Danny Lennon:

So as a way to maybe introduce our topic, I thought I'd actually hand it over to one of our quack asylum favorites that we've maybe discussed on before. And much of his claims will be discussed today. And this is from a segment of Dr. Mark Hyman's podcast, where he is talking to a member of his team that works at his clinic on how they deal with some of the detoxification issues we're going to talk through today. So I thought maybe as a way to introduce what we'll talk about, he can do a better job than I can.

[Video Clip]:

And today we're going to be talking about detoxification and toxicity and the burden of toxins in a world. Now it doesn't relate to a specific condition because toxins can cause a whole range of problems, right. And, and we're going to get into the details of it. But first I want to welcome you to the Doctor's Farmacy, Megan.

[Video Clip]:

Oh, thank you. I'm happy to be here. And I'm excited about this topic. It's a really important one. And one we see, you know, really impacting so many of the people we see here

[Video Clip]:

It's really true. I mean the two things that are just blank spots in medical education are Buddhi medicine mm-hmm <affirmative> believe

[Video Clip]:

Unfortunately. Right.

[Video Clip]:

And the whole issue of toxins in health. Yeah. So when I was in medical school, we learned about acute toxicity. You, you know, took a drug overdose if you got an acute exposure to a pesticide or heavy metals, but we learned nothing about chronic low-grade toxicity from the 80,000 plus chemicals that have been brought into our environment since the turn of the last century, including pesticides, plastics, SS, BPA, flame, retardants, you know, herbicides glypho, I mean, you name it. We are just inundated with chemicals. Right. And I remember when I was, was researching a book many, many years ago, I found this study that looked at fat biopsies. So people got liposuction, or they had a breast reconstruction or ma mastectomy. They would send the tissue to go be analyzed. And they found that every single person in the study was a toxic waste dump. Yeah. And they had things like D D T, which isn't even out there anymore in the marketplace. Right, right. And PCBs and heavy metals and dioxin and all these PCBs, I mean just nasty stuff that is stored in all of us.

Danny Lennon:

So maybe quite a lot of calls for concern, given that "everyone is a toxic waste dump" and there's "nasty stuff" in all of us. So we're going to investigate some of this because as, as noted, there is maybe something to this. And of course, I'm sure it won't be lost on you. That one of the, this is the second of two major blank spots in modern medicine, along with the lack of understanding that food is medicine. Yeah. So let's, let's think about what the argument we're actually talking about today. So there's a number of things that people may see related to like obviously quackish products like detox teas and so on. That's not really what we're discussing. We want to get into maybe a more deeper argument that has maybe some basis and something along the lines of, we are going to come into a lot of these different environmental toxins.

Danny Lennon:

And some of that is through the food that we're exposed to. Other things are in the environment and these things can accumulate and compound in effect over time. And then the proposal is that this can cause a series of symptoms and then even chronic diseases. And so by having an ability to remove these toxins that would leave us in better health and this removal of toxins we could think of as a detox diet, a detoxification protocol, a detox plan, you'll see a whole host of different names, but it's the same idea that through a certain intervention that's typically centered around changes in food or nutrients or supplements, we can enhance this detoxification to get rid of these environmental toxins that are going to be problematic. Right. So now of, of course, as we just said that it's not just a case where we're talking about like a juice cleanse that someone's going to see on TikTok, which I think our audience is smart enough to know is obviously nonsense, but there is some areas where there might be some credence this right, in that we clearly know that there are these environmental toxins of these different chemicals that are in the environment.

Danny Lennon:

We know that industrialization modernization has increased the number of these over time. We know that within the body, there are these pathways that we'll probably discuss related to detoxification. And as we'll probably discuss as well that nutrients of course have some degree of a role. So there is a basis to make some sort of claim. And I think the final aspect we'd add in addition to there's these environmental toxins around, they can get into the body and accumulation of them, we can propose, could be problematic. One of the other things. And I think the last clip I'll play before I'll get you to talk about some of this is in relation to people that will be clear to try and make the position that they're not talking about something nonsensical, right. Because it's, I'm sure people listening will have seen this

thing on social media where someone says you don't need a detox protocol because you have one of these, right.

Danny Lennon:

And they'll show a picture of a liver. And one of the pushbacks that someone might have to that is like, okay, look, we accept that there is detoxification pathways in the body, but our position is that actually to enhance these pathways, we can do some type of diet or supplementation. And so just as example of this one clip that I wanted to show to tee this up is, is from a podcast that included Chris Kresser talking about detoxification protocols. And this is getting into the idea of whilst we do have a natural detoxification system, we may still need an outside intervention or very specific type of protocol to get rid of some of these environmental toxins.

[Video Clip]:

The problem is that, although we do have natural detox capacity, that capacity evolved during a time when the toxic burden was far, far lower. So we, again go back to this idea of ancestral health. In our ancestral environment, we didn't have exposure to massive amounts of heavy metals like lead and mercury through, you know, industrial contamination or cadmium or arsenic. There's naturally occurring arsenic in some foods. But you know, the amounts that we would've been exposed to are nothing like what we're exposed to today. We didn't have pesticide and herbicide exposure, things like glyphosate. We didn't have industrial chemicals like flame retardants and the chemicals that come from jet fuel. We didn't have indoor mold and other biotoxins that form when living in indoor environments, of course they're outdoor molds, but they don't have the same impact on our health.

[Video Clip]:

Because they're dispersed, you know, you living in an outdoor environment, that's spreads around in the air and those molds actually often tend to be different as well. So we didn't have the massive toxic burden that we have today. And so our natural detox mechanisms did not evolve to deal with the toxic burden that we're facing today. And evolution is not fast. So our genes and our, you know, physiological systems cannot change quickly enough to keep up with the massively growing toxic burden that we're experiencing. So that's one of the main issues is that, you know, if you, if you, if we consider what determines whether somebody detoxes appropriately, one of the main factors is the burden of toxins that they're exposed to. And the higher that burden is the harder the detox system will have to work. And the less likely it is that it will be able to perform as well as it, it needs to in order to clear all the toxins out of the body.

Danny Lennon:

So before we maybe dive into any specific claims or before we even talk about detoxification generally what are the typical things you see in this area? Is there anything you would add to that initial introduction that you would maybe frame the rest of this conversation with?

Alan Flanagan:

Not as far as any of the, I guess the claims that have been made, but, you know, since, since a common feature of these episodes is trying to help people to start to pick up on themes that they consistently see with quackery. I think to that we have mentioned before, but I think bear repeating again, before we get into the discussion here is the first being this jump from stating what is, you know, just maybe a physiological fact, not necessarily controversial one in a way that is implying that there's some sort of

additional, you know, meaning or as if that statement is itself evidence of a specific need or a specific intervention being required. So, you know, as an example, they're saying, oh, we have these systems and they need this support.

Alan Flanagan:

Well, it's literally like claiming that, you know, we have, we need nutrients for bone formation and bone health over time, or we need nutrients for skeletal muscle growth. Like it's literally not actually communicating anything other than making the bold statement, but the statement is made in such a way that implies that there is this additional intervention required or something specific required that you're not currently doing. And then, you know, related to that is this is this conflation between a potential mechanism and a potential effect. And as a corollary to that, a claim between a potential exposure and a potential outcome. So generally what they're describing is an exposure, oh, we have these things in the environment, right? And they're, they're leaving the inference that people will walk away with as, oh, these things are bad and they will lead to adverse health outcomes.

Alan Flanagan:

What most of these people, in fact, none of them that I've ever seen will actually do is link these exposures to actual outcomes, whether that's the, you know, major chronic diseases, we tend to be interested as it relates to nutritional exposures, cardiovascular disease, types of diabetes, neurodegenerative disease, or otherwise. So it's really important that when people are scrutinizing claims being made to think, well, hang on, has a mechanism here just being described in terms of an effect or has an exposure been described as if it's implying that there's outcomes related to that exposure, but those haven't actually been described. I think that it's just so common to see those kinds of framing of arguments made in relation to both the function of detoxification in the body and the specific nutrients required

Danny Lennon:

That might lead us into a good point to jump into of, of thinking about, well, what is detoxification? Because as you say, if this is a typical process, we have pathways for detoxification that goes on in the body and even thinking about what, what toxins are, there's obviously could be an endless list of things given. It's just something that's going to be harmful within cells or within tissue, et cetera. That if we think of like, people are probably very well versed in thinking about, say alcohol, and if you have alcohol that is going to be a toxin within the body, and there is an ability to detoxify your body of that. And that's the process of breaking down alcohol which will go through the liver and we have this formation of acetyladehyde, et cetera, et cetera.

Danny Lennon:

So we, this process that we talked about in the alcohol episode, where we take toxin and we can detoxify that. And so it might be worth getting into some of the details there, because often the framing of these certain protocols starts out with a discussion of something like these different pathways of detoxification in the body, particularly at the point of the liver. And then using that as a, like, you alluded to using that as support for the following protocol. Even though those things may be completely divorced. So in terms of, first of all, what we do know what are some of the, maybe from an overview levels, the main things we should know about detoxification, the role of the liver, this phase one phase two pathways that people probably get will hear about if they look into some of these protocols.

Alan Flanagan:

Yeah. So, you know, detoxification is a normal bodily process. I think one thing to bear in mind for people listening is that the term toxicity indeed the field of toxicology it is something that is not necessarily that applicable to nutrients, mostly, you know, detoxification use the alcohol example or drug metabolism would be another area where these processes that I'll describe are, are very, very studied, you know, in depth, to understand how a drug, you know, behaves and is processed and ultimately eliminated in the body with nutrients, we know that there's a bell curve of activity from deficiency insufficiency. Then we have our range of adequacy, and then we can have, you know, excessive marginal, excessive intake and what would be termed toxicity. Now there is toxicity potential for things like preformed vitamin A, retinol and there is toxicity potential for other nutrients, but there they are in fact rare instances unless someone has outrageously supplemented, or there are well known examples for you know, different life stages and conditions. So pregnant women, for example, would be told not to overdue eating liver because of work concerns over the high levels of preformed vitamin a in it. And this, you know, is the problem, I think, in some of the conversation that quacks use, because they're taking this detoxification, right. It's a very, you know, wow, like real complex sounding term. And, and it's, it's almost implying as if normal digestion absorption and elimination of nutrients, you know, is some sort of like toxic process. And this is of course what they're pushing with a lot of these environmental exposures. But most of their concern is, is environmental exposures. And, and we'll talk and think about that. So with any compounds that we have food or drugs or alcohol, we tend to have a few phases.

Alan Flanagan:

And anyone that kind of, you know, goes through a bioscience degree will probably have that acronym of A.D.M.E. Absorption distribution metabolism and elimination or excretion. And so primarily what we're thinking about here is absorption metabolism and elimination as it relates to detoxification. Okay. So we'll have that initial phase of absorption and the liver is important for this process because of a process known as first pass metabolism. So if the compound that's being digested and absorbed is a drug, for example, it will go through the liver and a certain amount of that drug will be depleted. So drugs are designed to account for first pass metabolism. So that what comes through this first pass through the liver is a sufficient active dose of that drug. So the liver has a number of functions here obviously from a nutrient perspective, there's other things like bile production, glycogen storage or lipid regulation. But we're not necessarily concerned with those today. We're concerned more with these processes of detoxification. And so we have this first phase of absorption we've got this compound or nutrient or potential environmental pollutant, for example, now in circulation, shall we say there's two major processes that are regulated by the liver; two phases, as you mentioned, phase one and phase two that are involved in processing these compounds right. Now, the, this is not applicable to nutrients. This process, these are processes that are because nutrients are recognized as such by the body. So they are processed differently. The processes that we're describing now are for what we would call "xenobiotic agents", right? These are non-nutritive compounds that the body doesn't recognize as nutrients. And then we'll process then through these phases in the liver and the two major ones, phase one and phase two involve different processes.

Alan Flanagan:

Phase one typically takes compounds, many of which are what we would term lipophilic, which means they have an affinity for fat they're often bound to fat. And again, claim that is a grain of truth in some of the quack arguments, is that yes, a lot of these compounds tend to be fat soluble. Yes. They tend to

be easy to store in, for example, adipose tissue. The phase one process is best thought of as conversion. So this is primarily orchestrated by a group of enzymes known as the cytochrome P450 enzymes. These are major enzymes involved in metabolism of Xenobiotic agents in the body. For drugs, this tends to be predominantly through a specific enzyme known as the cytochrome P450 3A4 enzyme. Now there are different enzymes, all with a different numeric and alphabetic combination, and we don't need to get into them, suffice it to say that this entire enzyme system, the P450 system is the major enzymes involved in phase one metabolism.

Alan Flanagan:

And that phase one is primarily converting through various biological processes like hydrolysis, for example or oxidation or reduction. So these biological processes that are transforming the original compound into a reduced or oxidized version of the initial compound, right? And then what's happening then is that compound is then getting passed to the phase two or the second phase of this detoxification process. And this is a phase known as conjugation, and there are five [six!] different conjugation pathways there's amino acids conjugation, glutathione sulfation methylation acetylation and glucoronidation. And again, you don't necessarily need to like learn all of these off. The reason they're called those different names is generally related to their requirements. So for example, we know that certain amino acids are sulfuric amino acids, like the amino acid methonine or cystine.

Alan Flanagan:

So sation conjugation, just as an example of why these are called, these names is called. So, because it requires those two particular amino acids that I just mentioned methonine and cystine in order to, to, to function. So it's, it's termed that amino acid conjugation pathway requires the amino acid glycine. And you're seeing a theme here. Most of these phase two pathways will, a lot of them rely on amino acids. Some will require essential fatty acids, and some will require acetyl COA, which we obviously have involved in energy production. And there may be other nutrients vitamin C or B vitamins that are required for the function of these, of these liver pathways. And conjugation is best thought of as if phase one converted a compound into a an oxidized or reduced version of whatever the parent compound is. Conjugation is one of these five pathways, basically binding to that conjugating with that compound, in order for that compound to then be successfully eliminated. This typically involves changing these compounds, which as I said, when they are absorbed are fat-soluble or lipophilic, and it's turning them into hydrophilic compounds, i.e Water soluble so that they can be excreted primarily in urine. And so this is a process to simplify in sum of we have absorption metabolism and elimination. We take in compounds that are not nutrients that are xenobiotic agents, so that could apply to a drug that someone's taking for a specific condition could apply to alcohol, could apply to environmental pollutants. The liver then has these two pathways. The first essentially is a conversion process. And that's from a group of enzymes. Like I said, that are known as the P450 family of enzymes and they convert these products. And then the phase two stage of detoxification is going to lead to elimination. And that involves five different pathways, all of which have slightly different makeups in terms of their activity and the substrates that are required to form and produce and act and have these pathways function. And that is best thought of as a phase of binding to the compound produced by the phase one conversion in order to then make that compound ready for elimination. And the compounds are then eliminated through primarily through urine.

Danny Lennon:

And I think people that did listen to our 'Alcohol and Health' episode may remember something similar that fits in with the, exactly that process. You laid out where we have this toxin alcohol, and you get this breakdown into acetylaldehyde you have this conversion into acetate. And then in turn eventually gets down, converted into carbo dioxide and water, which then can be easily eliminated. And so this is following along this process. There's also, I think, an important point to touch on here. And maybe I can give an example, because it's something that you reference at the start of this episode, but also we've mentioned a number of times in previous episodes of there being this real basis of everything you've just discussed, discussed in terms of these two phases, people will see in various discussions about detoxification protocols and stuff that we may see as pseudoscientific all start out with the exact same things that's just been said.

Danny Lennon:

And so they're rooted in this thing that we've just said is physiologically factual, what is going on. And there tends to be at some point, then a jump from there into a certain recommendation or piece of advice around a dietary or supplemental intervention that is going to have a health outcome based on what you've just said. So one example that we'll probably come back to and that we'll discuss later probably relates to glutathione, which is one of the darlings of some of this area is if we were to take an example of maybe a pseudoscientific approach to some of what you just said, someone could say, "well, we have this glutathionation that goes on and that's involved in heavy metal removal." They'll mention, as, as you did glutathione conjugation, is a root of phase two detoxification in the liver?

Danny Lennon:

They'll then typically point out the role of certain nutrients in some of these pathways, right? So you mention that there's all these different enzymes involved here. So they might say, well, there's certain nutrients and certain foods, maybe that's dark greens, for example cabbage, broccoli, et cetera, that we know are inducers of this glutathione conjugation. And then they will then point to maybe things like, well, this glutathione that we mentioned is supported by N-acetyl-cystine selenium, alpha lipoic acid, and there's a whole list of others. And then they'll eventually get down to a point where saying, so the treatment that we're going to give for someone is in order to remove heavy metals from you, you need to go on a glutathione IV drip, you need to take high dose supplements of selenium and N-acetyl-cystine, glutamine, whatever it is. And there's a list of them that we'll probably discuss a bit later on. And so they're taking something that's rooted in what we know about these two phases of detoxification at liver, looking at some of the nutrients that may be involved in that pathway, and then jumping from there to a recommendation; food wise, or supplement wise that is promising to help a health outcome. And that, as an example, exemplifies much of the disconnect between that... that line between accurate science of what we know versus maybe a pseudo-scientific protocol out the far end.

Alan Flanagan:

Yes, absolutely. And, and that is one of the most common themes in any of the quackery that we've discussed is this jump from, well, Hey, glutathione requires these three amino acids, you know, cysteine, glutamine, and glycine, you know, in addition to there's these other compounds that you mentioned that are involved in regeneration of glutathione and most of this just being mechanistic. So it's like rather than then ask, is there any, you know, human outcome data, or do we know that like, if this is provided that there is this intended effect, there's this leap straight to, well, you know, these amino acids are found and these foods, therefore you want to go on a "protocol" as they call them where you're emphasizing these foods, you know, as if that's almost some sort of immediate guarantee that

you're now having some sort of specific effect on one of five pathways in a specific phase of liver of a perfectly normal function of the human liver. As far as the detoxification of these compound goes. So yeah, it's this enormous leap of faith that they're hoping people make with them.

Danny Lennon:

So maybe as a frame for some people, when we're talking about, well, what particular toxins commonly come up? We we've mentioned heavy metals are a common one for people to look at mercury, lead, arsenic and so on. Then there's a number of different chemicals that are termed endocrine disruptors. So that will have some sort of impact on the endocrine system. And you'll hear this from certain pesticides to parabens, to dioxins, to BPA we could get into maybe some of the specifics a bit later on, but a collection of these different chemicals that we know are environmental toxins. And then in, in order to look at what some of these ways of removing them or enhancing detoxification or supporting detoxification that comes along, there's a couple of different groups that we can look at what gets proposed, right? Some are just food or diet recommendations that typically take the form of a specific detoxification diet.

Danny Lennon:

Let's say, then others are supporting supplements. And then we have some other interventions we can discuss a bit later on like the IV vitamin drips as an example, or using a certain cleanse or coffees, et cetera. But primarily if we're looking at foods and diet, and then some of these supplements, I think one of the interesting things, when you see what gets put forward is they're very difficult to to test, right? So someone comes along with the mechanisms that you've just outlined and saying, well, look, we know that these pathways are supported by these certain micronutrients or even phytonutrients are in plant foods. And so now we're going to put you on a protocol where we're going to have lots of fruits and vegetables that are full of these phytochemicals. That's going help you with your detoxification. We're going to get used to stay away from these environmental toxins.

Danny Lennon:

You're going to only eat organic food, et cetera, et cetera. And then with all, with all this, then we can look and see, does this person report feeling better? But of course, there's obviously a clear problem if you then were saying, well, the reason why this person feels better, if indeed they do is cause lead down to us, enhancing their ability to remove toxins. And that's what caused this benefit as opposed to these other dietary changes. And then secondary beyond that, are we getting a benefit from targeting detoxification above and beyond what someone would get from eating the type of dietary pattern that we discuss ad nauseum here of primarily lots of fruits and vegetables and other plant source of food? Is that probably like, is there any enhanced benefit from targeting detoxification pathways specifically? And I think that is never really addressed. It's just almost presumed to be

Alan Flanagan:

True, to be true. Exactly. And it relates to this we've probably mentioned this like truism before that, like I know is probably repeated to med students over and over, but this idea that, you know, when you hear hoof beats first, think of horses not zebras. What we see with this conversation is quacks trying to convince you that what you're hearing is a zebra, <laugh> going outta their way to get you to ignore the low hanging fruit or the fact that it is in fact likely a horse. So and how this plays out for example is your they're they're. Then they're leaning on these really niche explanations to explain diseases where we

have much more, not just plausible, but evidentially supported reasons. So you played that clip clip from Chris Kresser earlier later in that clip, he goes on to talk about lead and heart disease.

Alan Flanagan:

Now, bearing in mind that this is an individual who denies that LDL has any causal role in atherosclerosis and heart disease who dismisses the saturated fat and heart disease literature. So here's someone taking from a nutritional standpoint, the and point the the best supported intervention someone could do to reduce heart disease risk and not believing it and dismissing it, and then getting them to focus on something like lead and detoxification. It's, it's, it's an example of the danger of quackery as far as practice goes, because you're getting someone to major, not just in the minors, but in a minor that may not even be relevant whatsoever at all. So I, I think that's, I think that's a problem that plays out in this is this, this this, yeah. This tendency to, to major in the minors with the focus on, well, we have this evidence for this environmental exposure and it's, it's, it's a negative and so we don't want it, so we need to focus on eliminating it.

Alan Flanagan:

So here is how you eliminate it. Well, we need to step back from that and ask two major questions. The first is, well, what's the nature of the exposure. And how does it add up to this potential disease outcome? And then the second is what's the nature of this actual intervention that they're asking people to do, or that they're recommending in with their, you know, quote unquote protocols. So in relation to the first question, what, one of the things about any of these compounds as they exist in, in the environment, which they do is they talk about them as if they exist in some sort of lawless framework where they're just admitted you know, oh, we've got fire retardants. Okay. <laugh> like, so the fact that you've, you know, a fire, you know, or hydrant potentially like in your work office or something, and it's sitting there in the unfortunate event that a fire happens, like, is that a risk?

Alan Flanagan:

These are compounds that because of their chemical nature are subject to, you know, a lot of maybe America is obviously different with their odd approach to the concept of regulation, but certainly in, you know, the European union and elsewhere, a lot of these compounds are highly, highly regulated. Some of them are banned. Some of them are persistent pollutants, i.e. Even if they have not been used, like DDT is a good example. If they have not been used in a number of years, they can still crop up in the environment. Okay. So then the question we need to ask is if we're thinking about risk related to toxicity, potential of you know, environmental pollutants, well, risk is always a combination of the hazard, the nature of the hazard multiplied by the extent of the exposure. Okay. So if something has a small potential for hazards, but you've got a very high exposure to it.

Alan Flanagan:

Well, that can add up to an increased risk, right? And, and this is, this is something we've talked about before, when we see what people would argue are relatively or what they would criticize our minor relative risk reductions from nutrient, you know, a 30 percent relative risk reduction. And people say, well, that's nothing. Well in the context of, of food that you might only consume 30 grams of a day or every second day that is at is adding up over time. It is meaningful because the nature of the exposure in this case, it's not quite a hazard. It's better thought of it as an exposure. If it's food is actually a large exposure over time, because you have lifetime intake. Well with environmental pollutants, these have

much greater toxic potential. So they have a very large potential hazard, but their exposure actually in a day to day sense.

Alan Flanagan:

Now the quacks have to make it out as if you are literally drowning in this stuff. That's not necessarily the reality because they exist in a framework where they're regulated in terms of how they can be used. Like as Bestos, you can't build what that stuff anymore. Right. We know from like the lead factory studies and you know, that that lead exposure is not good for people, right? And these compounds have been regulated over time. So that people's exposure to them. You know, they talk about things like jet fuel, like are you standing in an airport all day, just inhaling jet fuel? We have to think about how the potential exposure of these adds up over time in a lifetime. And they, they don't do that level of due diligence to appropriately quantify what the actual potential hazard of these compounds is and what they then don't do is link that to disease outcomes.

Alan Flanagan:

So yes, you might have associations between certain environmental exposures and cardiovascular disease or neurodegenerative disease, or even type two diabetes for example, but they tend to not really be anywhere near, as robust as associations for the established risk factors for those diseases. And that's why you don't see them as the major risk factors for those diseases. Even the one that tends to attract the most focus is neurodegenerative disease, because there's a big focus on a lot of these compounds being neurotoxic. But even when you look at that literature, there's really not good evidence that upholds the hypothesis that you'd get from animal models or in vitro studies that these compounds potentially slightly, slightly more for Parkinson's disease, but on the whole, no real strong evidence compared to other environmental or indeed nutritional or genetic exposures that, that these compounds add up to that risk.

Alan Flanagan:

So I think that's, that's the first thing that we really need to be careful with here is they're throwing out all of this, you're exposed to this and that and this and that, and it's all toxic and you're just swimming in this stuff every day. And it's like, step back from that a bit like are you standing on the airport, inhaling the sweet smell of jet fuel? Like, you know, and so really what they don't do is quantify what that hazard is. What is the genuine exposure to that people have in the population and how do these exposures relate to disease outcomes? And they never actually paint that picture for anybody because if they did really, the whole thing would fall apart and we'd realize that we're listening to zebras to horses and not zebras.

Danny Lennon:

Yeah. So, so I think it to Steelman the argument, they may say, you're absolutely right, that we need to look at. Not only what are these sources of toxins and because undoubtedly, they can be deleterious to human health. I don't think anyone's saying there's no such thing as mercury poisoning, for example. And they may say, well, what we're saying is that the taking into account chronic long term exposure, even when we don't have an acute a poisoning, let's say of a heavy metal, this long term accumulated chronic exposure can be problematic. Now the, I suppose the thing we could look at then, as you say is, well, there's a number of further questions we should maybe jump to before, oh, presuming this is bad because we're going to be exposed to all these pollutants. And, and this is something we touched on in

the GMO episode because we talked about things like glyphosate or, or pesticides and so on, or even GM foods.

Danny Lennon:

But particularly if we're looking at, say pesticides, for example, on these residues that people are concerned about, we talked about how certain safe levels of those are determined and then how we can compare that to someone's average exposure over time. And then see if it's a problem, as opposed to thinking, the only way to be healthy is through zero exposure to any environmental toxin, which is just not going to happen. Right? Yeah. So we can hold the fact that these things can be problematic for human health at certain levels and for certain periods of time. But then we can look at well, what is the actual exposure that you and I on a daily basis are related to? And in, particularly with something related to detoxification that we take into account is that we know some of this is getting cleared all the time. So the bigger question is not, are you exposed?

Danny Lennon:

Is, are you exposed in such a high amount that you are taking in and accumulating more in your body than your body is actually able to clear through the detoxification we just talked about within the liver? And if so, is that leading to some sort of deleterious health outcome or at least the ones that are being claimed for like literally every chronic disease, everything yeah. Or just a range of symptoms that are, are quite generic. And so being able to look at those two things is an extra layer of investigating this initial hypothesis that the amount of toxins we come into contact with in our daily environment is problematic. Because we cand it'll depend on who you talk to, but I mean, some of these claims are around, no one should ever use toothpaste or non-state frying pans or plastic containers, deodorant ever. Yeah. Because all of these things are, are too much. And, and so that's the question it's like, is using this creating too much of, of a burden in, and then leading to disease. And I'm not sure where they're pulling actually that connection or it's just, again, mechanistic, speculation.

Alan Flanagan:

It's the assumption. Yeah. Plastic is the new soy. And it <laugh> just pull down your testosterone levels. Yeah, these, and this is the problem there, there's that leap of faith from what they're describing to all of these interventions and behaviors and protocols that people are apparently required to do in, in order to combat this, this exposure when they haven't done the, and again, like for people listening, it was a point I was trying to make the other day in relation to quackery that you don't necessarily need to have domain specific knowledge in order to come away with the bullshit radar activated. So in this case, you know, what you would be hoping, you know, what we would hope you would think when hearing these claims is that they haven't even done the preliminary discharge of the burden of proof that of, of telling you why these compounds and at what exposure levels are associated with disease outcomes.

Alan Flanagan:

They've just said, these compounds are in circulation. You're exposed to them every day. They cause death <laugh> they cause disease and you need to deal with them. Right. And I know, and I know that can sound like an attractive sequence. And often it might seem logical. You know, here's an exposure, these things are bad. These things cause disease. Here's what to do about it. And I think to, to people listening often, that would sound like a logical sequence. But what you have to ask is hang on, have they discharged even the most basic burden of proof that this exposure, what are the levels I'm exposed to,

are these levels the levels that we would see a disease process at and are these exposures even related strongly to these disease outcomes that they're claiming? And the answer is often and mostly no.

Alan Flanagan:

And, and this is, this is a real problem. I think for the functional medicine space generally is, you know, as, as a field, they tend to, you know, reject LDL and think about inflammation. If it relates to cardiovascular disease, you know, with neurodegenerative disease, you know? Yes, there's no real drugs that are effective interventions yet for Alzheimer's and dementia. I think there's been a little more, more progress with Parkinson's, but, you know, overall, we don't really have the interventions that we would have for lipid lowering. But we do have strong genetic, you know, people with APOE four, for example and you've got these people running off talking about some random environmental pollutant, you know, type two diabetes, chronic overnutrition fat accumulation in the liver spill over all this stuff we talked about in the last episode like that you would focus on some sort of accumulation of a toxin in adipose tissue over that. Like it's such an absurd distortion of the, what we know about these diseases and what the major risk factors for them are that you would have someone start to focus on this stuff rather than think about the actual main determinants of these diseases and their risk factors for which we have pretty good evidence what those major risk factors are.

Danny Lennon:

And as an example of that, and I'll include the full details for people in the, in the study notes for this episode. But the Institute of Functional Medicine actually have a, what they've termed a detox food plan that they have available for their practitioners to prescribe to their patients. And it goes through a whole plan of basically this diet that you put them on and they're supporting supplements. But when you look at the, some of the, and I'll put the exact terminology up on, on the detailed show notes, but they say in this, "it places a stronger emphasis on eating clean foods for life, reducing food contact with plastics or other potential contaminating elements and eating organic foods when possible." It then talks about some of the stuff we've just said of these various amino acids that may be involved in detoxification and uses that as a rationale for advising healthy protein based foods.

Danny Lennon:

It then talks about some of these other phases of detoxification and that why phytonutrients are important. So we advise a range of vegetables at this particular time, and then they also have certain foods that they designate as therapeutic foods. And so for as one example, they list coconut oil as a therapeutic food in this sense, because it "contains medium chain triglyceride that provide energy sources to the gut and liver, particularly when undergoing a metabolic detoxification". And within this overall plan, then you look at it and they they've listed that the goal is to consume eight to 10 servings per day of non-starchy vegetables to "aid in liver detoxification and the elimination of toxins from the gut". But when you think about, if you are able to get someone to start consuming eight to 10 portions of fibrous vegetables, that is a really good overall dietary pattern.

Danny Lennon:

You presume, in addition to this high quality protein that they recommend for the amino acids that are involved in detoxification, as opposed to other benefits. And so, again, the big thing is if someone is benefiting, is it from them getting a diet that now has a high amount of vegetables, fruits, this's, protein, fiber, et cetera, everything that following this plan would, or is it from the fact that they avoided pesticides or plastic packaging and took certain supplements, et ceteragain, it's where, where would you

hedge your bets? It it's like picking the one that has the least probability of being accurate. Yeah. The exactly strange thing, you know?

Alan Flanagan:

Yeah. That's, that's the, yeah, it's the, it's the, the horses and zebras, like they're asking you to think that's someone, even if you look at the stratification of, of risk reduction in epidemiology relative to servings of fruits and vegetables, if you were able to hit in the region of 10, like that is where we would see the greatest magnitude of effect in any cohort study for most of these disease outcomes that we're talking about. Right. So even, even just to steal man, this idea as well, right? So one of the, in the fish episode, one of the points that we mentioned in relation to mercury was some of Martha Claire Morris's research where they did brain autopsy studies comparing brains of people who died with dementia or Alzheimer's to brains of people who died healthy from a cohort that they had in Chicago.

Alan Flanagan:

And the people who ate fish had higher levels of brain mercury <laugh>. They also had lower risk of being a brain with Alzheimer's because of the other beneficial compounds that they were getting from the fish and probably other obviously constituent nutrients in the diet as well. But, but that's an example of, you know, the actual food intervention likely being the reason for potential risk reduction. If we're taking this vegetable example, as it relates to like carcinogens or heavy metals, let's assume that someone is not eating any sort of these 10 servings from any organic sources, like they're, they're buying this off a supermarket shelf where it's being transported in a truck, probably sprayed with the pesticides and stuff that the quacks are going, going on about. Let's assume there's nothing organic about these vegetable and fruit servings, a day 10 servings of vegetables and fruit from non-organic sources that apparently have the idea that we would expect to see a potential adverse effect.

Alan Flanagan:

It's, it's absolutely unseen. <Laugh> in the wider epidemiology of diet and disease that this is the one food group that no one apart from the extreme Mors in the carnivore crowd would, would debate is, is good for human health. And so there's no question that there would be a positive impact on health based on available research. There is almost no question that someone would benefit from consuming 10 servings of multicolored non-starchy vegetables and fruits every day. And the idea that the presence of, you know, pesticides, for example, would somehow negate that benefit or that you would get a greater magnitude of benefit from organic. Just isn't something that we can say from an evidence based perspective at all. And I, I find it just an example of where that argument that they make just really falls on its head, because of course there is going to be a benefit to consuming that level of vegetable non-starchy vegetables and fruit in the diet. And of course there are myriad, nutrient, and phytonutrient or phytochemical compounds that will be provided by that consumption level. And that's where the benefit lies <laugh>.

Danny Lennon:

Yeah. I mean, because the natural extension from their argument is that okay if we're saying these certain nutrients for that are found in various different food groups, let's say these dark green veg that they are involved within these detoxification pathways and we even keep it specific to that. And then the presumption is, well, if you're consuming, let's say conventional produce and you use plastic containers when you're finished cooking it and use your non-sick frying pan and you consume farmed fish, all these things that they're saying don't do, if you're doing that all these vegetables water. Yeah.

And if you've got all these nutrients coming in, the presumption then is okay, so is it now the case that your detoxification system in the liver is not functioning properly or that there's too much toxic? Like these are claims that there is no reason to think is because that's never been quantified.

Danny Lennon:

So it's just a very strange position to have. But nevertheless that's where we are. I did find it quite interesting cause I did come across one study. This is by Davisson & Sofka. It's a 2019 paper that was looking at essentially gets as close as this question of maybe, well, who does go for something like a cleanse detoxification diet. So it was a cool little study. They did that. They found people in Appalachia and they set up a local community based program that they knew could benefit basically anyone's health. So it was a healthy eating program, but basically they called a cleanse detoxification diet, a three week protocol that people could sign up and do. And from that paper, a link to the full thing. But the interesting part was that they said "while participants in Appalachia could benefit from a program that could improve health, this program's participants did not share socioeconomic characteristics reflective of most people from that area, most were college educated females with a reported family income and level of education that were far higher than the average population". And this is the go to show. This makes sense. When I look at so many of the functional medicines protocols that are out there that are unbelievably expensive, require a shopping list that is going to be difficult to acquire and difficult to pay for and is, as I think you've referenced in many of these conversations is targeting basically the worried well that people have the least about their health concerns. So now we need to invent something that you can focus on and think that you're getting a health that is superior to anyone else. And at least that's what I glean from that particular paper. Well,

Alan Flanagan:

A hundred percent it's, it's that that's a paper basically, you know, highlighting go culture. And there is, you know, I think we've talked about this before, but that there is, you know, there is a very kind of, you know, an obvious gendered component to to people who are susceptible to quackery. And, and there is some I guess, sympathy that, that, that, that needs to be extended here because I think with, with the reason why much of this nonsense is really targeted at women is to be fair. There are a lot of female specific conditions for which conventional medicine doesn't really have any good answers for right now. And women are under researched as participants in intervention studies certainly as participants in, in medical intervention studies and there are enormous gaps in relation to women's health in, in the medical literature and with conditions like polycystic over ovary syndrome with endometriosis, uterine fibroids, and some of these other conditions where people really struggle and they don't get answers from the conventional space.

Alan Flanagan:

Of course, people are going to be trying to take their health into their own hands and if they have the financial means to do so, you know, they're often in a position where they're easy targets, unfortunately for a lot of this rhetoric of, of quackery and obviously willing to part with money in order to try and help improve whatever underlying condition they they may be dealing with. And you know, I think that's, I think that's the great the great hypocrisy of things like go culture is when it's portrayed as empowering women. It's absolutely not at all. You know, it's entirely disempowering to be convincing people that, you know, you're, you've got the solutions to their problems when in reality, what they keep doing is just spending more and more money on useless interventions, protocols and products, eh, to get very little to nothing by way of an outcome that's meaningful.

Danny Lennon:

Yeah. And unfortunately much of the quackery and the wellness space skews that way. And, but then on the other side, we do have of course the carnivore community and the only skewing highly towards...

Alan Flanagan:

Jacked white men in America.

Danny Lennon:

<Laugh> yeah. That's it primal urges to fight and live like we did in ancestral times. One final thing that I thought might be a nice way to end this because this is a specific type of toxin, but one that I came across and I think the only word I could describe to you for some of this is unhinged unhinged, as we've just mentioned our carnivore community. This was actually on a carnivore based podcast. The, with Paul Saldino and his guest is a guy named Evan brand. I believe first time I came across this, but this was what was referring to a detoxification protocol in relation to mold or microtoxin toxicity. There's a whole host of wild things that we could have discussed here. But I'll lead off on first, a framing of this, of, of how he discusses mold, being a problem and how we might need to stay away from that. And some of the potential interventions, one could go through of using what he refers to as binders, which would be something like activated charcoal, which we can maybe discuss in a moment. But I I'll just play this and lead us into some of this.

[Video Clip]:

Now, how you win against this is if your rate of detox is greater than your rate of exposure. So if Monday through Friday, you're working in a clean office or at a clean home and on the weekends, you go out and you get these exposures, you should be able to make it and you should be able to stay well in certain people, they have to go and mold sabbaticals, where they just live in a bubble and they try to just avoid these moldy places for me, I just stay on a permanent sabbatical, meaning if I go into a moldy book store and I smell it or see it, I'm leaving because if I stay in there long enough, I may get depressed. I may get anxious. I may just feel dizzy. I may feel Spacey <laugh> now, most people are not that sensitive because they haven't been sick like that.

[Video Clip]:

But when you have a huge mold exposure, your bucket gets so full. That there's actually a name for it. They call it T I L T tilt. It's like tolerance induced or no toxin induced loss of tolerance. That's what it is. Toxin induced loss of tolerance. This can happen with pesticide exposure and chemical exposure. People that work in agriculture who got a big let's say they got hit in the face with a big amount of pesticide. Now, small amounts of pesticide, make them sick. This tilt phenomenon happens with mold. And so I personally stay on binders. I do a binder every night before bed, either activated charcoal or silica or pectin, or fulvic acids, my wife, we just got her urine run. And fortunately she's completely clear of mycotoxin. So we've completely cleared her out. It took us two years to do it, but we did it now, if you can totally get clean, maybe you don't need lifelong detox, but most people except for you, you're killing it. You're in fresh air all the time in Costa Rica. So like you're exempt, but most people that are in closed buildings all the time, they're probably getting exposed. And if you test positive in the urine, you're not detoxing it. Well, you should continue on with something. All I'm saying is like a 10, $15 bottle of activated charcoal, one capsule a night, like this is simple, cheap and effective.

Danny Lennon:

So this is again, nothing new compared to what we've just talked about. It's not something that is a thing, right? Yeah. It, it, there is mold. There are microtoxins. I think people listening may actually be familiar with, I think when Bulletproof coffee first came on the scene, one of, many of the big claims from Dave Asprey was around coffee beans are problematic because of levels of mycotoxin I think particular okratoxin A, and this is again, a reason why he had his own special beans that you could buy. But when you look at again, the question is not whether this thing exists or whether this thing is even problematic. It's about how, what is the, how much of this is present and how much are you taking in relative to what is a safe amount that your body can deal with?

Danny Lennon:

And is it leading to actually health issues as opposed to just noting, oh, well, there is this thing that could be problematic, so therefore just stay away from it altogether. And so this is very much the same thing, talking about these microtoxins of talking about ordering urine tests and seeing that these microtoxins are showing up in the urine again, is that causing a problem? And certainly is it causing the problems that are being claimed here of saying you can walk into a bookstore that has mold in it and you will get depressed after that. <Laugh> like, that is a claim that's being made. Like, I don't know how someone can genuinely make that claim with any serious intent and

Alan Flanagan:

It's difficult. Like people would hear that and not just step back and be like, ah, it smells like that smells like awful bullshit. You know, it's like that people would listen and be like, oh my God, that explained. And again, you know, they're often prey on people who are desperate and that, that is it's the great crime really of quackery is, you know, if someone is depressed and they're listening to that and they, you know, maybe they haven't got good answers or maybe they don't have the financial means to access, you know, professional therapeutic help. And they're sitting there listening to that and they suddenly jump at that. Right. You know, because, oh, okay. This guy's given me the answer that I, that I, that I have never had, it must be the mold. And it's like, that's, that's the crime of quackery is that, that someone with that indication could think that this nonsense is the reason that they're depressed or have anxiety. And you know, yeah. You'd, you'd wonder though, why anyone else would not think, wait minute, that really sounds like nonsense.

Danny Lennon:

Yeah. It creates a problem. And I think if people go to like the YouTube video for these things and look at some of the comments, as I said to you, it it's actually really sad to see because there's people getting so upset and worried because now they have just learned about a new problem that they never knew about before that, oh yeah. Now I have a mold issue and now I'm going to have to throw all the clothes I own and clear out everything I have and get rid of all these foods like it it's it's wild. And I mean, even, even unlike the same thing goes for the recommendations for things like activated charcoal of here, you take something where again, there's a grain of truth of activated charcoal can be used in some emergency settings when someone has a true poisoning in that it helps prevent some of that toxin getting absorbed into the gut.

Danny Lennon:

So it can be used in really high doses in an emergency room. But again, then someone's saying, well, each night you should take some activated charcoal to help you detox activated charcoal, isn't D discriminately picking out good and bad things. It's just preventing these compounds from getting

absorbed and the amount that you're getting in these typical consumer products, you would need to take hundreds of these capsules in order to get the dose that is used in a clinical setting. And yeah, it, it's, it's again, just the same, the same process that we've talked about through this whole episode of taking something that has this grain of mechanistic truth, and then giving a very clear message of your health is being harmed in these ways. And here's an intervention, whereas those are two things you cannot say based on what we yeah.

Alan Flanagan:

Yeah. And that, that, yeah, at the start we mentioned, like there's, there's two, two themes. There's the making an assumption that the exposure they're describing is the cause of the disease outcome. So exposure outcome you know, manipulation or framing. And then the other then is, is intervention and effect. And and I think we, you know, this is exactly what we're talking about here is like you say, yes, activated charcoal may be used in a clinical context that does not mean that popping a capsule night is going to make you clean of microtoxins. And similarly, you know, any of these specific interventions are not necessarily going to you know, the, the, oh, these foods provide these nutrients that are required for these pathways. Therefore there is this outcome, like, let's, let's just use, let's just use an, a contrasting example in relation to bone, right?

Alan Flanagan:

Like if I was to say to you or make a claim, well, if you look at bone, bone requires calcium and phosphorus and magnesium, so eat these foods and you'll have bone health. It's like, we would never think in that way, if I made that claim, most people would respond by saying, well, where's your evidence that actually consuming more calcium. So where are we to do that in the ordinary course, we would then start to talk about research and discuss the merits of the research in relation to calcium and bone health in human beings with outcomes, right. We would link the nutrient based plausibility to actual outcomes. I think because detoxification is such an abstract concept. People don't apply that just same basic standard to the discussion in relation to detoxification. It's the same way. If we were talking about protein and skeletal muscle building, for example, you know, if I made a claim that, yeah, well a diet with two and a half grams of protein per kilo of body weight is superior than a diet with with 1.5 grams of per kilo of body weight.

Alan Flanagan:

So you need more or something like that. You know, again, most people would say, well, is where's, where's, where's the data that those two doses on muscle growth in human beings, again, that's, that's maybe something that's more concrete as a way for people to think that their brain immediately goes to, well, where's the hu you know, where's your human outcome data to support this. Whereas I think because detoxification is quite an abstract concept, they're able to make those claims, oh, you need glutathione. So you need cystine. So you need these foods and people go, oh God, I must need that. Rather than stepping back and being like, wait, is there any evidence that me specifically inducing the glutathione pathway with said, foods and nutrients will lower risk of why disease outcome, and they never go to that level of due diligence again, because they largely can't.

Danny Lennon:

Well, let me give people maybe one last claim that they can listen to and use some of the skills we've talked about to see, can they detect if this is a valuable claim that is based in any degree of reality. So

this has come from that same conversation. And again, we're talking about mold and mold toxicity and some of the things that could potentially cause, so just see how evidence based these may sound.

[Video Clip]:

And this is one of the more interesting things that I've learned about recently hearing you on another podcast and talking to you is the number of symptoms that mold can present with. It's quite varied. And there's a lot of people out there who have anxiety or palpitations, or maybe are having these attacks that may feel like PTSD, post traumatic stress disorder, or, you know, higher blood pressures. And isn't it interesting to think that this could be mold? I mean, what's the spectrum of symptoms that mold generates in people. What is the most common? And then what other things do you see in people who are exposed to mold? These are obviously not not going to be, not every person who has these symptoms has a mold exposure, but I want people to understand that there's a, quite a breadth of symptoms that people can experience when they are exposed to this. And it's something to think about.

[Video Clip]:

Sure. Yeah. I mean, people call Lyme disease, the great mimicker, because it seems like so many other things and mold is in the same category as the great mimicker. If you put side by side, a table of Lyme disease symptoms, or coinfections like Bartelle and babesia, you put that next to mold symptoms. They're almost exactly the same. It could range anything from anxiety and panic attacks to depression, bipolar, schizophrenia, sort of mood issue. If you have rage, if you're angry, if you're abusive, you probably have Mo toxin. If they were to take a survey of all like domestic abusers and test their urine for microtoxins, I'd put a huge amount of money on the fact that 95% of them are going to test positive. In fact,

Danny Lennon:

So the claim there is <laugh>, this is it's, it's actually scandalous that someone is actually, yeah. Someone is, is let's just frame this, that this person is talking to Paul Saldino; a psychiatrist by training, and has made the claim direct to his face. That mold is the reason for 95% of domestic abuse cases. Like that is a scandalous, horrific, horrible, disgusting thing to say. And they're just talking about this as if, oh yeah, this is good information.

Alan Flanagan:

No other clip highlights had that that Saldino is whatever about his complete lack of qualification or expertise for nutrition and diet, the guy is supposed to be a trained clinical psychiatrist with a degree in psych that's his specialty. And he doesn't even stop there and flag that and be like, well, well, I'm going to push back on that a little bit. We like it's it's so it's, it's ju I think it highlights how just gullible and unintelligent Saladino really is. Like if you go back to the very start of that clip, anyone was listening to that. The one, the one thing that I hope they picked up on is that Saldino says what I've learned recently, but then he goes from listening to you on podcasts and talking to you, it's like, oh, right. Yeah. So this isn't from a delve into primary literature. No, this is from podcasts with fucking, with your man unhinged, whatever. Yeah.

Danny Lennon:

This guy told him. Yeah. And then like he's fine to talk about it in the context of like PTSD. And again, there's a psychiatrist saying this and like, yeah it's, it's one of the most wild segments I've ever came across later on, they go on to discuss other things that, that mold causes from recurrent infections,

vertigo, erectile, dysfunction, heart palpitations, AFib issues, blood glucose issues. So, so basically everything. And again, it's not to say that severe mold exposure has no potential to impact human health. No one is saying that someone is saying, please, can we just have some evidence that you can make the claim that the reason why there is domestic abuse cases is because these people have mold that is causing rage. Like that is such an absurd thing to say. And to be on a podcast with a doctor and this for, to be information that people are listening to. It's, it's beyond insane, beyond insane.

Alan Flanagan:

It's beyond insane. Yeah.

Danny Lennon:

<Laugh> so, anyway, so maybe we'll get to a point of wrapping up with some conclusions. I think maybe one useful way to frame this is to make a comparison to what actually gets talked about in the field of toxicology. And I came across a information sheet that is created by the American college of medical toxicology and the American academy of clinical toxicology. And they have an info sheet titled 10 things, physicians and patients should question now that there's just five of these that want to read out because or maybe four that are particularly relevant to our discussion today, but I will link to the full sheet in the study notes. So they have number one, don't use homeopathic medications, non-vitamin dietary supplements, or horrible supplements as treatments for disease or preventative health measures. Number two don't order, heavy metal screening tests to assess non-specific symptoms in the absence of excessive exposure to metals three, don't recommend detoxification through colon cleansing or promoting sweating for disease treatment or prevention and number four don't order tests to evaluate for, or diagnose idiopathic environmental intolerances, electromagnetic hypersensitivity, or mold toxicosis. And there's a list of other ones, but these are the most relevant to what we've discussed today. And again, it's completely at odds with much of the protocols you may see around the place. One thing that I did mention to you before we set recording that I think will be interesting for people to know is if they do go to that detox diet plan page from the Institute of functional medicine, they have certain claims saying dietary changes can help patients that do have elevated toxicant exposures. And they put a supporting reference there to a paper by Hodges and Minich. And if you go to that paper and read through it, and you get down to the actual conclusions of that, you see that the authors of that study note "one of the limitations that comes to the forefront in this collection of studies is how the information in many cases is constrained primarily to studies in cells or animals. It remains questionable as to whether similar effects would be seen in humans at moderate reasonable doses", then also says, "at this time it is best to take precaution in advocating foods or food based nutrients that only have cell or animal data as support. It is best to rely on the clinical studies that have been published to date in making more firm recommendations". And so this is, again a recurring thing that we've talked about, this disconnect between mechanistic datanimal data, human clinical data and how those are all going to be different. And then in particularly when you're making recommendations to people, and then also noting that this is in the actual paper and is used as a supporting reference for this detox diet plan, which, which is recommending a variety of supplements based on mechanisms and in vitro work. And so it's a, it's, it's unfortunate that tends to happen, but it, it's not uncommon. I don't think

Alan Flanagan:

No, no, exactly. Like this is, this is unfortunately a really common theme with, and it, again, it highlights the level of just intellectual dishonesty that you'll see in, in quackery and certainly the functional medicine and other, other functional whatever that follows that title space. And, and it's the fact that

they, they purport to be scientific. Right. You know, you could read any of Chris Kresser eBooks and they're all referenced. And it's like, Ooh, this has this veneer of science and, you know, references that are that divorced from the claim. Like the reference is literally saying the diametrically opposed conclusion to what it's being cited as supporting it's, it's, it's an unbelievable level of intellectual dishonesty. But, but unfortunately typical of the quackery community.

Danny Lennon:

So maybe at this point, if we, if we finish off with some conclusions, I think one of the things to note that that we've said multiple times is of course there are these environmental toxins on one side, and that there is detoxification that goes on in the body and there probably are actual health promoting behaviors that you can follow that would promote, let's say better detoxification that are mainly targeted around, well, not having an exposure that's going to basically hurt your liver. And one of the great ironies here is that if you look at a lot of the case, reports of people coming into hospital with some degree of acute liver injury is often from supplements that they've taken, just because of how many of these are just unregulated and people take high dose of a certain supplement, and then they end up with an acute injury to the liver, which is a weird irony.

Danny Lennon:

But then there's also things like just things like alcohol consumption, which we talked about in the alcohol episode, or just overall healthy dietary patterns or people that may will their doctors will be looking at their medication use, for example, and being aware which ones could potentially cause harm to liver. And that's why they regularly get tested. So these things are known about, but there's a very small number of things that you actually need to do in order to support that detoxification at, at the level of the liver. So I think I, in relation, there's probably two ways we can look at this in terms of what we do know, as we've said that there are these toxins in the environment, there is an increasing amount of those. They could potentially cause some degree of health impact. And we know that there are certain nutrients involved in those pathways that are present in a bunch of foods.

Danny Lennon:

But as you said, that's just more of a, just a factual statement as opposed to anything that reveals much of anything, what is not supported based on what we've discussed today is that you need a specific protocol to detox your system. It's not supported say that supplementing specific compounds is going to lead to better health outcomes due to more detoxification going on. And there's no real support to say that in order to be healthy and to avoid having a toxic burden, that you need to avoid things like toothpaste or non-stick pans or plastic containers, or conventionally produced vegetables, et cetera, none of those things are supported by by evidence. And, and so this is the the trick here is seeing that first thing set of things that we know to be true. And then the second things that are not supported and then being able to see how there's this disconnect when you see much of the discussions around these detoxification protocols. So if there's anything you'd add to that in terms of a summary statement to leave people with.

Alan Flanagan:

Yeah. And, and just, just to, even, just to kind of, to keep in mind that idea of, of, of the outcome, this being really, really granular about like, what, what, what exposure are they talking about and what outcomes are they talking about? And one thing that we don't necessarily need to get into in much detail, but I do think for, for the the best foot forward's worth mentioning is because Rhonda Patrick

always mentions there's a handful of human intervention studies all conducted in China. Two, two of them are very good studies in terms of methodological quality that looked at, for example, consuming a drink cons made from broccoli sprouts, right? So high in sulfurophane, and other compounds; glucoraffinin, and other glucosinolate compounds that are found in cruciferous veg. Now what these studies showed was that people excreted more of an airborne carcinogen called benzene.

Alan Flanagan:

Now the functional in, in true fashion, the functional medicine crowd, Rhonda Patrick, then jump from that outcome to cancer prevention, right. And, you know, in, in true round of fashion, then she's got people growing broccoli sprouts in their garden and blending half, half a ton a day and drinking it. And, and this is an example of, okay, yes, these studies do exist, right? They are in humans, they are showing an outcome that is potentially relevant. But the outcome they're showing is primarily that there was an increased elimination of this compound. They're not showing cancer prevention, they're showing elimination of the compound. That is the outcome that was measured. So it's being really granular. That that's, as far as that research goes at this moment in time, it's not showing that that outcome translates to another outcome of cancer prevention. They are different outcomes and they have not been studied yet.

Alan Flanagan:

And these are short term studies. The longest is 12 weeks. The other was 10 days. And it's, it's an example of, yes, this is where the grain of truth that exists is that this little body of evidence does exist, but it's a very specific exposure, which is not something most people are going to be doing. These are broccoli sprout concoctions that we're prepared by the research team given to participants every night for the intervention to drink and was in a very specific population who are exposed to high levels of benzene because they have basically zero regulation on pollution. So these outcomes are indeed specific to the population. So to extrapolate that, to say that someone living in, you know a European city, for example, where benzene is not in the air in this, in the way that it is in China it's, it's just, it's over extrapolation.

Alan Flanagan:

So, you know, again, have that healthy skepticism for what is the actual outcome. If they are looking at human evidence, what's the actual outcome. And if they're making claims in relation to a reduction of a disease endpoint, I can almost guarantee you, based on the limited body of human evidence, that's available, that that actual disease endpoint was not an endpoint of the study was not an outcome in the study and that it was an intermediate risk factor if it's even a risk factor. And we don't necessarily you know, have that strength of data that we do for other compounds. So, yeah, just be really skeptical in a healthy way, when, when any of these human studies get cited as to what the actual outcome is and what the exposure is and what population was it conducted in. Cause it may be specific to those three.

Danny Lennon:

Excellent. I think that does us right on cues.