Episode 623: Thomas Seyfried on Cancer Is a Metabolic Disease

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Katie: Hello, and welcome to the Wellness Mama Podcast. I'm Katie, from wellnessmama.com. And this episode is with someone whose work I have followed for a long time, and I'm extremely excited to finally get to talk to. I'm here with Professor Thomas Seyfried, and the focus of this episode is on cancer as a metabolic disease. And as I said, I have followed his work for a long time. He's a professor of biology at Boston College. He received his PhD in genetics and biochemistry from the University of Illinois. He did his undergraduate work at the University of New England. And he received several awards for that. He has a quite impressive bio. But what drew me to his work the most is his current work on, as I said, cancer as a metabolic disease. He has a book by the same name that I will link in the show notes. He's said things in the past, like, we can reduce the death rate by 50% when it comes to cancer if you view the tumor as a metabolic problem, rather than a genetic problem. And many within the field still view cancer as a strictly genetic problem. So I was so excited to dive deep with him on this today.

Before we jump into the episode, I do, of course, want to say that none of this is medical advice in any form. I am not a medical doctor. Dr. Seyfried is a professor, but also not a medical doctor, though he has done research that has been used in a lot of the current work that's being done on this. And he's working very, very

hard to get the metabolic approach into the more mainstream of care. Because it can help a lot of people, as we talk about, even when combined with the standard of care that currently exists. But we go deep on what cancer actually is, and why it isn't just genetic. He talks about how mitochondrial function is a big factor in the cancer equation. We go into the Warburg Study, and what it shows us about why cancer happens. He talks about how cyanide kills healthy cells, but not tumor cells. And how this helps us understand why cancer is a metabolic process. Basically, that cancer cells don't use oxygen for energy, what they use instead. And he talks about the two things that cancer cells feed on, which are glucose and glutamine. And how to address these from a metabolic and lifestyle approach.

We talk about risk factors of cancer, how to avoid them. We go deep on things like ketogenic diet, and my preference, which is water fasting at different times, as a way to address the glucose side of this equation. He talks about how to address the glutamine side as well, with something called glutamine-targeting drugs. And why his approach is to focus on the research side of getting rid of cancer without the toxicity. He said in his approach, he loves to see patients emerge on the other side of cancer, without damage from harmful things that they've taken to fight their cancer, but actually more healthy and metabolically functioning than they were before. This one definitely goes deep. He has a wealth of knowledge. There are a lot of links to more reading in the show notes at wellnessmama.fm, if you want to read more of his work, or get his book, or see many of the papers he's published.

But like I said, this one was one I was really excited for, because I've followed his work for probably at least eight or nine years. And it's the approach I would personally take if I faced that myself. I think you'll learn a lot, even if this is not something you're currently facing. And I know all of us have probably had an experience with someone we love facing cancer. So, I was very excited to get to interview Professor Seyfried today. And without any further wait, let's learn from Professor Thomas Seyfried. Professor Seyfried, welcome. Thank you so much for being here.

Professor Seyfried: Well, it's a real pleasure to be here, Katie. Thank you very much.

Katie: Well, I'm excited. This is a topic I have not gotten to tackle very much on this podcast. And I think as the statistics well illustrate, it's one that increasingly affects everyone, at least in the form of someone we know has had an experience with cancer. And I think maybe to start off broad and foundational. It sounds like a simple question, but I would love for you to walk us through, from your side, what is cancer? Because like I said, we've all heard of it. We've probably had a loved one who's experienced it. But I think most people have maybe only a very surface level passing understanding of what cancer actually is, and what's going on. And maybe most people think it's just genetics. So, walk us through the foundational, what is cancer to begin with.

Professor Seyfried: Yeah, well, thanks. The definition is simply cell division out of control, dysregulated cell growth that could happen in any population of cells in any particular organ. So, that's the simplest definition of cancer. Just cells that are no longer under a regulated growth control. And you have cells that grow out of control. And what we and others, especially Otto Warburg, found that this is due largely to a disruption of their ability to generate energy through oxygen. In other words, most of our cells in the body are under regulated control because we have a very efficient oxygen system in all of our cells. We breathe air into our body, and we produce energy in a highly, highly efficient way. And the organelle inside of our cells called the mitochondrion, it's actually a network of organelles, controls the energy metabolism in the cell. And when that organelle becomes damaged from any number of provocative agents, cells lose their ability to remain differentiated or quiescent. And they start to grow in a dysregulated way.

And they continue to grow, and they disturb the micro-environment, creating a variety of problems. And they can spread, eventually, they can spread. And we've defined the mechanism and the cells that do that. So we pretty much know what the metastatic cancer cell is. Metastatic is the spreading. Ultimately, that becomes your most serious consequence of cancer, is when these cells begin to invade local areas, and then get into the bloodstream and spread around the body. And that then represents a significant health hazard to the patient. But we've defined all of these processes at the biological and biochemistry level. And we're pretty clear as to what the whole process involves, and also how to effectively manage this whole process.

Katie: And like I said, I think this is a different way of looking at it than perhaps a lot of people have considered. And I've definitely talked to people whose understanding, or that they've been told by doctors even is, "Oh, cancer is just genetic. Nothing really impacts whether you get it or you don't. It's just in your genes or it's not." And you mentioned the Warburg Study. Can you go a little bit deeper on explaining what that one is, for people who aren't familiar with it?

Professor Seyfried: Yeah, well, Otto Warburg was a German scientist, one of the dominant biochemists from the 20th century. As a matter of fact, Sam Apple just wrote a book, "Ravenous," on the history of Otto Warburg, and how powerful and influential he was. He clearly defined the origin of cancer as a disease of respiration, as a disorder of respiration. Which means the cells can't get energy by oxygen, they start to ferment, which is an ancient pathway. We have confirmed Otto Warburg's findings and furthered them. So basically, when a cell can no longer... The fastest way to know this, it's terrible to say, but if people drink cyanide, they die instantly, or very close within a minute. It's because oxygen energy has been shut down to all cells in the body. Cancer cells can live in cyanide, I think. So, clearly, cyanide does not kill a tumor cell. If you had an animal or a person with a big tumor, and that animal or person were to drink cyanide, the animal and the person would die instantly, but the tumor cells would remain alive. And that's because they don't use oxygen for energy.

So Warburg showed this many, many years ago. And as he said, if the oxygen consumption or use of oxygen for energy becomes corrupted too acutely, the cell will die. So you can never get a cancer cell from a dead cell. It's the chronic interruption over time that allows the cell to transfer energy metabolism from breathing oxygen to an ancient fermentation pathway. And that's the key. It's the replacement of oxygen energy with fermentation energy. And that's what Warburg said.

And unfortunately, at that time, they didn't have enough information that we now have, because Warburg himself and other scientists showed that when you take these cancer cells and grow them in in a culture dish, they take in oxygen. So everybody was confused, how could Warburg say that it is the replacement of oxygen for energy, and yet these cancer cells were still taking in oxygen. And we have found that the oxygen that the cancer cell consumes is not used for energy. So this is the real breakthrough. In other words, thousands of chemists or biologists and oncologists say Warburg was wrong because cancer cells continue to consume oxygen. What we and others have found is that oxygen consumption is not used for energy. It's actually used for producing of these reactive oxygen species, which are radicals. And they damage DNA, and they cause mutations.

So the cancer cell collects mutations as an effect, a downstream effect of the damage to the respiration. So the fermentation is now what's the driver of the cancer cell. So the cancer cells... And when you say, whoa, what's fermentation? Well, that's energy without oxygen. Well, what kind of fuel can a cell... Well, how can a cell get energy without... What are the fuels? And there's only two that we have...we interrogated these cancer cells. And it's the sugar glucose and amino acid glutamine. So the two fuels are both fermentable. And we have not yet found any cancer cell that can live without the glucose and the glutamine. So the solution to

the cancer problem is a very simple one, target the glucose and glutamine simultaneously, while transitioning the whole body off to a fuel that the cancer cells can't use, which are ketone bodies. So this is the strategy, the outline for managing all... All these cancers are very much the same. This is another misinformation, is that people think breast cancer is different from brain cancer, is different from colon cancer, different... No, no, no, they're all fermenters. So in other words, one single approach can manage the majority of cancers that people have. Period.

Katie: Which in and of itself is exciting, because I think that you're right, the story seems to make it sound like these are each so nuanced and complicated, and have to be treated differently. And there's these long treatment protocols, depending on the type of cancer. And also just to circle back on the genetic side, and finally, hopefully put a nail on that and dispel that myth. When people think, well, cancer just is genetic. My response has always been, well, our genes are not changing rapidly. So if that were the case, why would cancer rates be rising so drastically? And what are the rates? We're seeing a definite rise kind of across the board in cancers, right?

Professor Seyfried: Well, some cancers are rising much faster than others, especially breast cancer. Breast cancer has now replaced heart disease as the number one killer of women. So that's new. So they're not making any major progress on this type of cancer. Brain cancers, pancreatic cancers, bladder cancers, you know, these lung cancers, they've always been... The biggest reduction in cancer over the last four decades has been the cessation of smoking. So that makes it look like we're making advantage in cancer, but it's actually stopping the smoking which was linked to all kinds of cancers. So most members of our society are smoking less. And then it looks like, oh, the cancer rate is going down. But the number of dead people accumulating every year from cancer goes up. You know, this is one of the great misinformation that come out, that, oh, we're winning the... We're not winning the war on cancer, we're losing miserably. And that's because they're chasing things that are downstream epiphenomena. So, you know, when they say a war, like Nixon in 1971 declared the war on cancer. In wars, we usually count casualties. We don't say we've lost 35 soldiers per 100,000 population. You know, we don't count it. We count a body count. How many are dying?

And the body count in cancer keeps going up every year. So they're trying to say, oh, we're making big advances based on the number of cancer deaths in 1991 when they instituted the anti-smoking campaigns. So it looks like per population, cancer is going down only because we're not smoking as much as we used to. But it's going up, body count goes up. And especially for some cancers, like as I said, breast cancer now has replaced heart disease for women. And that should not be. Breast cancer can be easily managed with metabolic therapy. But no one's doing this. There's no major hospitals or clinics that are treating any form of cancer as a metabolic disease. And that has to change. We will not make any major progress in managing cancer until it becomes recognized as a metabolic disease driven by fermentation metabolism. It's not that complicated. But you're right, Katie, they make it look like it's infinitely complicated. And they're giving us this information, target this. We have this drug for your cancer. That states profound biological ignorance. When you hear people talk like that, they seem to be absolutely clueless as to the biological underpinning of this disease.

So it's really disheartening. It's very frustrating for me to hear all this. And the members of our society, the population, they listen to these kinds of things. And they hear this misinformation. And then it becomes like, oh, cancer is a complicated genetic disease. Because the gene mutations are all downstream epiphenomena, of course, it's going to appear complicated. If you think it's a genetic disease, it's infinitely complicated with no clear solution. When you look at it as a metabolic disease, it has a very clear, manageable solution to this problem. So, we know this, and we're trying to publish as many papers, documenting this. I can't tell you how

many people are really doing remarkably well when they avoid toxic chemicals and radiation, and they tackle this disease as a metabolic disease. The body turns on this tumor cell and uses the tumor cells to fuel the normal cells. It's unbelievable.

I have to be honest with you, doing metabolic therapy is not a walk in the park. I mean, a lot of the burden falls on the shoulders of the patient. So when people say, oh, he or she are battling their cancer. Today, they're not battling anything. They're just sitting down, getting exposed to toxic therapies. When you do metabolic therapy, you are in fact taking charge. You are a major player in the management of your cancer. I mean, it's calorie restricted foods, right kinds of diets, off target drugs that work with the diets together. We've published all this. We have documented evidence to support this. So this is the future. It's just I don't know when the field will make this recognition and start to treat cancer as a metabolic disease. And the patients have to demand this, because the poor patients go in, and they think the top medical schools, Dana Farber, MD Anderson, they think they know what they're doing. They do not know what they are doing. Period.

Katie: Well, and I love this approach, because when you say it's the burden on the patient, because the patient has to take the action. My listeners are probably tired of hearing me say this by now, I say it so often. But we are each our own primary health care provider. And while we can work with amazing doctors, at the end of the day, the responsibility lies within each of us for our own health. And so, to me, this is actually very encouraging news, because you're saying, not only do we understand this in a different way than a lot of people think that we do, but there are things very much within each of our control that can affect our outcomes here or even our risk. So I would definitely want to go deep on solutions. But first, can you walk us through with the understanding of cancer being a metabolic disease and not a genetic one? What are some of the root causes that can lead up to it?

Professor Seyfried: Well, this is always an interesting... I put a big paper out showing all the root causes. It's multiple. Okay? Very many different kinds of things... So every one of these kinds of things are what we call provocative agents. They're all what we call cancer risk factors. What are the things that would put you at risk for getting cancer? Okay, chronic inflammation is one risk factor. So let's use an example of a breast cancer for example. A milk duct could become occluded, leading to an inflammatory micro environment around the occlusion. And that chronically can damage the respiration of a cell in that local environment. Damaged respiration leads to compensatory fermentation and dysregulated cell growth. So chronic inflammation, which could come as sleep apnea, could come from a lot of different reasons, in a particular population of cells, in a particular organ, okay? Exposure to chemical carcinogens. And that's why they call these chemicals called carcinogens, because they have the potential to cause cancer. And how they cause cancer is again, they damage the mitochondria in the cell, causing a failure in respiration, leading to compensatory fermentation and dysregulated growth of those cells that were chronically damaged by the carcinogen.

We all know that radiation exposure can damage respiration, leading to the formation of cancer. That's why people fear radiation because it has the potential to cause cancer. So that's another risk factor. Age is a risk factor. The older we get, the more chronic damage that we have to cells in our body, that lead to damaged respiration, compensatory fermentation, and dysregulated cell growth. Then we have the so-called oncogenic viruses, like papilloma virus, hepatitis C virus. These are viruses that enter into a particular population of cells, chronically damage the respiration, leading to compensatory fermentation and dysregulated cell growth, caused by the virus. So the virus is a risk factor.

Then we have certain genes in our body, like the BRCA1, for example, which is a risk factor for producing breast cancer in some women that might have that mutation. But because it's not 100% penetrant, meaning

that some women can have the BRCA1 mutation and never develop breast cancer. Therefore, the BRCA1 mutation is a secondary risk factor, just like a chemical carcinogen, just like radiation, just like inflammation. So you can have all of these different kinds of provocative agents.

So, one woman may have breast cancer from carcinogen exposure. Another one may have breast cancer from chronic inflammation. Another one may have breast cancer from just being old. So all of these things, another one from... But they all have...under the microscope, they all look like the cancer is the same, but the origin from these different cancers can be quite different.

So how you prevent cancer, which is going to be the great challenge because we know how to prevent it. You got to keep your mitochondria healthy. And if you keep your mitochondria healthy, it's very hard to get cancer. Our genes in our body are supremely capable of preventing cancer. You have to realize that it's only been recently within the last 70 or 80 years that cancer has exploded on the scene. You know, our primitive ancestors, in fact, Aboriginal peoples on the planet today, cancer is extremely rare. In our closest biological relatives, chimpanzees, they never had a documented case of breast cancer in a female chimp. And yet they're 98% similar to Western genetic and protein sequences. So why the chimpanzee female never gets breast cancer, and breast cancer, the leading cause of death for women? You know, so it's all because the chimp is living in his diet and lifestyle that he evolved to live in.

We have dramatically changed our environment to put us at risk for all these risk factors that cause cancer. So you keep your mitochondria healthy, and the probability of getting cancer goes down significantly. So all this is easily explainable once you understand the biology of the disorder you're dealing with. The great monster tragedy is that the majority of oncologists working at the top medical schools are clueless. They never heard of any of this stuff that I've just told you.

So as the result, they go off to the standard of care, continually radiating, surgically mutilating. This is a tragedy. I can't believe that they would do mastectomies on women, when all of the evidence show that they play no role in preventing the spread of the cancer, yet they continue to do all this stuff. So it's a tragedy. I consider it one of the greatest tragedies in the history of medicine, this whole concept of the way we're treating cancer, the way the system thinks they understand it. They don't understand it, and they're mistreating these thousands and millions of people throughout the world on this disease.

Katie: So before we get to the situations of if a person already has an identified cancer, I still want to talk a little bit more about the preventative side. And with the understanding that everything you just explained that there's a lot of apparent diet and lifestyle factors that go into this. It's not a single cause by any means. Are there some that emerge as sort of bigger needle movers that people can focus on if they want to keep their mitochondria healthy for the long term?

Professor Seyfried: Yeah, well, I think the best way to do that is do periodic fasting or water-only fast. It's hard, though. Man, I'll tell you it's not easy. I'm not sitting here telling everybody, hey, go out and stop eating. I've tried it, it's not easy. But ketogenic diets, nutritionally balanced ketogenic diets. Like, my good friend, Dom D'Agostino, he's always in ketosis. He lives that kind of a lifestyle. Our ancestors during the Paleolithic period, were always in a state of ketosis. And those cancers was almost nonexistent in that part of our background.

Exercise, clearly, exercise, eating the right foods, avoiding high carbohydrate, poorly nutritious foods, this will all significantly reduce cancer risk. Or smoking and other provocative agents, minimize these as much as possible, if possible. But I would say, the biggest, periodic fasting and exercise. In fact, there was a big thing on NPR today, National Public Radio, about how powerful exercise is, you know, in just reducing not only type

two diabetes, but cancer, and a lot of these... All of these chronic diseases that we're suffering, cancer included, are all the result of diet and lifestyle issues.

Our genes are supremely designed to protect us from cancer, obesity, and all these kinds of things. But when we put ourselves in an environment, a different kind of an environment, where we're oftentimes not moving, we're very sedentary, let's put it this way, driving cars, sitting in front of computers, whatever you're doing, eating massive amounts of high carbohydrate foods. We put ourselves at risk not only for cancer, but cardiovascular disease, type two diabetes. They're all piled on top of each other.

The problem is, no one wants to talk about the real issue, which is diet and lifestyle. It's our diet and lifestyle that is putting us at risk for cancer and all these other diseases. And, you know, you go to the grocery store, and you can see how many foods are made from artificial ingredients. You know, our ancestors had to work very, very hard to eat. Think about it, in the Paleolithic period, you had to run down a big elephant, or a deer, or whatever it is, chop it up, which is a lot of energy, and cook it. And there was no carbohydrates in our diet. We didn't have carbs. They were very rare and seasonal at best. So we were energy...we're a species that uses tremendous amounts of energy. We're supremely geared to store energy, because we were always in a semi starve state.

So now, all of a sudden, you take that same conditioned body, and now put it in an environment where food is given to you through a window. You don't even have to get out of the car, you just drive up and they give it to you. And you can eat it while... Right? And then they wonder, where did I get cancer? Where did I get type two diabetes? It's not a mystery. Anybody that has a few functional brain cells can understand it's our diet and lifestyle. I mean, that's the origin of all these different diseases. And what we've done, instead of saying, okay, let me know that it's my diet lifestyle. But I don't want to change my diet lifestyle, many, many people in our society say. So we're going to take these drugs that are going to try to do what our change in diet and lifestyle should be doing. And then we take a drug that seems to put a bandaid on some aspect of our diabetes, or whatever we're going to do. But we're not going to change our diet and lifestyle, and hope that the drug, or the pill, or whatever they've given us is going to make things all right.

So, we're also part of the blame. It's ourselves. We're a large blame of this, because we don't want to hear the fact that we have to give up sugar and eat a little bit. I don't want to hear that. I like my jelly doughnut. I like my coffee with all kinds of sweeteners in it. I don't want to give that up. Okay, then if you get cancer, don't be bitching and moaning about it. You know what gave it to you. You gave it to yourself. I hate to say that. It is terrible. But that's the facts.

Katie: Well, but the encouraging side of that is, that means there are things within our daily control, that can have a very noticeable effect on our risk of these things. It seems like from reading some of your research, even if someone already has cancer, these things can make a big difference. And I love that you brought up periodic water fasting, because this is something I first learned about from you and I think from Dr. Pompa and I started doing several years ago. And not only did it make a big difference in my labs, because I track those relatively regularly. All my inflammation markers are now very low and within very healthy ranges. It made it easier to lose weight. And I know people push back on water fasting, especially for women because of the hormone implications. I personally think there are ways to do it in a way that's still very healthy for your hormones. But are there any guidelines from what you're seeing on how much, how often water fasting, just general guidelines, assuming someone doesn't have cancer?

Professor Seyfried: Yeah, well, you know, we developed the Glucose Ketone Index calculator. We published the paper on that. And we did it for the cancer patients, specifically glioblastoma brain cancer. Because, you

know, you can manage your cancer quite effectively if you can keep your blood sugar down and raise your ketones. And water fasting lowers blood sugar and elevates ketones. I did not know at the time that so many normal healthy people would be using this Glucose Ketone Index to keep themselves super healthy, and competing with each other to see how low they can get their GKI, a statement of how anti-inflammatory their body is and how super healthy their body is. So, I didn't know that, but apparently there's a lot of people who don't have cancer that are using the Glucose Ketone Index as a way to maintain and quantify their low blood sugar. Ketones is a super fuel. My good late friend Dr. Richard Veech, from the National Institute of Health, and another friend of mine who passed away a few years ago, George Cahill, head of the Joslin Diabetes Center. Both of those guys told me all of the power of the ketone. It's a super essential fuel, keeps your mitochondria super healthy. So you can actually get more effective energy with fewer calories, if you're burning ketones.

And when you do water only fasting, blood sugar goes down and ketones go up. So you really supercharge your mitochondria, cleaning out the reactive oxygen species, the damaging particles in the mitochondria. So you really get super healthy. That's why water only... We evolved to do that. That's our background. We were not sitting in supermarkets with bad foods for our 2 million years of existence on this planet. You know, we were always in a state of therapeutic ketosis. That's why cancer and all these different diseases were almost unheard of. I mean, of course, infections, that's what killed most of our ancestors. They had antibiotics and things like this. Serious falls. You know, it's a tough life, I mean, when you're existing Paleolithic period. But yeah, so the Glucose Ketone Index calculator, which we published, is being used to determine how healthy people can be over periods of time.

So if you decide to do water only fasting, usually it takes... Here's what we found. We found that jumping from a regular diet into water only fasting is extremely difficult. It's like trying to give up cocaine, cigarettes, nicotine, it's alcohol. And if you're addicted to something, going cold turkey is pretty tough. So what we found, especially for the cancer patients, we go first to a zero-carb diet. And it's not that easy. You would be surprised how carb addicted most of us are. But you go for 7 days to 10 days. You know, you can eat eggs and meat, and you can eat some vegetables, as long as you don't have excessive carbs. And then your body starts to adapt. And then you can jump into water only fasting. And the effect is much less stressful, because your body has already started to adapt to this kind of a thing. So you don't have to go cold turkey into zero carbs right away. And then you can do that for, like, a week and monitor your GKI. And if you get your Glucose Ketone Index down on the round of 2.0, 1.0, where ketones and sugar are about balanced in the blood, you get super, super healthy.

But a lot of people don't know about that. They don't know how to go about it. But in my mind, that's the greatest way to prevent cancer, cardiovascular disease, type two diabetes. I mean, let's go run down the list of chronic diseases that are crippling us, and you can get rid of most of those doing water only fasting or zero carb dieting, and this kind of thing. And you have to do it... And it doesn't have to be so bad. I mean, some guys like to eat eggs, other guys like to eat these Tomahawk rib eyes. I mean, I've spoken to all kinds of people that eat all kinds of things. It doesn't make any difference what you're eating as long as you can get your GKI down to a lower. People say, "Oh, I eat this and I can't get it down." Well, don't eat that, eat something else. All of a sudden, "Oh, yeah, now I want to eat this thing. It goes down." So, good, so that's how flexible we are. So it's not one size fits all.

Katie: Yeah, I think that tip of going down in carbs first before switching to straight water fasting is helpful. And maybe also for me, it was helpful to start with short water fasts. Like, I think the first one I ever did was

only 24 hours. And then now I begin every year with a usually 10-day water fast. But I don't recommend starting there, obviously

Professor Seyfried: No, no, no. Your body has to adapt. It's like running a marathon. You just can't go out and try to run 26 miles. I mean, you have to work yourself into a preparation. So that's the same thing with water only fast, same thing with all this stuff. Your body has to reacclimate, become conditioned, and get in shape to do these kinds of things. And once you can do that, you make it part of your lifestyle. But that doesn't mean you have to deprive yourself of all the joys that we have. But you just have to know that, okay, I may have gone overboard on a particular time of year, but I certainly know how to get back on track. So it's like anything.

Katie: And you mentioned glucose and glutamine, I believe, as being the two things that cancer cells feed on. It makes sense that a ketogenic diet and water fasting would definitely address the glucose side of that. But what about the glutamine side of that equation?

Professor Seyfried: Yeah, the glutamine side is a very interesting one. We've known for years, and many scientific papers have been published knowing that cancer cells need that glutamine. And we have now discovered that glutamine is a fermentable fuel, like glucose. This is our big thing. So, we're the first group to identify glutamine as a fermentable fuel. So the two together, the glucose and the glutamine. Now, what's interesting is, you can kill... I know patients who have survived long term cancer with calorie restricted ketogenic diets and this kind of thing, without targeting the glutamine. We find that in our preclinical studies, we can manage the cancer much more powerfully and effectively if we restrict the glucose with diet, and then we use off target drugs to target the glutamine. Now, I know people who say, "Well, I'm doing water only fasting, and I'm going to do all this to get rid of my cancer." And it has been done. Believe me, I see patients that have never taken glutamine targeting drugs, and they seem to be doing okay. But I think that we might be able to do this much faster and much more efficiently, if we get the patient first into nutritional ketosis with the Glucose Ketone Index. And as soon as they hit that index, then we hit them with low dose nontoxic glutamine targeting drugs to really finish off the surviving tumor cells with no toxicity.

See, my strategy in managing cancer is getting rid of the cancer in a relatively reasonable period of time, without any toxicity. So when the cancer patient emerges from the therapy, they are far healthier and more fit than they were before they had the cancer. So we're finding that some of these patients who have cancer also have type two diabetes, cardiovascular disease, high blood pressure, hypertension. They have all kinds of other problems besides having malignant cancer. So when we do our metabolic therapy, many of these patients get rid of the diabetes, they get rid of the hypertension, they get rid of the cancer, they get rid of all the things that were troubling them. It's astonishing. And all we're doing is allowing the body to come back to its natural state. It's coming back... It's very hard to get the body to come back to its natural state when you're being treated with toxic poisons and radiation. I mean, name me any kind of a person who would want to get healthy by taking toxic chemotherapy and radiation. It's absurd. You don't get healthy taking that stuff. So, you get healthy by bringing the body back to its natural state, in a well formulated way. And that's called metabolic therapy. And it can work just as well for cancer as it can work for a lot of other chronic diseases.

As a matter of fact, Virta Health is a way to cure type two diabetes without drugs and this kind of thing. But that's not advertised on television. What's advertised on television are drugs, drugs, drugs, drugs. And this gives a lot of misinformation to people thinking that, oh, I have this terrible malignancy. All I have to do is take this one drug and it'll go away. Wrong. A lot of times those drugs will kill you. They don't talk, oh, yeah, on some of the immunotherapies for cancer, they give you a whole litany of things that can cause problems, and in fact, kill you. So why would anyone want to take any drug or treatment that has a remote possibility of

killing you? Yet they get all this and they go to the hospitals and they get these drugs. And they call it hyper progressive disease. We all know about it, but it's not discussed, that the drug that they treat you with could actually kill you faster than the disease. And it's not insignificant. And then we say, oh, it's a rare side of… No, no, no, 20% is not a rare thing.

You have a 20% chance of being killed by the therapy they've given you. And they don't like to talk about that. So, you know, we're looking at this, and this is the greatest problem, I think. You're talking about a metabolic therapy that can manage a whole range of chronic diseases. In other words, a multibillion dollar industry of managing all these chronic diseases with expensive drugs and procedures, when you don't really need to do that. But you have to be aware of what you need to do and how to do it. And that's the kind of educational mission that can really help a lot of people.

Katie: Yeah, because...I mean, I don't think anybody's probably ever had a pleasant, lovely experience with chemo and radiation. But it seems like often people think that is their only option. And I've heard people even say that, you know, like, they think that's their best chance of beating the cancer.

Professor Seyfried: Yeah, well, this is the problem. When you go to the oncology center and you say, "I'd like metabolic therapy." The first thing you hear is, "That doesn't work. There's no clinical trials on that. If that worked, I would have heard about it." You know, and this kind of nonsense, nonsense. And it's just people trying to protect their turf. And there's no financial incentive to do this. You know, unfortunately, I keep telling people that, it's not a revenue generating process. And you just want to kill cancer cells without toxicity. And they say, "Well, there's no clinical trials," but there's hundreds of case reports and anecdotal effects. So then you have to say, "Why would there be no clinical trial?" And what happens now... I have some friends that are doing clinical trials only after the patient fails radiation and chemo. So you take the patient, give them radiation and chemo, and then tumor recurs... Oh, we got recurrence, especially for glioblastoma, brain cancer. It always recurs. And now we're going to do metabolic therapy.

I say, "No, no, no, no. You do the metabolic therapy first. Where is the group of people doing metabolic therapy without radiation and chemo?" "Oh, we can't do that. It's unethical." I'll tell you what's unethical, is treating patients with radiation and chemo. That's unethical. In fact, for brain cancer, I call it malpractice. It is malpractice to treat someone with a glioblastoma with radiation and chemo. Why? Because I published papers showing how that therapy accelerates the recurrence and demise of the patient. I published clear evidence for this. So I would call that malpractice. It's unethical to be treating brain cancer patients with radiation and chemo. It's terrible for the patient. The patients need to know this. So this is a really important issue.

Katie: And one of the reasons I was so excited to get to chat with you about this today, it seems like for a lot of people who are afraid to try the metabolic route first, from what I've read of your work, even if they're still going to do chemo and radiation, doing these things alongside it can still be helpful. Is that right?

Professor Seyfried: Yes, that's right. As a matter of fact, what we're finding from our colleagues in Turkey is that the amount of toxic drug that you need to give the patient can be reduced significantly. So the drugs can have therapeutic benefit if they're given when the patient is in therapeutic ketosis. We're finding that out. As a matter of fact, we're finding that, yeah, so there is a there is a possible hybrid or transition period, where I'm not so sure about all kinds... Even with radiation, I just don't want to use it for brain cancer. I think it's outrage- I think it's malpractice to be aerating anybody with a brain tumor. But there's some other cancers that small dose radiation together with ketogenic metabolic therapy can have benefit. And you don't have the toxic effects. And we know from the work of Longo and others, that people who do water only fasting, they have far

less toxic effects from chemo. But what we're finding is that the dosage of the chemo can be significantly reduced when patients are in therapeutic ketosis. So you get the potential benefit.

But I'm saying to myself, to what we're saying, oh, yeah, you can do that. But we can also target glucose and glutamine, even far less more toxic without using those toxic chemical drugs, using off target medications with this whole process. So, you know, I know that it's hard for the whole system to jump from one treatment modality to another. It's too radical. It's too radical. So they have to do this hybrid thing for a while until they come to understand completely what I'm saying. And then in so many years, they'll be doing exactly or very similar to what I'm telling you right now. We don't need any of these toxic drugs. You know, we can get these off target drugs. But you think about the effect that that would have on an entire industry. It's not something a lot of people are going to embrace anytime soon, except the patient. Who benefits most from this? The oncologist or the patients? You have to look at it that way, right?

Katie: Yeah. And it seems like the patient should absolutely have the access and the option at least to try these things.

Professor Seyfried: Absolutely. I know, in France, now, they're having a system where the oncologists are now having to tell the patients that there are other options to what we're doing here. That's not allowed in this country. We don't tell the patients that there is another... Well, except unless you whisper it in their ear when you're going out the door. "I know this is..." But why should somebody have to whisper an alternative effective therapy, not boasting about it? You know, they have to whisper it for fear that they might be ostracized or lose their license to practice medicine. This is nuts. This is not right.

Katie: If you're able to say, what are some of the medications that can target the glutamine side, or that can be used that are not currently being used in the mainstream treatment?

Professor Seyfried: Yeah, well, this is under active development right now in the pharmaceutical industries. They're all looking for a new kind of drug. The best drug we found right now is 6-Deoxy-norleucine, DON, D-O-N, which is the drug. It was used on little kids with leukemia. The problem with that drug in the past, it was used in high doses without targeting glucose or glutamine. It was used as a glutamine inhibitor in high doses, not putting the patient in therapeutic ketosis. So they said it was too toxic. And yeah, anything can be toxic if you don't use it in the right way. But when you use it the right way, it becomes like a novel drug. So we found a way to reduce the toxicity of that drug massively, by putting the patient first in a state of therapeutic ketosis. And we've seen in preclinical system, it's showing great therapy. And it's a press-pulse. Again, if you target glutamine too aggressively, you could harm your immune system. So you have to know the biology of what you're doing. So press-pulse metabolic therapy is where you can use diet to press the tumor into a very reduced state, a less aggressive, less angry, more indolent. And then you go after the tumor with low doses of these glutamine inhibitors for only a short period of time.

You don't keep it on the patient. You don't give it to them every day like you would do a regular chemo. This is a new concept called press-pulse metabolic therapy, which we developed here at Boston College. So my clinician friends and I, we put it all together. But it's a way to degrade the tumor slowly, by hitting them hard with the diets, with the water only fasting, the diets. And then you use small doses of these glutamine inhibitors. And that takes care of the tumor. And the patient will emerge in a very healthy state without losing hair, having all these adverse effects that you have from the current standards of care. So it's a strategy, we published it all. Nobody can use it, though. It's not part of standard of care. Oh, we have no clinical trials on this. Well, why not? Why not? Well, who's gonna pay for a clinical trial? A big drug company? Well, I mean, where are they going to generate revenue from a metabolic therapy that doesn't generate revenue? So you

can see the... Let's ignore it. Let's not talk about it. And I'm talking about it. I'm educating the population, that there are things in there. And if you do it the right way... And then you say, "Well, none of our oncologists are trained to do that."

Well, why don't you get the training? It's not that hard, you know. Well, we never had that in medical school. There was never any discussion about it. Well, you're supposed to be a smart guy. You should be able to sit down and read the papers, and then apply that. Well, they won't allow me to do that because it's not... I could lose my license. Well, why don't we change the system then, change the system so that you can do it.

The IRB, the Institutional Review Boards, they need to know about this. And if they deny the patient, tell the patient this is... Then they're committing malpractice in doing that. So I think it has to change. And the other thing why we're not making the progress on this cancer, everybody thinks their cancer is different from everybody else's cancer. So you have the Susan Komen thing with the breast cancer, and then you got the lung cancer group, and then you got the bladder cancer group, and the brain cancer group. These guys are all the same cancer. They all work on glucose and glutamine.

Where is the public outrage? Where is the public concern about this? There's no march on Washington. There's no outrage to your politicians. There's none of this stuff. So, status quo, status quo, cancer deaths, continual suffering, continual human demise. It's just a tragedy of monumental proportions that no one seems to be concerned enough to do anything about. Period.

Katie: Yeah, which brings us back to unfortunately or fortunately, each of us are our own primary health care provider. And unfortunately, until these things become standard of care, it's going to be often up to the patient to navigate this and figure out their own options if they are faced with something like cancer.

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Are there any places in the world that make this version more available? Like, is there anywhere people can go and work with doctors who understand this approach?

Professor Seyfried: Well, very few. I mean, we're in the process of training. And believe me, many, many physicians, they want to help their patients. I mean, this is why they got into the field, right? They want to help their patients. And many of them feel yoked and restricted from doing this. So we're trying in small clinics. To be honest with you, the last place to do this kind of stuff will be at your top medical schools. MD Anderson may be the very last place to do it. It's terrible to say that, isn't it? Sloan Kettering, MDN is at Dana Farber, Moffitt Cancer. I mean, the last place you're going to get people to do metabolic therapy is at the top medical schools. But the smaller clinics may open up, where some of the knowledgeable physicians could say, "Okay, I've had enough. My patient wants metabolic therapy. I'm going to do everything to..." Listen, if I had cancer, and I know and I wrote the books, and I wrote all this stuff, I would like to talk to some of my colleagues like any patient would like to talk to their healthcare provider. You know, am I doing the right thing? What do you think, you know? Oh, yeah, you know, we're feedback, feet forward. And yeah, good point. You know, because you'd like to talk to somebody that seems to know about it.

And even though I know all this stuff, I still want to talk to Miriam Kalamian, my good colleague, who runs a service to help cancer patients. She wrote the book, "Keto for Cancer." Very knowledgeable person. And we're getting more and more of these kinds of folks that are working with the human body, nutritional aspects, to walk them through, talk to them when they feel like that it's not working as fast as they would like. And some of the comments and some of the questions they may have. You'd like to answer their questions. I mean, it's just human physiology. It's just part of the understanding your biology. And the physician should know this and help the patient walk through the procedures. Yes, it falls on your shoulders, but it's good to have someone to speak to about it. You don't want to feel like, jeez, am I doing this the right way? I don't know if I should eat that or do this. Talk to somebody about it that has the experience to help the patient. So it's a work in progress. More and more people are learning this. And there will be centers, no question about it, cancer centers that will be able to help folks, either on site, or through Zoom meetings and things like this.

Katie: And a few, like, clarifying questions I just want to make sure I get through as well. We've talked a lot about the glucose glutamine component of this. Are there any cancers that can survive on ketones, or on fatty acids, or when someone has made these shifts?

Professor Seyfried: We haven't found any. Okay? And we've interrogated them. Anytime you pull a cancer cell away from all of its microenvironment and grow them in the dish, and then we take them and... Here's what we do, we take these different cancer cells, and we put them in the dish in the most minimum amount of material. And then we time them, how long it takes for them to die. And then we add things back and see whether they can live on this or that. Can they live on a fatty acid? Can they live on a ketone? And the answer is, we have never found one that can do that. The only thing when we add back is glucose and glutamine, they grow, like, explode, their growth explodes off them, and you can actually almost see them getting bigger in the plate. And you take away glucose, and they hang on with the glutamine. You take away glutamine, and they hang on with the glucose. You put the two together and they explode. So, you know, asparagine is another amino acid that it hangs them on a little bit longer. But they eventually croak. But we have never found any

fatty acid, or ketone body, or anything other than glucose and glutamine that can keep these guys alive. When you bringing them down to the... What are they? What are the basic things that these things need to survive?

Now, when you put them back in the body, there's plenty of glucose and glutamine, unless you target it. And the targeting, if you're taking it away... And the other beautiful thing about the body is that our cells also like glucose, especially glucose. So when you restrict the glucose, the normal cells start taking more of it in, and the tumor cell absolutely has to have that. It can't go to the ketone. The normal cells can go to the ketone, but they also love the glucose. So you're taking and starving the tumor cell of the very fuel it likes because the normal cells also like the same fuel, but they're not totally dependent on it because they can burn the ketones and the tumor cell can't. It's a beautiful system. It's an elegant, beautiful, natural system killing tumor cells. You shouldn't have to lose hair and have all those horrible things happen to you. But, you know, how long is it going to take for the population and the medical establishment to understand what I'm saying? I don't know. That's something we'll have to figure out and wait for.

Katie: I mean, you've certainly been out there educating and making a huge effort to try to get this information out, for sure. Is there any typical timeline when someone starts addressing this as a metabolic issue and addressing the glucose and glutamine sides, on how long that switch takes? And like you said, the body is supremely capable of trying to keep us healthy? How long does that process take when we actually understand the body and work with it instead of against it?

Professor Seyfried: Yeah, well, it depends on the nature of the patient, how old they are, how advanced the disease is. You know, it's like anything that you would work on. You know, some people, they wait until, like, the stage four, or like a week away from hospice. And then they come and say, "I want to do metabolic therapy." Well, I think it might be too late at that time. But when you get first diagnosis is when you launch into this whole thing. There's a lot of opportunity to really bring the body back into a state of metabolic homeostasis, and gradually degrade the tumor.

Now, there's a movie coming out, it's called "The Cancer Revolution." And it's produced by Brad and Maggie Smith. And Maggie had breast cancer that metastasized to her brain. And she was given only six or eight months to live. She went on our metabolic therapy and completely managed her cancer. She's out many years now. And her husband Brad was a professional documentary filmmaker. So she told Brad, "Brad, set up a movie, will you?" So Brad is putting out the first episode. I think it's a six-part documentary series. And it's going to be coming out in the next month or two, the first part, mostly on Otto Warburg. And then our stuff will slowly come into play. But, you know, cancer is a metabolic disease. And it all started with the book that I wrote, basically. And Otto Warburg, I mean, let's be honest, he had it pegged a long time ago. But he didn't fill in all the pieces. We've done that. We filled in most of the missing parts of this whole process. So, he didn't know about glutamine. He didn't know glutamine could be fermented. He didn't know about ketogenic diets targeting glucose. He didn't know a lot about the way you manage it. That's what we brought into this whole thing.

So then it becomes a real manageable kind of disease. But the movie will illustrate a lot of the historical linkages in a very professional, elegant way. And I think the population is going to be greatly educated and informed about this. And then they have a whole bunch of survivors of these stage four cancers that also come on and tell you... And people are, "Well, they're anecdotes." But when you get, like, dozens and dozens and dozens of these anecdotes, maybe there's something real behind this. It's not just anecdotal. It could be the general way to manage cancer effectively. So that'll be coming out.

Katie: I'll make sure we link to that as well. And at the end of the day, even if right now, the evidence is anecdotal, if you are a person who has cancer and it works for you, it doesn't matter if they're double blind clinical studies, if it works for you. The outcome is all that matters to you in that moment.

Professor Seyfried: Absolutely. Yeah, the long-term survivor doesn't care. And Pablo Kelly, our guy, you might have heard of Pablo, he's the brain cancer guy that he's out now over eight years. And he came to me, and didn't want any radiation. "Okay. Oh, you're going to be dead in six months if you don't do this." Well, he didn't do any radiation, chemo, or anything, just metabolic therapy. And for me, I'm shocked that it worked as well. Now, the cancer is not cured. It's there. Just it's an indolent. Now, brain cancer, that kind is very aggressive. And he's still living over eight years. I'm still working on this new case, we're going to publish it very soon on dog cancer. Dogs, unbelievable. These dogs, man, their cancer can disappear with metabolic therapy. I'm even shocked myself. And I didn't even target the glutamine. So we have mast cell tumors that completely resolved in dogs with this kind of a metabolic therapy. So, once people realize that dogs can... Why should these dogs? And they're also obese, and they don't get any exercise. So they're suffering from... The wolf never had these kinds of... Well, dogs are derived from wolves. And the wolf never had cancer.

And now we're getting these dogs that are eating all kinds of vegetables and stuff that are putting them at risk, too much calories, too many vegetable. Dogs should never eat vegetables. Dogs don't eat vegetables. And all the dogs are getting cancer and all kinds of problems. And they're suffering just like we are. But we're going to take care of that dog cancer real quick. And then people are gonna say, "Well, what about me? Why can't you do that for me?" Well, we can. It's just that you got to know about it. It is kind of amazing. It's actually... Man, sometimes I'm amazed myself at this whole thing.

Katie: I recently interviewed someone who's looking at aging through studies on house pets, because they share our environment. So there's an interesting correlation there. And similar things, they were finding the same things of, like, oh, these metabolic things also impact aging, also impact sleep, also impact apparently everything, which makes total sense.

Professor Seyfried: Yes, absolutely. It's just aging is the result of entropy. Entropy is the second law of thermodynamics disorder. We're all gonna die. We're programmed or to die. We're not programmed to live for 400 years or anything like this. All metabolic therapy does is delay entropy. It's just a delay of the inevitable. But, you know, you don't mind living longer if your quality of life is pretty good. You don't want to be living longer demented in a nursing home. You know, I mean, this is not what I call quality of life. So, you'd like to live your normal life and be good up until a day or two before you die. And basically, you can do that with a metabolic approach. But aging is another thing. But I don't dwell too much on aging because, you know, I'm trying to keep cancer patients alive just for longer than they're predicted to be alive. So that's what's our focus.

Katie: Well, a couple last questions, although I could talk to you all day, because you are fascinating. We mentioned the BRCA gene a couple times. And I think it's about almost 3% of women carry these genes. And I think the standard of care right now is double mastectomies and hysterectomies. And understanding everything we've talked about, my thought is, it seems like there has to be a better way, even for women who have these genes. But what's your take on women who have these identified BRCA genes?

Professor Seyfried: Well, I think those...so they already have a documented risk factor. So we know the environment can significantly reduce risk factors. So those folks would be the ones that would most likely to get into therapeutic ketosis following Dom D'Agostino's program. You know, where you're really on kind of a Paleolithic diet. You have significant exercise. You're keeping your GKI, Glucose Ketone Index at a low level.

You know, and I know the actress Angelina Jolie made a big thing about that. But a lot of those folks, they need to stay fit and trim anyway, to get the roles they need in these movies. I don't know what they do. But they're ideally suited for metabolic therapy. I don't know why they would want to be surgically mutilated. I mean, that's certainly an option. But if you feel that's your only option, you don't want to take charge of your own Glucose Ketone Index. And if they do get cancer, we know how to manage it, target the glucose and glutamine. So I would say that metabolic therapy should be an option to radical surgical mutilations.

Katie: And I will make sure we link to more information about the Glucose Ketone Index calculator as well, because I think this is a helpful tool we can all have to understand better what's going on within our bodies. And I'm sure we've also sparked as more questions as we have given answers today, because this is such a complex topic. So where can people find you and learn more about all these different things we've talked about?

Professor Seyfried: Well, most of the stuff that we do is published open access journals. So I have many, many podcasts in the media. My name, just Thomas Seyfried video. And also you can just go on publications, just look my name up. And a lot of them are open access, so that means anyone in the population can just go to the PubMed or even on the web and download the papers. Press-pulse therapy is downloaded. Now, I know there's technical terms in there. And I know, as I said, you have to have a certain level of scientific literacy, because I'm writing my papers for the professional audience, the scientists. But I try to make it understandable enough. Don't forget, my job is to teach undergraduates here at Boston College. So it's a real challenge. You know, I have to take that technical information and bring it down to a level where even the person who's not familiar with the material can understand it. So we have that challenge in front of us.

But, you know, our primary funding comes from philanthropy, and from private foundations, because there are people out there who realize the power of what we're saying. And they know we're right based on the scientific publications, and they want to be part of it just for the sake of saying, I want to be part of this new movement. And the Foundation For Metabolic Therapies, Travis Kristofferson's foundation, many, many people that contact me. I don't charge any money for any of the information that I have. I'm employed as a professor at Boston College. That's my job. But people can donate to our research through private foundations. And we get money from private foundations. What I do here is, I do all the preclinical testing on the best animal preclinical models of cancer. And then when we get something really, really spectacular, I share the information with the oncologist in our group, and then they would start to put it on patients. So it's a trickle that... And it's a feed forward feedback, because I get information from the patients, and then we adjust our preclinical system to perfect it.

So we're still in the doses timing and scheduling perfection. And once we have that down, man, that's it, we're going to know how to go about doing this really well. But preclinical studies cost money. But we're doing it, we're getting it done. I'm so grateful to philanthropy, I'll tell you, it's just wonderful. You don't have to be writing these NIH grants and having three people make a decision, whether you know what you're doing or not. Listen, we know what we're doing. We know how to go about it. And we're on the as fast a track as you can possibly have to get this disease behind us. And we're doing that. So, yeah, so there's a lot of branches to this whole thing. We're working on all different kinds of cancers. Got really good people working in the lab, smart, knowledgeable people. Got great physicians out there that want to apply it. And more and more people are hearing about it.

So as your show, your podcast information, more and more people begin to hear about it, more and more podcasts. And eventually, it'll be a tipping point and a grassroots movement to say, "We want metabolic therapy for managing our cancer. Tell me doc, what do I need to do? How do I do it?" That's it. And we will

provide them with that information. It's tragic, but it's also exciting. I'm very hopeful for the future. I think the future, we'll be able to move forward on this disease.

Katie: And in the meantime, you are giving resources and education to people who are willing to try this approach on their own or alongside standard of care, which I think is really, really encouraging. And I loop back to that thing I say so often, which is that we're each responsible for our own health. And I love that you shed light on these misconceptions that are happening in such a wide scale within the cancer world, and put the power back in our own hands, even in a preventative way. So like I said, I've followed your work for years. I'll link to a lot of the things I've personally read in the show notes so people can keep learning from you. I also know how busy you are. And I'm so, so grateful for you taking the time to be here and share today.

Professor Seyfried: Well, thank you very much, Katie. It was a real pleasure, real pleasure to be here. Thank you.

Katie: And thanks as always to all of you for listening and sharing your most valuable resources, your time, your energy, and your attention with us today. We're both so grateful that you did. And I hope that you will join me again on the next episode of the Wellness Mama Podcast.

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