



**Transcript of “Jeff Chilton: Medicinal Mushrooms,
Industrial vs Traditional Methods & The King of Mushrooms
-#249”**

Bulletproof Radio podcast #249



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Dave: Hey, it's Dave Asprey with Bulletproof Radio. Today's cool fact of the day is that we have an intern program, well not really. Our cool fact of the day is coming up but if you want to spend some time working with people who really, really care about helping others as much as you do, people who care about being just a little bit better every single day, this is probably the coolest internship on the face of the planet. At least I want to make it that way. If you think you've got what it takes, head on over to the Bulletproof website, look at the career section and apply to be an intern. We're really growing the company and this is a chance to get in while Bulletproof is still at its infancy stage.

I'd love to have you apply. Thank you.

Today's real cool fact of the day though is that mushrooms are fungi but you already knew that but that's not as cool as the fact that they are uniquely different from plants. In fact, they're as different from plants as plants are from animals. In fact, fungi and animals are in the same super kingdom which is called Opisthokonta. If I said that even remotely, right? If I didn't say that right, given my extensive training in Latin, today's guest is going to correct me. Because today's guest is a mycologist who's been in the mushroom business for almost 20 years and probably one of the foremost experts on how to grow your own mushrooms at home and figure out their medicinal benefits.

If you read the Bulletproof Diet you know that I don't think mushrooms are a great regular food source but I'm a fan of medicinal use of mushrooms which is why it's going to be a lot of fun to talk about the differences between those two things. The guest's name is Jeff Chilton who wrote the book, "The Mushroom Cultivator" which was published in 1983 and has been in the field ever since. If you like shiitake, oyster and inoke mushrooms, he's kind of the guy you should thank because he was one of the guys behind the R&D to take those cultivable species.

Today, he runs a company called NAMMEX, the North American Medicinal Mushroom Extracts Company which is the first certified organic mushroom extract company that there is. Jeff, welcome to the show.

Jeff: Hi, Dave, thank you very much for having me.

Dave: How do you get to be such a mushroom head anyway?

Jeff: Well, when you grow up in the Pacific Northwest, we end up with webbed feet here. It rains a lot. Not only do we have a lot of water we have to walk through but it's a perfect environment for mushrooms. Really, I had mushrooms around me most of my life growing up and then as a child of the '60s mushroom came of age with me.

Dave: Mushrooms are a pretty common food source and I've seen some studies about how, say, white button mushrooms can contribute to smooth cell wall proliferation, one of the markers of cardiac disease. I tend to find that people get yeast problems when they eat a lot of mushroom and I've basically said, "Look, steer clear of mushrooms for a while, see how you feel and then you can add them back in." They're kind of a suspect food because they have so many complex compounds and then you oftentimes don't know what they're going to do which is why also they make amazing medicine.

Do you focus more in them medicinally or more from a food perspective and how that's changed over the course of your career?

Jeff: Well, in the beginning, I was a mushroom grower and so that was the food end of things. I started as a mushroom grower in 1973. I got out of university and what do you do when you have got a degree in anthropology?

I did study some mycology and I wouldn't call myself actually a mycologist, I don't have a degree in mycology but I did study mycology and anthropology. After that I went to work on a mushroom farm because I was really interested in knowing how to grow them so I grew mushrooms as food for 10 years. Not just the button mushroom that you

see in all the stores but shiitake and oyster mushroom and other, what we would call specialty mushrooms.

That's a big part of it for me was mushrooms as food but I also knew that mushrooms have this medicinal side to them and so that was something that I was always very interested in and something that ultimately I started reading more about and then that became the basis for my business.

Dave: Now you use extracts of mushroom rather than whole mushrooms medicinally?

Jeff: You know what and this is an important part for all herbal medicines and that is how do we get enough of the active compounds from that particular plant or mushroom to benefit us because, for example, if you just take an herb or a mushroom and you grind it up to a powder you're going to have to really take a lot of that powder and most companies are putting out products that are capsules of 500 milligrams and they say, take two a day. Well, that's one gram of dried powder and that's really not enough to give you an actual medicinal dose.

The key there is, how do we concentrate those mushrooms down into a form that will allow you to actually get a beneficial dose and that's the key because you and your listeners when they take something they want to know that they're actually getting the right amount of it or something that will actually produce an effect.

Dave: You wrote a white paper which is the reason I asked you to be on the show, I just came across it. Actually, your son who's a Bulletproof follower sent it to me.

Jeff: He is indeed, yeah.

Dave: I was like, wow, this is really neat. Because you wrote a 30-page paper, you did a bunch of laboratory analysis and you found that a lot of the mushroom products that are on the market are ... well, what did you find, Dave, in this wide paper? I don't have to translate it. You wrote it.

What did it say? It was pretty groundbreaking.

Jeff: Yeah. Thank you for mentioning that because the one thing is that I could maybe sit here and talk about other people's research but this is actually research that we did ourselves and that's something that for me has been very, very important right from the very beginning with my company. I wanted to analyze my products for the active compounds so that I can say to my customers look, the product I'm giving you has X amount of the actives.

I did a study with a hundred different samples and the key compounds in mushrooms, all mushrooms, the really key medical compound are what called beta-glucans and after many years there finally was a test where we can measure the beta-glucan content of mushrooms, specifically for mushrooms. What I did was I took a hundred samples, I started with dried mushrooms. I also had mushroom extracts, and then I went out on the marketplace and I bought 40 different products that were on the market, many of which were what are called mycelium. Mycelium, the thing is mycelium is one part of this fungal organism that we often call a mushroom but mycelium is the actual body of the organism and the mushroom is the fruiting body.

We normally only see the mushroom because we're out walking around and we see these things sticking out of the ground, we think wow, mushroom, but what we don't realize is that under the ground is the actual fungal organism itself that produces the mushroom. The mushroom is the fruiting body and it's there for just a short period of time.

My study essentially analyzed mushrooms, it analyzed the mycelium and came up with actual hard data on these various products. The important part about it is that I took and analyzed a lot of products right off the marketplace. Products that were out there just I bought the bottles, we took them out of the capsules and they became part of this study and what we found was that the vast majority of these products that were called mycelium products actually were mostly starch.

Well, the reason they were actually starch was because these mycelium products were being grown on grain and the grain at the end of the process was not being separated from the mushroom mycelium. What

you ended up with was a product that was very high in residual grain and very low in mycelium.

Dave: You actually could be getting gluten-containing mushrooms.

Jeff: Here's the thing. The grain that most of these producers are using is gluten-free, a lot of them are using brown rice, a lot of them are using other grains so it's gluten-free. The problem is, is that these products are being sold as mushrooms and so when you go out and you look at the label it says reishi mushroom or shiitake mushroom, when in fact the product is this fungal mycelium in a very small amount and mostly this residual grain. The reason that we were able to ascertain this was because mushrooms do not contain starch. Mushrooms for any sort of storage like that they contain glycogen but very small amounts of that.

The mushrooms were very high in beta-glucan. The next to no starch, the mycelium on grain products were very high in starch and very low in beta-glucan. It's just the opposite of what a medical mushroom product was supposed to be. I'm looking out at the marketplace and I'm going "Holy smokes, we have all these products out here that people are buying, thinking they're getting medicinal mushrooms and the medicinal compounds when in fact they were actually buying mostly grain powder."

Dave: This is going to cause a major storm in the mushroom industry because mushrooms have become really a hot thing, medicinal mushrooms, and what your data shows is that there's quite a lot of we'll just say deceptive practice in that business.

Jeff: What I call these are facsimile products. They're not genuine medicinal mushroom products. For me in this business, I'm trying to sell a therapeutic product, I'm trying to sell a product and people buying them want something that is going to be therapeutic, they're buying it for a reason because they have read about these things. They've learned that they're very good for enhancing immunity, they potentiate our immunity, that's why people are purchasing these products. In this case a lot of those products are simply mislabeled and also manufactured in a

way that does not produce the medicinal compounds that people are looking for in medicinal mushrooms.

Dave: Now, you do sell mushrooms that are done right so you have a vested interest in saying this. You published all the data in your white paper, did you publish the lab reports, like how complete is this?

Jeff: I'll tell you what, I'm a raw material supplier so I sell products to companies that then take my raw materials, my mushroom extracts, put it in capsules, bottles, put their label on it and I've been in the business since 1991. Fact of the matter is, is with this study, personally whether I sell more products or not makes very little difference to me.

My business is pretty stable. I don't have to sell more product, it doesn't really matter but for me, the most important thing is this is a category that I feel is really important and people deserve to be taking genuine medicinal mushroom products. At some point if they're taking products that have none of the medicinal compounds in them then ultimately, they'll say well, yeah, I've tried these medicinal mushrooms but you know what, they really didn't do much for me.

That's my feeling about it. I want this category because I believe in it. I believe these mushrooms can help people. These mushrooms have ... They're proven scientifically to have benefits and so I think people should deserve to have those benefits when they buy these products. This is something that it's ... all industries have this type of thing going on to some degree and in this business, there's a lot of products out there, not just mushrooms, but a lot of products that maybe they're just very low-potency products. Maybe they're what I call lowest common denominator.

You've probably seen those kinds of products when you're out there as well. Products where you go, well, yeah, this is like an entry level, probably not going to get much out of this. You're probably wasting your money. Whereas a good product is there are good products out there and you can find them and maybe you'll have to pay a little more or something and it's a tough market, Dave.

I mean everybody out there, all the companies I sell to, they're competing at like 9.95 and 19.95 and so there's so much pressure to purchase the cheapest product out there.

Dave: You also get these companies who will put in 715 micrograms of substances where I take 15 milligrams a day. They're putting in less than 1 milligram so they can have it on the label even though they know that it's really not physiologically active but at least, it's there to look good. Some of the really expensive guys do that too.

Jeff: That's absolutely right. One of the things that if you look at closely at a lot of the studies that are being done and you look at the amounts that are being used to get the kinds of results that they're getting in the studies, well, you'd know that to get those results, a person would have to take a tremendous amount of these particular products, even with some of the mushroom products. One of those in particular, I would say, would be even this *Heraclius erinaceus* which is a lot of people are interested in now. It's this lion's mane mushroom.

Well, to get the benefits of it you're going to have to take quite a bit of it. There's companies out there that will sell you these parts acting like, oh yeah, take two capsules a day of this and you're good to go. You're not good to go. You have to really take a significant amount and for me, the key for me is I want to analyze my products. I want to say to my customers, I've analyzed my products, I've got 25% beta-glucan in that product. I have zero starch, I'm giving you an opportunity to know that you actually have the compounds in this product that make it what it is, medicinal.

Dave: One of the tricks to medicinal mushrooms that I think is unknown is that when you grow them on grains they don't get the precursors that are required to make the medicinal extracts. Can you talk some more about why sort of feeding grain to mushrooms is just about as bad as feeding grains to cows? Like what comes out the other end isn't the right thing?

Jeff: Well, yeah. I mean it's a very ... Let me start by saying this. The reason why mycelium is being grown on grain is very simple. You cannot produce mushrooms in North America cheaply enough to sell them as a

nutritional supplement. You cannot do that. For example, if you take a pound of shiitake mushrooms and the grower has to get, I think last year it was \$3.50 a pound. Well, if you dry that out, that becomes \$35 a pound. Now the grower has to get \$35 a pound for that same pound of shiitake mushrooms.

Nobody is going to pay him that amount of money for that. Because of that, in North America, producers are like, I can't grow mushrooms but I can grow mycelium on grain in a laboratory, in a sterile environment and what this is, it's a very simple product that has been around since the 1930s when it was a revolution which was this is called mushroom spawn. This is actually the seed that is used to produce mushrooms. Normally, you would take this mycelium on grain and you would break it up and you would spread it through a substrate, something the mushroom is going to feed on to produce mushrooms. That's what this is.

What some people have done and here's the thing, I did the same thing in the '90s in fact and I've grown mushroom spawn for years and years and years. I know mushroom spawn. I even sold it as a supplement in the '90s but I realized that you end up with all these residual grain in there and you don't have, to address your question, the active precursors that you need, for example, reishi mushroom.

Reishi mushroom mycelium on grain produces none of the important triterpenes. These triterpenes are why reishi mushroom is unique. They're very important compounds and mycelium on grain, we've tested mycelium on grain, it is a flat line. There are not peaks in our high-performance liquid chromatography test. There's nothing there. It's the same with chaga. People out there are buying these chaga products. The place where chaga gets the betulin and the trametenolic acid and these other important compounds is the tree. Without the tree and the precursors in the tree, it's not in this chaga.

Dave: What this means is that most cultivated mushrooms because they're cultivated in a cheap industrial manner, even if they're medicinal don't have medicinal compounds. You have to get them well crafted or the

cultivator has to go out and find the substrate like ground up trees maybe and put those in a warehouse somewhere.

Shipping trees is kind of expensive but.

Jeff: Well, yes and no. What it does mean is that no, there are lots of mushrooms in this world, lots of mushrooms. Eighty-five percent of those mushrooms are grown in China. That's where I get my mushrooms, Dave. I get my mushrooms from China. I traveled in China all through the '90s. I visited farms, I visited research facilities, I visited factories that produce extracts.

In 1997, I went to China and I sponsored the very first organic mushroom certification symposium in China. Literally, that was the first, 1997 and around 2000-2001, people were producing the very first organically certified mushrooms in China.

Dave: When you went to China though, we're talking about organic and China in the mid-90s. Even now, organic in China is generally something that Chinese people don't believe. They'll not buy Chinese-made organic products because they know it's a lie. Maybe it's not but in general it can be.

Jeff: Yeah, you know what, it's an interesting subject because I guess what I would say is certainly Chinese certifiers, you might be suspect of that. The products that I get from China that are organically certified are actually certified by Europeans certifiers, high quality, well-known European certifiers. Let me say too that it's a concern. It's a concern everywhere but let's face it. Do you eat all organic produce and fruit and do people in the US do that?

I mean I do, I do my best to but we spread tons of pesticides and chemicals around as well. I'm sensitive to this of course. Every product that comes over has to go through very significant testing, heavy metals especially. I mean everybody is looking at heavy metals. I've always had to test my products for heavy metals ...

Dave: Especially from China.

- Jeff: ... microorganism, pesticides. We have to test all these products. I can't sell these products unless they've been tested.
- Dave: Here's a weird question about microbiological testing. I bought a couple of pounds of shiitake mushrooms at Costco years ago and they were actually covered in mold. What the heck was going on there?
- Jeff: Okay. Here's what's going on. There's two things going on, Dave. One of which is it's taken a long time for produce managers to understand how to handle mushrooms, fresh mushrooms. Number two, which is very interesting, is if you leave them out too long and especially if you have them, because I've seen this on oyster mushrooms before, if you have them overwrapped, as they get older, what happens is the mycelium starts to grow because the mushroom itself is made up of similar tissue as mycelium, so all of a sudden that mushroom would start to regrow its mycelial part.
- I'd even seen mushrooms growing off of mushrooms and I've seen that in supermarkets before and I want to say to the produce manager, has nobody trained you here? You've got mushrooms there that absolutely should not be sold. They belong in the garbage. That's kind of what happened with you. I'm sure the Costco person was not sensitive to that and shouldn't have been selling those. That happens a lot with mushrooms.
- Dave: Was it the shiitake basically growing shiitake in itself? It looked like a different species.
- Jeff: Well, I think what was going on is you see, it was probably a whitish mold and that is just the shiitake, it's still alive basically and so because it's in a high humidity, high carbon dioxide environment, which it could have been or maybe it's just sitting in its box and it's kind of warmer, it will just start to regenerate the mycelial stage.
- Dave: When that starts happening are they safe to eat, they just look ugly?
- Jeff: Well, you know what, they are safe to eat but you have to be careful. At that stage I wouldn't eat them and part of what happens is with mushrooms is as they reach a certain point, the thing more than

anything else you have to look out for is just the bacteria. You'll see that on like say white button mushrooms, they'll start to get brown spots on them. Shiitake mushrooms, you look at the gills and they'll start to get brown spots and that's bacteria growth.

Dave: Kind of slimy. Okay. What kind of bacteria is strong enough to grow in a fungus? It seems like fungi and bacteria have been fighting since time immemorial with little chemical weapons at each other. What happens to the mushroom and what happens to the bacteria when there's some competition going on, on the mushrooms?

Jeff: Well, you know what, mushroom is able to ... I look at it almost as a cooperative dance where, for example, like mushrooms in nature, what happens with mushrooms in nature, the mycelium is out there and is spreading through all of that material in nature consuming it and it's a competition with all sorts of microorganisms out there. They've got bacteria, they've got other fungi, imperfect fungi, fungi that don't produce mushrooms. It's competing and everybody's vying for these nutrients and a lot of times what happens with these nutrients is they ...

The mushroom consumes something, when it's done, somebody else comes in and starts to consume it even more. There's a constant process of decomposition going on and that's in a way the beauty of what's going on in our environment is that everything is in a constant state of breakdown so to speak but it's a breakdown that is regeneration. That's just an absolute constant out there. I love it when I go out mushroom hunting and seeing all of these going on around me.

Dave: People have actually called me like anti-mushroom because I'm be cautious of eating these things because you don't know what they're going to do to you. I'm actually like a Paul Stamets fan and I understand we'd all be dead without fungus in our environment. It's really important but I just also just filmed the documentary called Moldy.

Just quick plug, moldymovie.com if you haven't seen it and I interviewed a whole bunch of people about common soil fungi growing in buildings and to some extent in our food and what that's doing to people and these aren't actually mushrooms, these are molds.

Jeff: Yes, molds, that's right, that's right.

Dave: These are kind of the same family and we all know that there are tons of so called toadstools and poisonous mushrooms and things like that.

Jeff: Yeah. You know what, I would say is yeah, I understand and I totally agree. I mean there are things out there. For example, there are fungi that grow into grain and as you know there are aflatoxins out there. These are these toxins that you have to be very careful about. This is definitely a concern, especially with our food. We don't want to be consuming those kinds of things. The other thing too is certainly you don't want to be in an environment where there are a lot of spores being produced that you might breathe in.

There's actually something out there called mushroom harvester's lung because, and this the beauty of the button mushroom. The button mushroom is grown and harvested before it matures and the gills start to produce spores. You don't have that in button mushrooms farms but if you're in an oyster mushrooms farm, the fact is, is that you got to have a respirator on because the oyster mushroom is an open mushrooms, almost right from the beginning so the gills are there, and as it matures, it is producing a lot of spores.

It's the same thing like on a ganoderma farm in China. It's really interesting because you go in and as they are maturing, and this is a greenhouse. It is absolutely wall to wall, big beautiful reishi mushrooms. It is filled with this brown cloud of spores. You're looking in there going, "My God, okay, these mushrooms are producing a lot." The interesting part about it is that that was what was going on in the '90s but today, they are actually harvesting the reishi spores and the reishi spores have now become a very big medicinal product in China.

When I was just there last year the harvesting methods, they no longer allow the spores to come out and up into the air within the house. Now they actually put a paper around the mushroom at a certain stage. They have a plastic bag under it and the spores fall down into this plastic bag. When they go to harvest the mushroom they have a bag. At this point in time the spores are actually more valuable than the mushroom.

Dave: I've heard about like fractured spore mushroom extracts coming from China but I haven't even tried one because we actually don't digest spores well all.

Jeff: No, that's right. That's absolutely right. Spores, generally speaking, will go right through us. We cannot digest spores. However, they believe that if they can, they call them cracked spores, if they can crack that shell that then they can get at the compounds inside which they consider to be highly medicinal. Are they ...

I have looked at some of the research. I'm uncertain at this point and we're exploring this, we're looking at ways that we can actually analyze these spores, find out what's in there. There's claims that they're high in triterpenes, there's claims that there are beta-glucans in there, I don't really know for certain. I've just stayed away because you know what happens so often, Dave, is that there are products that go to market that get hyped up so much that trying to figure out what is real and what is just marketing hype becomes difficult.

Reishi spores are one of those products where you'd get marketers out there, and they're selling these things left, right and center for a lot of money in China, making a lot of money on it. I just step back and go, "Okay, I've got to wait and look at the research a little more closely. I've got to do some analysis on my own, we're doing that. We'll see down the line whether or not it's real or not."

Dave: That's a nice cautious tone and I tend to have that as well where you're going to see some research about it and I haven't seen much so I just heard that it's popular which is maybe a bad thing.

Jeff: You know what, I'm one of those people that truly believes in scientific verification of active compounds and so this is one of the things in the whole mushroom industry that's been lacking all along is there have not been enough tests to be able to actually get a, let's just call it a fingerprint, an actual activity finger print and that's what I've done in my white paper was produce an activity fingerprint.

One of the other tests we did was for a compound called ergosterol. Ergosterol is really interesting compound. I don't know if you've heard about it but ergosterol is a corollary to cholesterol that we have except in fungi it's called ergosterol. Ergosterol, when you expose mushroom tissue to UV light, ergosterol turns into vitamin D which is just amazing. I mean it's just a wonderful thing.

You're not going to get a lot of vitamin D just by eating mushrooms as they are because most mushrooms are either grown indoors or once they're harvested, they go right into a cooler and then off they go to the supermarket. You can take those dried shiitake, put them out in the sunlight and that will convert some of the ergosterol to vitamin D.

I've even seen supplements that now are based on mushroom tissue, vitamin D2 supplements that are based on mushroom tissue and I just think that is fantastic. One of the things though, let me just tell you a little story about that. The Chinese traditionally have taken their shiitake mushrooms and when they harvest them, they lay them out on screens and they dry them in the sun. Sun dried. They've got these sun-dried shiitake and so here's something they've been doing for the longest time drying them in the sun which is producing a high vitamin D shiitake in the last 10 years.

Since they've gotten more industrialized, what do they do with the shiitake now? They put it into an indoor mechanical drier, forced air drier. They're doing just exactly the opposite of what they should be doing with those shiitake but this is sort of like, well, here we are, we're an industry, we want to be more industrialized. We want to have all this great equipment here, new equipment. This is how they do it in the West. They're changing to that and I'm just looking at it going, this is a huge mistake.

Dave: Sometimes the traditional methods are better. I know that animal source vitamin D3 is pretty easy to get and vitamin D2 is just less biologically active and potentially harmful. There's one company who's making vitamin D3 I think from shiitake concentrate of some sort but it's just frightfully expensive.

Jeff: Yeah, I haven't heard of that. I would be surprised if they're making D3 because D3 is ... I've never heard of that actually coming from a mushroom at all. I've just seen it coming from, D2 coming from a mushroom so, I don't know. D2, I've looked at it a bit and I'm not sure of the research you've looked at but what I've seen of D2 is most of the tests show that it's active. I'm not sure whether they know. Some studies say it's just as active as D3, other studies say no. Whether or not, I'd have to see, in fact I'd love to see some of the research that you're looking at that talks about D2 and any sort of negative ...

Dave: It comes from the Vitamin D Research Council and Dr. Cannell's work and Dr. Cannell's spoken a couple of times at the anti-aging non-profit that I run and has spent like 30 something years as just really a primary vitamin D researcher so he has a bias towards vitamin D but he's done some writing about ...

Jeff: On vitamin D you mean vitamin D3 from other sources.

Dave: He's been looking at D2 and D3 and just looking at the rate of, I believe, if I remember, like hip fracture from D2 versus D3 and a few other things like that and said vitamin D2 was maybe displacing D3 ...

Jeff: Interesting.

Dave: ... which is interesting. I was just looking here because now I'm wondering about the D3. It looks like there's a company called Source of Life that claims to have a vitamin D3 from mushroom but there's some questions about that.

Jeff: Yeah. I would be very questionable. I would say it's very questionable product. I've never heard of that. I don't think it's possible. It is a completely different compound. It's cholecalciferol versus ergocalciferol, different compounds.

Dave: Got it. I'm looking at some stuff here. That company has never responded at least according to one of the other websites about it. It sounds like it might have been D2 but they were claiming D3 and I stand corrected in that, usually D3. It turns out lichen can make D3 but not mushrooms so I didn't know that either. I'm just Googling as we talk.

The trivial things we learn while talking.

Jeff: I know. That's the wonderful thing about talking to people about various subjects and I've been kind of ... In the last couple of years I really dove back into the research a lot and there's so much information out there. You know that. You've been in it and you see it in whatever particular field and it's so hard to keep up on and yet it's important. Most of us, we can be broad in a certain sense in what we know and at the same time we kind of specialize to some degree.

Dave: That's true. You're a very deep specialist in this and I want to make sure that the people listening get some real actionable things out of this. Can you walk me through the medicinal value of what's in mushrooms, like I want to talk specifically so people understand?

What about beta-glucans in cell walls? I'll just go through the list of things in mushrooms. Tell me what they do or why we should care about them.

Jeff: There's been a lot of study on beta-glucans over the last 40 or 50 years and really, they have shown now after all this time that beta-glucans actually will activate our immune cells. There's a lot of different beta-glucans out there, the one specifically that are in mushroom are called beta 1316 glucans and that is just the configuration of the beta-glucan and that's very important because other beta-glucans out there are not active in the same way.

There are beta-glucans in oats, in cereal grains but those are beta 14 glucans. They don't have the same immunological activity that these beta-glucans from mushrooms do. It has a lot to do with the branching of it. Just like different mushrooms have different levels of activities but this beta-glucan makes up the cell walls of mushrooms. It is the major component in the cell wall of the mushroom. That's something that ultimately we want to break down with our extracts and get it into a form that actually people can get benefits from.

Because one of the things about mushroom is that they do have this substance called chitin in their cell walls and you may have heard about chitins.

Dave: I was actually going to ask you about chitin next so it's awesome, tell me about it. Yeah.

Jeff: Chitin's really an interesting thing. It's a polymer that is elastic but it's a super strength. In a way it's almost like the Kevlar of the natural world. It's a super strength kind of polymer and it's present in mushroom cell walls and it's part of what ... it's a structural component, it's what helps mushroom to a degree stand up. A lot of people have said without I think good reason that oh, mushrooms are indigestible because of this chitin. That's simply not true.

Mushrooms are not as digestible as many other vegetables because of chitin but all that chitin does is make them a little less digestible. To a degree, that's not a bad thing because one of the benefits of mushrooms is it's very high in fiber and a lot of that fiber is the chitin that's moving through the system and some of the other cell wall components and that ends up being a prebiotic.

Mushrooms are actually a very good prebiotic. The chitin actually makes up somewhere around 5% of the cell wall whereas the beta-glucan component is upwards of 60% of the cell wall. The chitin is a small percentage but it is there. People also might think of chitin as something that helps to make up an insect or even a crustacean shell but the difference is, is that chitin binds with calcium carbonate with our crustaceans so most of that crustacean shell ... I mean a mushroom doesn't have a hard carapace or a hard shell like that crustacean does so you can't say oh gee, they're both made up of a chitin so they're the same, not at all.

Chitin is one of those compounds that we have to think about but it's not something where you go, "Oh, you can't digest mushrooms." That's simply not true.

Dave: Okay, that makes good sense. What about ... we talked a little bit about triterpenoids but tell me what triterpenoid as secondary metabolites. Why would people want to take those? What are the benefits?

Jeff: Triterpenes have been have been found to have a lot of different actions and one of them is certainly they have shown immunological anticancer actions. They're also used for liver. In fact, I spoke to a traditional Chinese doctor in China. He said ganoderma, he said reishi was his number one liver herb so it's good for cleansing the liver. It's antibacterial, antifungal, antiviral. It's got a number of different actions. That's really what makes reishi so unique.

Reishi has these triterpenes. Triterpenes are something that ... That was one of the first analytical methods that my company developed in the 1990s was for triterpenes. We've been measuring triterpenes in reishi mushrooms since 1994. We did it in the lab at University of British Columbia with a professor emeritus there, Dr. Neil Towers. If there's any one mushroom that people should think about, I would say it's reishi mushroom because it's very high in beta-glucans so you're getting the immunological action of the beta-glucans and you're also getting these other actions of the triterpenes.

It's like the ... I hate to say king of mushrooms here because I've heard so many people talk about this and the funny part of that is that in the 1970s a book was written about shiitake that came out of Japan. It was called "Shiitake, King of Mushrooms." Then in the 1980s and early '90s reishi was the king of mushrooms. Then in the 1990s, a company came along with maitake and maitake became the king of mushrooms.

Now I'm out there and people are saying the new king of mushrooms is chaga and I'm like ... Somebody even said chaga is the king of mushrooms and reishi is the queen.

Dave: If you look at the history of Chinese emperors, there's been more than one different dynasty so we just have mushroom dynasties and I think it's all right in that.

- Jeff: I just find it amusing because I think a lot of people just haven't been around enough to have experienced all these different kind of mushrooms, I have.
- Dave: Now, if someone were to come to you and say like, I'm going to take one mushroom that's going to do the most for me, which one and how should I take it? What would you say?
- Jeff: Again, I would say reishi mushroom and I would say look for ...
- Dave: How would you have them take it?
- Jeff: I would look for an extract, I would look for ... and to be clear, making sure that what we're looking for is an actual mushroom that has been extracted and if possible, something that has been measured for triterpenes, something that has been measured for beta-glucans, very important.

If you can't find that, some of them, maybe you can find actually, if you're on the West Coast you can probably find reishi mushrooms themselves and be able to make them up. Otherwise, if you're looking for a bottle of product, that's what I would look for, I would stay away, I would look very closely at these mycelium products. Look at the labels, look very closely. Beware of what you're buying. If you want to buy these mycelium products, fine, but be aware that that's not a mushroom. Be aware that it's got grain in there, so I would say reishi.

The other thing I would say is I think there's a place for putting, let's say, three mushrooms together in a formula like reishi, shiitake, maitake. I think that there's good reason to do that. The other mushroom that's really great out there is Trametes, turkey tail. Again, make sure you're getting the mushroom, make sure you're getting an extract of that mushroom. If you're not, you're probably not getting enough of the medicinal compounds to do you any good. The other thing is don't expect effects immediately. Don't expect those benefits to come tomorrow. Don't think that tomorrow your sore throat and your cold is going to be gone. It's not.

You have to take these regularly for a period of time and the beauty of these is that these are what are considered adaptogens. These are actually herbs and compounds that are taken over a long period of time. You don't have to worry about I've got to stop taking them or anything. You can take them for a long period of time and they will actually provide you with these benefits that are anti-stress, they balance the different systems of the body. Mushrooms are fantastic in that way.

Again, the beauty of mushrooms is that they're one of what I would call the first nutraceuticals. They are food as medicine. They are both. They're some of the first. You've got shiitake mushrooms that have been used in China for thousands of years. Food, medicine. Maitake, same thing. It's really a great food that can also become your medicine.

Dave: Thank you so much, Jeff, for coming on the show and just going deep on mushrooms and helping people understand when you're buying a mycelium product you're actually not getting real mushrooms, which is a problem and we're not recommending one brand over another. You're a mushroom ingredient supplier. You're far up the chain so this isn't like you or anyone trying to say this is better than another but just saying that there's widespread ... it's not technically mislabeling because some of them actually say mycelium but you think you're getting something that's active and you're probably spending 30 or 40 bucks. It may not even say mycelium, it may just say the name of the mushroom but you think you're getting it and you're not.

Jeff: That's absolutely right.

Dave: I found that mushroom extracts can be really, really effective and some of the Chinese medicine people I've worked with, acupuncturists, use them to great effect. I've also taken a lot from those that don't do anything. I think there's ... You've written a white paper, this 30-page piece of research that shows why you went and you've looked at actually what's in 40 different things and I appreciate that you did that at your own expense and then you published it. Yeah, you had economic incentive because you make the good stuff but still, putting numbers out there is something that I really value, so thanks for doing that.

Jeff: Thank you, yeah and I appreciate you having me on the show. We could probably go on for a long time. There's a lot of material to cover and I'm really happy that you're able to have me, Dave, because it's something where again, there's a lot to know, there's not a lot of information out there, there's a lot of information that is just erroneous. I want people to understand what's going on here. I want them to understand what is a good mushroom product, how to be an educated consumer. That's really what it's all about, how to be and it's not easy, believe me. It's not easy when you're looking at the shelf and you're seeing a dozen different products.

Dave: You live on Vancouver Islands, the same place I do but you're up in Tofino which is one of the most scenic parts of the world but if you ever make it to the southern part of the island we'll sit down over a cup of Bulletproof at Bulletproof Labs here and have a further chat about mushrooms because it's always interesting to talk with people who spent their life studying something like that. Thanks for living on the island. Thanks for being on Bulletproof Radio.

Jeff: Thank you very much, Dave.

Dave: If you appreciated today's show, all you got to do is go out there and find some quality mushroom extract and quit buying the cheap stuff because it doesn't work. Have an awesome day.

Check out the next episode of Bulletproof Radio because we got something really special coming up for you. I'm not going to tell you what it is. If you haven't had a chance to check out bulletproofconference.com, go for it because October 23rd through October 25th in Pasadena, California, we're going to have almost or about a thousand people showing up to the Bulletproof Conference to hack themselves, to play with big toys and to hear from some of the world-leading scientists about how you can improve your cognitive personal and physical performance. It's going to be fun and you get to hang out with cool people anyway.

Join me there. I'm excited about it. Have an awesome day.



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