it quickly and get the benefit, and some people might take it orally and slowly, and some people use it for one or the other. Unlike THC, CBD does not show up in the drug tests, and it's not sedating, and it doesn't produce psychological side effects. Basically, it's an anti-inflammatory.

**Kellie Pokrifka (08:23):** So CBD seems to be advertised for just about everything. I really want to get down to what exactly does it do to the body and how can this help in migraine.

**Dr. Silberstein (08:31):** The ... let me go back to the body itself. I think the crucial issue is the fact that the body makes its own marijuana. Think about it. Why does a drug work? It only works if there are parts of the brain to which it interacts, and then the body makes endogenous chemicals called anandamide and 2-AG. And there are receptors in the body for anandamide and for 2-AG. THC (tetrahydrocannabinol) goes to the same receptor as anandamide; the CBD (cannabidiol) doesn't. And what's interesting is the fact it probably is involved in receptors throughout the body that are involved in inflammation. So it's not really part of the endogenous system.

**Dr. Silberstein (09:25):** Another interesting point. What do you think the most common receptor in the brain is? It's the receptor for marijuana. Why? Because of what it does in the body. It acts as a brake to keep things from being overactive. You have stuff pouring out of a synapse. The body says, "God, too much is coming out!" It sends one of the body's own marijuanas, 2-AG, back to turn it off. It actually is a damper. It's like when you're riding on a bike and it's bumping, you put a brake or something on your bike to keep it from getting it. That's what the body does, and when you give somebody marijuana, or THC, it overloads the system. And that's why it can produce problems. And the most dangerous thing is not marijuana, but the so called "artificial marijuana" like Spice, which is so potent that it destroys, interacts with the body's own receptors. Sometimes marijuana is spiked with these products and it can be quite dangerous.

**Kellie Pokrifka (10:27):** You were talking about inflammation. Is neuro-inflammation found in everyone experiencing regular migraine attacks?

**Dr. Silberstein (10:35):** The biggest and hottest subject today in biology is neuro-inflammation, and we're getting to the concept that part of the process of migraine, when all these things are going on, there is inflammation. Now, think about it. There are cells that support nerves. These cells are called glial cells and many people now believe these glial cells secrete chemicals that aggravate, and itch, and terrify the nervous system. And there are drugs that calm that down and act to smooth it down.

**Dr. Silberstein (11:15):** So, many people believe that the endocannabinoid system is involved in quieting things down. I think most of us now believe that marijuana works that



way in migraine and that migraine itself may be, in part, a neuro-inflammatory disorder. Think about it. If you get punched in your arm, you get this reaction. These chemicals are coming out to restore. That's a neuro-inflammatory disorder. People think the same things may be happening in parts of the nervous system, and the brain, and its lining, as part of it. When it's good, it brings repair. When it's bad, it gets out of control.

**Kellie Pokrifka (12:01):** So clinical endocannabinoid deficiencies have been found in people with enhanced pain responses. Would this include migraine?

**Dr. Silberstein (12:09):** I don't know the data for migraine per se, but there is evidence that the defective system ... if you don't have your own pain control system, you don't have good pain control. That is correct.

**Kellie Pokrifka (12:21):** Could that imply that something like CBD could be used as a sort of supplement?

**Dr. Silberstein (12:25):** No, because the thing you need to know about CBD is does not interact with the cannabinoid receptors. It's an entirely different mechanism.

**Dr. Silberstein (12:34):** But think about this. If you were to develop something that actually enhanced the body's own marijuana by stopping the metabolism of our own endocannabinoids, wouldn't that be amazing? And they're drugs that are now being developed, which block the metabolism of the body's own endocannabinoids to enhance it. Think about that. It's like an antidepressant. The SSRI (selective serotonin reuptake inhibitor) enhances the effect of serotonin in the brain. These drugs enhance it.

**Dr. Silberstein (13:13):** The other very interesting thing about this is the following — the endocannabinoids, in part, are precursors for the prostaglandins, which are the things that the nonsteroidals tackle. So if you actually block the destruction of the endocannabinoids, that in itself will turn off inflammation because you don't make enough of these pain drugs. The body's own pain drugs are the prostaglandins.

**Dr. Silberstein (13:43):** It's really beginning to come together. It's not like marijuana is something horrible and bad. It takes advantage of the body's own system, and like everything else, too much of a good thing is bad. The famous statement of Paracelsus is "the difference between a drug and a poison is the dose." And I tell my patients, "Would you take a drug that if I gave you too much of your brain would swell and you would die?" And they would say, "No." And then I tell them what it is — "Water" — and that's the crucial issue. It's you don't want to get the body out of whack.

**Kellie Pokrifka (14:20):** So dosing is obviously very individualized, but when someone's starting off, they really have no idea where to go. What would be a good dosage to start on?

**Dr. Silberstein (14:29):** I think the problem we have is there are no good studies. You can look at the data, for example, for epilepsy, and do the equivalent. But CBD, really, it's not toxic unless there are contaminants. So we don't really have to worry. I would suggest if you wanted to try it, you have to be your own body's guardian. Try a little bit and more, and that's the best way to do it.

**Kellie Pokrifka (14:53):** Why don't we have any good studies on this?



**Dr. Silberstein (14:58):** In the United States, it's still illegal to study marijuana. Let me tell you an interesting story. Close to 50 years ago, I was with the National Institutes of Health. We had a refrigerator full of legal pot, which was grown by the government, in Mississippi. And we actually were the first people to study what happens to THC in the body of people when you give it. And what happens when you take pot. The problem is that what people had to do research on, it's a bad variety.

**Dr. Silberstein (15:34):** You need to remember that there are multiple different varieties of marijuana. And while it may be legal in states, it's still a federal offense, and it's very difficult to get approval, and to do the studies that are necessary to show whether a drug works or not. And think about it. You have strain A, which has a lot of THC; strain B, which has as much, but it has more lemon flavor or more violet flavor. They're all different. And if you don't know the composition of the marijuana you're getting, it gives you no idea what you're getting. So I think the problem is the fact the plant is extraordinarily complex and the federal government, in their infinite wisdom, would rather ban something than find out about it.

**Kellie Pokrifka (16:22):** OK. So to reiterate, THC can affect the endocannabinoid system.

**Dr. Silberstein (16:26):** Correct.

**Kellie Pokrifka (16:26):** But CBD has no effect.

**Dr. Silberstein (16:28):** That is correct.

**Kellie Pokrifka (16:29):** Interesting. And how would the endocannabinoid system affect the trigeminal system? And what does that have to do with migraine?

**Dr. Silberstein (16:36):** It is believed that the pain of migraine intimately involves an activation of the trigeminal system. The trigeminal system sends relays into the brain. If you have an overactive pain center in the brain, the endocannabinoids quiet it down. They work everywhere in the brain to calm overactive nerves. That's their job. So basically what you're looking at is something that's a buffer. It keeps things from getting out of control.

**Kellie Pokrifka (17:08):** So let's talk about different ways to administer CBD. Are there any you prefer?

**Dr. Silberstein (17:13):** Here's my concern. The major difficulty and fear of smoking any marijuana (pot) is the fact that smoking itself is a risk, independent of what it is. Secondly, there's been an issue lately of contaminants in vaping, which I think is a vitamin, that's produced pulmonary deaths. And again, since these are not regulated, it bothers me. I think from the point of view of safety, oral preparations and the things that are topical are the safest to use, in the absence of knowing what's in them. That's the problem. Not that CBD is bad or good. You don't know how pure it is and which contaminants it has.

**Kellie Pokrifka (18:01):** How can we tell what is in it?

**Dr. Silberstein (18:03):** I think the only way to do it would be, that if somebody who were making it and offering it, had an independent chemical laboratory analyze it for purity. And then you would know you were getting independent analysis. That would be the way to do it.



**Kellie Pokrifka (18:21):** If we purchase it from a dispensary ...

**Dr. Silberstein (18:24):** If you purchased it from a dispensary, depending on ... for example, in the state of Pennsylvania, the dispensary has to give their products to the independent laboratory for analysis. So under those circumstances, you know what you're getting. If you buy it online, you do not know what you're getting.

**Kellie Pokrifka (18:45):** So you don't have any recommended brands that we could get online that would be reputable or ...

**Dr. Silberstein (18:49):** The problem is the following: How do we know what's in it? How do we know the contaminants? How do we know it's not a mixture of a little CBD and another oil? It's a great way ... we don't know what's in it and there's no guarantee that what they say they're giving you is what they're giving you, in the absence of independent analysis.

**Kellie Pokrifka (19:18):** Besides oral and skin creams, what other ways can we ...

**Dr. Silberstein (19:21):** Well, there are tinctures, which is basically ... tinctures, generally you can extract the marijuana plant, and it becomes a tincture. But CBD is a pretty simple chemical itself and you can take it in any formulation. There're candies, there's loafs, there's tablets, sublingual, I think there's even a nasal spray for some of those products. And I think, the way I look at CBD is more of something to be used chronically than acutely.

**Dr. Silberstein (19:49):** And I also think there's pretty good anecdotal evidence that CBD creams are effective for aches and pains. I have to tell you that my partial tear of my Achilles tendon — it may have been placebo effect. I got CBD cream; I put it on it. Whether it helped me get better, I don't know. But I have ... my threshold for using CBD cream is very low. And I tell my patients with neck pain or discomfort to try it. In the absence of evidence, I can recommend they try it. I have a little bit more problem with the CBD things that you take by mouth — I don't know how pure they are. If we can get it through a dispensary, I'm happy because it's been analyzed, in Pennsylvania.

**Kellie Pokrifka (20:31):** So do the skin creams work locally versus systemically?

**Dr. Silberstein (20:34):** Yes.

**Kellie Pokrifka (20:34):** Can you explain what that means?

**Dr. Silberstein (20:36):** OK. If you have an itch or a rash, you can go to the drugstore and buy some topical steroids. It makes it go away. So what really that means is it's local and anti-inflammatory. So if you have an ache or pain in your muscle, the CBD can go a little bit there, go to the muscle and relieve the problems. That's called topical. We do it all the time. We ...

**Kellie Pokrifka (21:02):** So, it's not going anywhere else in the body? It's not going to the liver ...

**Dr. Silberstein (21:04):** I would suspect that if you spread it over all your body and really dosed yourself, it might spread. But the amount that you give in a local area will not.

**Kellie Pokrifka (21:15):** So does that help with liver and kidney purifications or ...



**Dr. Silberstein** (21:20): There is ... that doesn't get in the liver and doesn't get in the kidneys. That is correct ... I have no concern unless with a contaminant that will be picked up and distributed. But the CBD creams are, in my opinion — if there's no contaminant — perfectly safe to use.

**Kellie Pokrifka** (21:36): If you take it orally, does it work that same way?

**Dr. Silberstein** (21:39): If you take it ... let's think about it. If you take it orally, the amount that gives to the area of interest is much lower. So if you have one spot that hurts, better to flood it. If you take it orally, it's going to get diluted by the time it gets to that body part. So it depends on what you're taking it for. If you've got a sprain in your foot, I would take the cream. If you have a more generalized problem, you need to take it systemically.

**Kellie Pokrifka** (22:06): Do you have any recommendations if you're taking it for migraine?

**Dr. Silberstein** (22:09): I don't know. I don't know, because of the fact that every time I look at the issue it's unclear. And my patients from the dispensary who take it, some say it helps, some say it doesn't help. Unfortunately, in the absence of being able to study it in a manner — even to get a registry — we can't do it. That's the problem. We don't know. It doesn't mean it works. It doesn't mean it doesn't work. It means we don't know. And the feedback ... we have, in Pennsylvania, the ability to recommend marijuana in its different forms from our clinic. So we do that. We provide it as a service to our patients and the feedback we get is mixed.

**Kellie Pokrifka** (22:52): So you're allowed to recommend it but not prescribe it?

**Dr. Silberstein** (22:54): Correct. The difference is, in the state of Pennsylvania, to protect physicians, we cannot prescribe it because that's against the law. So we can go to the patient and say, "We suggest it might be a good thing to get." They go to the dispensary and they're the ones that give it out. They pick the strain, they pick the type, they tell them what they're getting. A doctor cannot do that in the United States.

**Kellie Pokrifka** (23:21): Are there any advocacy measures a patient could take if they believe that this should not be illegal, and research should be able to be done? Do you have any recommendations for that?

**Dr. Silberstein** (23:29): There are a lot of different organizations that are currently looking at advocacy. And one of the things is the fact that the pharmaceutical industry is now looking at drugs that enhance the body's own THC without the side effects. I think the problem we have is ... the answer to a problem in the United States is to put people in jail instead of figuring out why they're doing what they're doing and what they can do to correct the fundamental issue.

**Dr. Silberstein** (23:59): And I think that THC ... the story of THC is extraordinarily interesting. In the stories in the Bible, at the high holidays where the high priest went into the Holy of Holies and had smoke coming out. They've actually done archeological digs that show there's marijuana there. And so there's a lot of evidence that many of the people in religious cults and mainstream religion, when they had these visions, were taking marijuana. And there's evidence for that. And there's a book written about it — a name I can't think of — and I think it's been ... the use of marijuana and psychedelics have been part of human culture forever. In many religions it was limited to a small part of the population. I think, like



everything else in life, the way is not legal; but the way is to rationally and logically look at the safety and benefits of these things, as opposed to saying everything that you take that makes you feel good is evil.

**Kellie Pokrifka (25:03):** So when and why did public opinion on marijuana change?

**Dr. Silberstein (25:11):** I think with the advent of medical marijuana — and there's clear evidence that medical marijuana is good for the nausea and vomiting and weight loss of cancer and HIV — it started to be accepted. And after that it became legalized. And what happened ... you know what the major impact of legal marijuana has been? Crime has gone down and the money that went to the gangs went down. So I think that people got used to using it. And I think my bias is that the use of marijuana needs to be studied carefully, and then analyzed, and figure out the right strain to take for the right disorder, as opposed to simply going to a dispensary and like, it's Russian roulette or roulette. Not Russian roulette.

**Kellie Pokrifka (26:09):** So, in the news we've been hearing a lot about the dangers of vaping and a lot of people may be taking CBD through vaporizers. Can we just discuss ...

**Dr. Silberstein (26:17):** Sure. The issue has to do, again, with the contaminants, and it looks like there was a contaminant that resulted in significant lung damage. And since you are getting products that have not been analyzed and shown to be safe, when you vape something, you don't know what you're getting and it could be dangerous. The fundamental problem with marijuana — it's not standardized. And there are people who are now developing something called chemovars. So you have a strain of marijuana, they analyze the THC content; they analyze the CBD content, and the terpenes.

**Dr. Silberstein (26:59):** And the other disconnect in the marijuana field is the different types of leaves. There is no correlation between what it looks like and what it contains. And the folklore about the different types of marijuana and the names given it make no sense. One year the best plant in the world is a cannabis sativa and then next year, the same gets the opposite. So I think that those names no longer have any meaning because of crossbreeding. So you can have a narrow or a wide leaf plant; one can be high in THC, one can be low in THC. With crossbreeding, those names don't mean anything anymore.

**Kellie Pokrifka (27:43):** So even if you believe that you are buying the same type of marijuana each time, it could be completely different?

**Dr. Silberstein (27:49):** How do you know, unless you have a chemical analysis showing the components of each strain, what you're getting? If you go to a dispensary, they're forced to do that. If you're not, you don't know.

**Kellie Pokrifka (28:00):** And so if you're not buying it from a dispensary, there's really no way of ...

**Dr. Silberstein (28:04):** It depends on the states. I don't know what — I don't know the laws. I know in Pennsylvania it's done. But you need to be careful that it's being independently analyzed. If you're getting it and it works, and you get it again and it doesn't work — it could be you're getting something entirely different.

**Kellie Pokrifka (28:23):** So would you believe that using THC is more effective than just using CBD on migraine?



**Dr. Silberstein (28:32):** Very interesting concept. It is now known that THC and CBD interact. And depending on the ratio, it could be good or it could be bad. And it is quite clear that the right proportion of CBD and THC is better than one overwhelming the other. And that is called synergy. And the synergistic combination is better for pain, nausea, and vomiting.

**Kellie Pokrifka (29:03):** However, getting THC is still illegal in many situations.

**Dr. Silberstein (29:07):** It is always ... in the United States it's illegal, but in certain states you can get it. You can get it legally, but if you buy it in one state, it's illegal to take it across the border to the other state. So if I have a patient from New Jersey, they can't buy it in Pennsylvania. But even worse, if they go on vacation, they can't take it because if it's in their bags, they can be arrested and it's totally insane. And even worse, if you're getting legal THC for a medical problem and they do a drug screen on you, you can lose your job. It's total insanity.

**Kellie Pokrifka (29:41):** So even if you are going from one state where it is legal to another state, which is legal, it's still ...

**Dr. Silberstein (29:46):** It's illegal to take a controlled substance like that across the border. That is correct.

**Kellie Pokrifka (29:53):** That is ridiculous.

**Dr. Silberstein (29:56):** No, it's insane. Would they make you stop taking insulin to cross the border? If you were dying of cancer or HIV, and you had a drug that helped you, and if you didn't take it, you would puke your guts out — but they'll put you in jail? That's the insanity of the laws in the United States.

**Kellie Pokrifka (30:15):** Certainly. I've heard that if you take an oral version of CBD, it can give you a delayed response, but it will give you an extended response. Do you find that to be true?

**Dr. Silberstein (30:29):** There's something called bio-availability. What do I mean by that? If you get a shot of something, it goes up quickly and you get the full amount of it. Take it by the stomach, it's metabolized and there's a delay in absorption, but once it gets in the body, it's metabolized quickly. We actually showed with THC, which I know fairly well, that if you take THC, most of it's in your fat tissue. Which is why if you take a test you have to wait a couple months off marijuana before it clears out of the body. It stays in the fat tissue for months. So no matter what route you take marijuana, it stays in the fat tissue for months. It goes up in the blood and then it's sucked up. So, it's hundreds of times more concentrated in the fat tissue than the blood, and it leaks out slowly.

**Kellie Pokrifka (31:24):** Would it still be providing benefits for those months that it's in the bloodstream?

**Dr. Silberstein (31:27):** Yes. It depends on the dose and how much you've taken. So that's the reason why if you take marijuana you need to keep taking it because it gets sucked up.

**Kellie Pokrifka (31:39):** If you were to be on a maintenance dose of CBD or marijuana, how long would you have to be taking it before you could see regular effects?



**Dr. Silberstein (31:46):** You should be able to see it, depending on the route of administration, within days. For CBD, since it's in an anti-inflammatory, it might take longer.

**Kellie Pokrifka (31:59):** If you're on a specific dose, how long should you be on that dose before deciding you should go up or if you should go down?

**Dr. Silberstein (32:05):** The problem we have is, as a physician in the state of Pennsylvania, I have no control over the dose. The concentration is done by a dispensary. However, I can make certain points. Nobody ... to the best of my knowledge, there is no lethal dose of THC. But in those places where you can get it elsewhere, if it's spiked with one of these synthetic THCs, it can kill you.

**Kellie Pokrifka (32:37):** Is there a lethal dose of CBD?

**Dr. Silberstein (32:39):** Not to the best of my knowledge. But like I talked about water — if you took too much of it, just by the volume it would kill you. So I would suspect that, in general, CBD and THC are not lethal drugs unless they're contaminated.

**Kellie Pokrifka (32:58):** And again, the only way you can tell if they're contaminated ...

**Dr. Silberstein (33:00):** Is by doing independent analysis.

**Kellie Pokrifka (33:04):** Are there any other topics you want to cover on CBD or THC?

**Dr. Silberstein (33:08):** I think the major problem we have is that we cannot get defined strains to study except for the one strain from Mississippi. What we really need to do is study this in a scientific manner to find out what's the right combination, and how to give it and administer it. Most people believe that the problem with smoking marijuana is not the marijuana from a health point of view, but the fact of the smoke itself. So I think we need to be able to study it, so that we can actually find out if it works or doesn't work and how to give it.

**Kellie Pokrifka (33:47):** And you said Mississippi. How did that become the standard?

**Dr. Silberstein (33:51):** Because the federal government decided so. We ... there's a farm in Mississippi that make marijuana for use.

**Kellie Pokrifka (33:59):** And so, if a study is done and approved through the federal government, it has to be ...

**Dr. Silberstein (34:06):** The only — to the best of my knowledge, the only marijuana that can be used that's obtainable from ... the federal government is in the state of Mississippi. I could be wrong. It may have changed, but that's the best of my knowledge. Correct.

**Kellie Pokrifka (34:23):** All right. Well, thank you so much. I really appreciate this interview.

**Dr. Silberstein (34:26):** You're more than welcome.