DANNY LENNON: Today, we are going to be talking about a particular idea, and that is in the realm of quackery, and this is peddled by a number of different people, and you will have heard various different arguments; and really, it's the overarching idea being related to suggestions maybe not to eat vegetables, or, at least maybe you don't need to eat vegetables. And yes, you heard that right, we're talking about people giving nutrition advice on the basis of health saying that you shouldn't eat vegetables, but this is a claim that has got more and more attention, particularly probably from elements of the carnivore community, most notably, because that is a dietary pattern that advises not having to consume these foods; and there's probably two or three related elements that we're going to discuss that are related or maybe a natural extension of one another. So the first is thinking about this idea that vegetables aren't beneficial for health, or, at the very least, aiming for increased intakes of vegetables don't actually benefit health in the way that we believe. Second to that would be there is maybe an ability to get the same nutrients we would find in vegetables, from animal foods, and even at a higher bioavailability, so therefore, why would we consume vegetables? And then the

further extension would be people saying not only are they not that beneficial, but they're actually detrimental to health, and certain compounds are typically in vegetables can cause problems to your health, and therefore you can improve health through removing this food group almost entirely or completely from the diet. And within that there's a number of kind of sub arguments that we're going to work through. I think we have a list of about maybe seven or eight, some of these will overlap and blend in together, so there's a number of these kind of arguments that you will hear. And so, anyone putting forth this particular claim around vegetables tends to fall back on the same argument. So we're going to try and walk through these with, I suppose, two principal goals, one being that to actually have a direct kind of counter or an understanding of what evidence currently says about these various different arguments, and it'll be useful then when you do come across them, but probably even more from a meta level is to look at the reasoning behind some of these arguments, and maybe be able to extrapolate the thought process behind this to other areas of nutrition, and I think that will hopefully prove useful. So there's a number of these that we can dive into, and we'll just get into it, I suppose. The first one that I think is where a lot of this gets based back to is routing it in some way in either evolutionary biology or what is natural to humans or what we're designed for, and you will typically see people claim that humans are actually naturally carnivorous, or that we're evolved to thrive on animal foods, and we've maybe only fallen back on plant foods as either a food source in times of famine, or barely to scrape through with survival; but given the option, we would go towards animal foods, that's what we're designed for, quote-unquote, that's what we thrive on; and actually, we're word evolved to consume an animal based diet, and in some places, you will see people even go further and say, actually, humans are carnivores. So there's lots to get through here, there's some half-truths, some aspects of this,

but what are the types of arguments for this that that you've heard, and what is the general kind of thought you've heard behind some of them?

ALAN FLANAGAN: Yeah, I think it tends to, or certainly, the narratives that I commonly come across are ones that focus on, and I say these words kind of in quotations, like, designed to or evolved to this idea that there is some kind of innate diet that we can replicate now that reflects something that we, kind of, in the course of evolution, gravitated towards for one reason or another. Those reasons don't tend to get elaborated on beyond painting a particular story of humans as hunters, kind of, the hunter comes before the gatherer that must mean something. So it's this narrative that very much focuses on the idea of hunting, of hunting large land mammals, game meats, and otherwise, it's an image that often kind of could get romanticized as cavemen sitting around a slain woolly mammoth ready to gorge on the plentiful energy and protein and fat that would have come off that. And so, it ties to essentially a modern argument for a certain macronutrient prescription for certain food selections. And it works backwards from that kind of modern incarnation to then create a story around our ancestral past that frames the arguments as if it's just common sense. Of course, this is what we're designed to do, who designed us, like, we evolved, okay, sure. And then, it gets into, obviously, this speculation, and it's difficult to paint an entirely accurate picture of our evolutionary diet, because we just can't go back that far, and there's no historical record. But there are scientific methods available that can allow us to, at least, make efforts to model and quantify what the potential macronutrient composition and foods contributing factors may have been in that evolutionary period. But yeah, in effect, this takes a modern incarnation of preference for diet, and works backwards to shape stories around our evolution romanticizes the hunter, aspect of hunter gatherer, there's a very

gendered component to that as well, which is pretty much what you see in that community; it's just all gym bros with their tops off. And it, again, leans to this idea that we're somehow innately designed, quote-unquote, to eat meat or animal meats nose to tail, quote-unquote, of various sources with some sort of kind of preference as if it's innate to us. And so, that tends to be the narrative framework within which various iterations of kind of low carb to carnivore tend to play.

DANNY LENNON: Yeah, and I think, as we tend to often note with anything, whether to quackery or pseudoscience, most of that does get rooted in half-truths, which is why it's so seductive, and why it seems logical, so we indeed could look at certain arguments that they'd put forth that do have grains of truth in them. So, for example, they may say something like, well, look, if you look at human evolution, we've evolved to develop this larger brain and therefore we end up having this like smaller, simple gastrointestinal tract, and that seems to be related to the acquisition of animal based foods, more energy, more protein, more fat. We see then in hunter gatherer societies that there seems to have been a relatively significant reliance on hunting foods or fish, etc., as a means of being able to survive certain times, again, probably going back to the energy density, and then, you can put forth arguments of, yeah, through the course of evolution would subsisting entirely on berries and grains have provided enough calories and being enough of a food source. But again, these are things that, yeah, we could completely accept, but doesn't really get us to the point of, number one, is the idea that we are carnivorous or carnivores are designed just to consume animal based foods predominantly. Is that true, we can investigate, first of all. And I think, probably second, and what we'll come to maybe later on after that is we could even, if we even granted that position, that doesn't necessarily tell us anything about right now what is the healthiest way for a human to live. Right? It's not talking about

health outcomes. It's explanatory of how we may have evolved even if it were true. And so, there's these two elements that are worth investigating, and I think the argument is certainly not as strong as people may think it is when they first come across it.

ALAN FLANAGAN: Exactly. And even when you, if we take some of those kind of aspects to their argument that they hold as truisms, even within the available scientific literature, it's not even a clear cut position that we could just accept them as kernels of truth, like, there is an element of truth, but it may not, in fact, be an entirely accurate representation of what that diet was in the first instance. So, one example of that is, well, one of the big features from an evolutionary perspective that is often focused on, and we touched on it a little bit in the DHA episode is DHA, is preformed DHA and the rapid incorporation of DHA, which, within some anthropology circles, is considered to be one of the major, along with kind of more available total energy intake, major steps that allowed for encephalization, the growth of our human large brain. And while certainly long chain preformed omega-3 fatty acids would have been available more in game meat, the type of meat that you would get from kind of game, you know, prey animals in, for example, Central or South Africa, well, there's also an energy cost to the hunting. And even if you look at modern hunter gatherer tribes, their success rate is often really low in terms of coming back with some sort of large kill. And so, even if we're just trying to parse it by kind of current knowledge on hunter gatherer tribes, holes start to emerge in this idea that people would have just gone out and come home with the woolly mammoth every time they were hungry. But more importantly, from the food stores, and Steven Kanaan has argued this in a number of papers where he's like, if we take into account not only the energy cost of trying to obtain a successful hunt of a land mammal, which is capable of evading you and running away, and there's a big energy cost to the

extended period that would have been required to go out after it, then there's also the potential for injury, and all of these factors that would not have necessarily been present with hunting freshwater fatty fish. So there would have been a very low energy cost to that output, it would have still provided incredible nutrient density, and it certainly would have provided more of the preformed fatty acids that we attribute to this process of brain development. So suddenly, this kind of romanticized image really falls away, and again, even if we just accept to a level that that romanticized version could have an element of truth to it, well, there's still equally plausible alternate positions that could be argued. And so, that's kind of one level is like the idea that there's one truth or one narrative that supersedes the others. You can't really make that argument, really, if we're speculating about human evolution, and there's equally plausible ones, there's no real way of reconciling, unless it's just a personal belief, there's no true way of reconciling which one of those is more plausible than the other.

And then the second thing then is just working back and asking at the level of kind of logic, well, okay, if this is a justification for a modern diet that excludes all plant produce, and focuses entirely on the consumption of animal foods, well, can we find any real evidence in certainly the Paleolithic nutrition research that people would have subsisted on 100% animal based diet? And the answer is absolutely not. So even in this modern justification for a modern incarnation or interpretation of a diet, there's still no evidence that that particular dietary pattern would have been consumed at any point, even if in various modeling scenarios, that there's a paper that I'll get into over the course of this that I think really sets this out nicely. But there's certainly no evidence that there was some sort of 100% nose to tail diet consumed by anybody.

DANNY LENNON: Right. And I think one of the things looking at this from a – because I asked people about this

in terms of, like, is there any anthropologist that support this, any of them that are legitimate at all. And I think what you find is in anthropology, and I presume the same would be in evolutionary biology, that it's as close to a consensus as you can get that humans are omnivores.

ALAN FLANAGAN: Yes.

DANNY LENNON: And second to that, it's almost 100% consensus that humans are an incredibly adaptive species in terms of what they can consume, hence why we see these various different dietary patterns from around the world. And then even when you look further at some examples of what is the earliest we start to see things like the presence of grains such as oats and stuff like that appear, and it seems to be earlier and earlier than previously thought, and you can go back hundreds of thousands of years for the presence of certain plant foods in different populations. So again, because we're working with incomplete information, as you say, based on all this, it seems incredibly unlikely that there's any basis to the idea that we should be subsisting entirely on animal products, just from that evolutionary perspective alone. But then going that step further and saying, well, what does that mean for health outcomes currently in the situation we're now in, is a separate question we'll again probably come back to.

ALAN FLANAGAN: Yeah, absolutely. And I think looking at that record is – and that's a really good point, as analytical methods have become more refined and stable isotope analyses and these various kind of analytical tools that can be used to try and better elucidate with slightly more granularity what may or may not have been consumed, and even just kind of evidence from recovery of kind of household items and living areas and dwellings, that, yes, the record of plant consumption goes further and further back. And then, there's this other question that always pops up into this, which is this

assumption that the shift to the kind of smaller gut as you said, and the kind of enlargement of the brain, you know, oh, and the people in this movement will like to point at our primate cousins and say, I look at them, that's a plant based diet with their large guts, and – I mean, it's not exactly a plant based diet from a human perspective – but the point is that the assumption that it was consumption of animal meat, specifically, that led to this process rather than fire, which, again, if you were to ask, and certainly anything I've ever seen in kind of evolutionary anthropology, or the kind of Paleolithic nutrition would really point more at the availability of fire, because that not only made animal foods capable of being obviously cooked for consumption, but it also made a range of plant foods and starchy tubers that previously would have been essentially inedible, were now available sources of nutrition for humans. So can we really point the finger at it's the consumption of animal foods and meats per se that resulted in this kind of evolutionary shift, or actually, is it the kind of seminal discovery of fire that allowed us to then obtain nutrition from a range of food sources of both plant and animal origin?

And I think that's where things come to the crux a little bit as far as the evidence that we do have – there's a really fascinating paper in the British Journal of Nutrition in 2014, and the heavy hitters are on it, so people kind of give out, it's Boyd Eaton, Loren Cordain, Cuypers is the lead author; and this was a really, really nice paper – sorry, it's 2010 – where they basically decided to model various diets. So the idea that there's some sort of monolithic human diet in evolution, obviously, is highly unlikely given that we would have moved around, we know that we got on the move pretty quickly and spread all over the world. But if we're assuming for the Paleolithic period, even within that, it's likely that there was dietary diversity, and so, they created a number of models, and these models were based within each model on an idea of selective versus

nonselective meat intake or animal foods intake. And so what selective meant was an assumption that for the animal meats, it would have been skeletal muscle meat and bone marrow and brain that was consumed, so that's what's meant by selective; and the nonselective would have meant an assumption that pretty much all of the animal carcass would have been consumed including organs and adipose tissue. And what they did was they modeled five different diets relative to whether they would have been meat based and nonselective – so meat based and basically eating every part of the animal, nose to tail, as Paul Saladino might say – meat based and selective so eating skeletal muscle meat, bone marrow and brains. If Liver King was there, he'd probably have the testicles, he seems to enjoy them. And then there was kind of fish and meat based nonselective again, and then fish and meat based selective, and then just a fish based nonselective again, because the assumption would have been the whole fish would have been eaten.

And so, they modeled not just macronutrient potential breakdown, but specifically, the contribution to total energy of plant and animal sourced foods, not only as a percentage of energy, but in grams per day, macronutrients, essential fatty acids, everything. And the lowest level of plant food contribution to energy was in the meat based nonselective modeling, which had based on previous research by Loren Cordain, and that had plant foods at 45%, and that was 45% of energy, that's the lowest in those, in each of these model's diets. The meat based nonselective model by Boyd Eaton was 65-35% plant-animal; the meat based selective was 50-50 with a range of 70 to 30 plant to animal; the fish based, again, 50-50, plant-animal with a range of kind of 70 to 30; and the fish meat based but selective was 55% plant, 45% animal, and then just the fish based nonselective was 57% plant, 43% animal. So that's percentage of energy. So across these diets, most of them are actually fairly balanced

in the contribution to total energy. Now, they may differ in their gram per day intake estimates, so let's take the one with the highest contribution modeled from energy intake from animal sources, which was the modeling from Loren Cordain's previous research, so that was 45% plant, 55% animal. That was about an estimate of about a 1000 grams of meat a day, but it was an estimate of 988 grams of plant food. Right? So even in the diet with the lowest percentage contribution to total daily energy intake in the across these variously models diets was a gram a day intake of plant foods of 988 grams. So we have limited evidence to go by, but the evidence that we do have is so far removed from anything contended in the kind of modern carnivore low carb whatever movement, as to just make it look divorced – as divorced from reality that it is, but it's very interesting when you do start to parse the actual available published literature on Paleolithic nutrition, how divorced from reality or certainly divorced from the evidence the modern recommendations of these diets are.

DANNY LENNON: Yeah, it's fascinating, because even some of the papers that I dipped into, looking at like the presence of various different tubers or different grains, you see a similar situation from, like, there was one in Italy from 30,000 years ago, the kind of data of evidence of them, of tools, where they're grinding up oats specifically, there's pre-heat and thermal treatment, so that's the use of fire. You see the same thing then, I think it was 150,000 years ago in Africa with certain tubers, and again, the ability to use cooking, hundreds of thousands of years ago in Israel for various different types of plant foods from nuts, seeds, etc., again, some evidence of fire use as well so that these foods were consumed. I think, typically, then, as a way to maybe get around that, some of the mental gymnastics becomes, oh, but that was just in isolated cases, because they may be needed those foods, but what about, and then they'll point to certain indigenous populations, some that you mentioned about earlier. So they

might point to the Inuits is one of the favorites or the Maasai, and they say, well, look, here's indigenous populations that eat close to no vegetables, yet seemingly have robust health, how can you explain that, or, if we were to go and eat in the same fashion as these indigenous populations, then we would have this same type of health because they seemingly don't need the these vegetables. What do you tend to see as the main fallacy in that type of thinking?

ALAN FLANAGAN: I think there's a couple, I think one is just general like that availability bias of seeing exactly what you want to see based on something that is available to you, and I think that's quite the case when it comes to citing Inuit populations or some of these modern hunter gatherer populations, because they're the absolute exception rather than the norm. They're not representative in any way of the totality of available kind of evidence that we have from hunter gatherer populations, which largely do show a kind of spectrum of ratio of plant to animal foods and contributions, that ratio tends to increase, and its ratio of plant to animal foods, the closer we get to the equator, which is another contradiction to an extent in the argument that we need to eat as our ancestors ate, if we're accepting the genome of our species evolved, where it's contended to evolved in Africa in the Rift Valley, in these kind of wider kind of areas down what kind of modern day East Africa all the way into modern South Africa, then, as far as we know, from current hunter gatherer populations, the ratio of plant to animal foods is much higher in relation to kind of plant foods. Generally, a Loren Cordain paper, from I think 2010 maybe, looked at 229 unacculturated modern populations, and basically posited that the closer you got to the equator, the more the contribution of plant foods increased, and the farther you got away from it, the more the proportion of foods of animal origin increased. But even if we take that as potentially something that is a heuristic to think about kind of diets of unacculturated populations or

modern hunter gatherers they might be called, you're still going with the outlier example rather than the weight of evidence.

So there's a number of kind of fallacious approaches to thinking this through that are betrayed in that kind of selection bias availability heuristic, and it's really just an example of ignoring a body of evidence to select something that suits a preconceived conclusion that someone already has. And then, secondly, it, again, makes almost romanticized assumptions about the health effects of those diets, and this does play out even in published research. The origins of certainly the kind of the whole story about the Inuit comes from two Danish doctors and researchers, Hans Olaf Bang and Jørn Dyerberg, and they did trips to Greenland in the 70s, and basically, with pretty shoddy research, i.e., largely based off, they did no direct assessment of diet, they basically just spoke to people, and we're like, what do you eat. And then using medical records that were fairly incomplete, they basically created a story rather than kind of empirical scientific research, they basically created a narrative review of their time there, that has kind of gone into not just like public lore, but even it's interesting to see how much they're cited in peer reviewed literatures, like, this is where the origins of this kind of omega-3 Inuit, they eat whale fat, but they're protected against heart disease, it must be those fish oils, and it's repeated to this day. But a more scrutinized examination of Bang and Dyerberg, A, their own kind of actual research at the time, and, B, they get the totality of current evidence that we would have in relation to this question, I mean, it absolutely just falls apart as a narrative. I mean, it's held up as this paradox that this is this robustly healthy population that consume basically a pure animal fat diet, and are kind of absent to heart disease, and that's really not true. I mean, if you really look at the more up to date evidence and published research on this, you would see that they have a prevalence

of coronary artery disease largely similar – there are certainly studies depending on what population they've taken and who their comparator population is, there are certainly studies which can seem to show individual studies that a given Inuit population seem to have lower rates of coronary artery disease. And that's why we just don't go with a single study, we go with the totality of evidence; and peer reviewed evidence overall would suggest, not only do they not have a lower prevalence of coronary artery disease to non-Inuit populations, they've excessive mortality due to cerebrovascular stroke, their mortality is generally twice as high as that of non-Inuit populations, and overall life expectancy, and this is more modern research compared them to age matched Danish controls, was approximately 10 years lower. So this idea, this kind of myth of these robustly healthy Inuits sucking down whale fat, it just doesn't stand up to scrutiny, no matter how many times we repeat the romanticized story of Bang and Dyerberg showing up to Greenland in the 70s, and finding that everyone was hale and hearty. This is why narratives will never really stand up to scrutiny of scientific evidence, notwithstanding the fact that these movements tend to be purely narrative based.

DANNY LENNON: Yeah, there's two things I want to comment on there, one, when you mentioned that we see this wide variance in the ratio of plant to animal based food, and I think that speaks to, again, this fact that humans being this inherently adaptive species that, yes, there is this wide variance because we're able to adapt from that, and I think there's good evidence looking at exposures of different populations to varying degrees of starch depending on where in the world they would have evolved, and you can actually then map that to see the number of copies for salivary amylase that they have, so the enzyme that starts breaking down starch in the mouth and in the gastrointestinal tract, and you see multiple more copies in people that have had more exposure to starchy foods

through evolution versus ones that haven't. So again, just showing that there is adaptations occurring when we're exposed to certain foods, and, in this case, a plant food, and so, it would seem to make no sense that we're just locked into not being able to consume them. And then, speaking of adaptation, kind of a side note on the Inuit that I always think is quite funny, is in relation to them often being held up as one of the great examples for the ketogenic diet because you have a group of people here eating really high amounts of fat as the main basis of their diet, but one of the fascinating things in terms of their evolution is this copy of a certain gene, that's CPT1A gene, they have a certain variant of that in the Inuit population, this variant basically only exists in the Arctic, and it essentially stops them from going into ketosis, or at least for the amount of fat they consume, they have super low ketone production, relative to anyone else, but it's based on this really rare genetic mutation that only, like, their particular type of variant only really occurs in the Arctic, there is a kind of a mutation of that same gene that can lead to relatively fatal condition, I believe, I'm not that aware of it, but think it's super rare, but there's a slightly different, in that, they don't really seem to have too much problem with it, but they just don't produce a lot of ketones because of it, this quite huge fat intake, which is just... interesting when it kind of goes against one of the main narratives...

ALAN FLANAGAN: Sure, what's the Francis Bacon quote – "man prefers to believe what he prefers to be true", that sums up the carnivore diet and the rest of the low carb movement.

DANNY LENNON: Yes, so I think that's plenty on the kind of evolutionary stories and the kind of indigenous populations and so on. To get into the specifics that many of them point to, one is a point that I outlined at the start is that they'll make the case that "well look, many of these nutrients and micronutrients that we're getting in various vegetables, we can also get from animal foods. And not only that, those same nutrients

are often more bioavailable when we get them from animal sources." And again, there's some degree of half-truth to a lot of this, so we've already mentioned DHA, and how that might be more beneficial than getting omega-3 from ALA in plants. We see differences in bioavailability of heme iron in animal foods versus non-heme iron in plants. We could have a discussion on vitamin A retinol versus the vitamin A carotenoids in plant foods and so on. We could talk about vitamin D3, vitamin D2. So there's all these examples where indeed we do see differences in bioavailability, we do see the presence of these nutrients in both animals and plant foods, and that's kind of then held up as this reason of, well, why would you ever want or need to consume a vegetable if I can get those same micronutrients from these animal foods with this enhanced bioavailability. I think one of the big things that hopefully is jumping out to people right now before we even dig into the micronutrients stuff that is often left out of that is something we discussed a lot in the two polyphenol episodes is that plants contain a number of other compounds that are not in animal foods, and that's often left out. It's like this sound bite of animal foods contain all the nutrients that you can get from plants, like, that's not technically true, maybe if we're talking about essential nutrients, if you're going to be specific, you could say that. But then we have these other compounds that are clearly only in plants, and then the discussion becomes of, well, do we want to look at potential evidence for these having a beneficial impact or not. And so, that's generally how I kind of see that lay of the land, what does your take be when you hear those kind of arguments around nutrients being available in animals and that we don't therefore need vegetables?

ALAN FLANAGAN: Yeah, it's a funny one, because it comes back to this idea of, quote-unquote, need versus optimal, or the idea that a diet would be defined as adequate simply because you get kind of like at the level of bioavailability, I don't

know a diet that is just defined as adequate based on bioavailability, bioavailability is a relevant consideration, and indeed, in low middle income countries, where there are often subsistence diets that are relied on, some of these questions are more pertinent to attaining nutritional adequacy in the population. So, for example, there's been stable isotope studies in the subcontinent, which have looked at, in particularly socioeconomically deprived aspects of the community that have looked at protein metabolism as it relates to stunting where diets are predominantly relying on a sole plant based staple of protein, like mung beans, for example. And the addition of very modest amounts of say powdered milk – in fact, if I remember, one estimate was the addition of as little as 200 mil of milk a day was sufficient to essentially kind of provide enough added amino acids to sustain growth trajectories. So there's absolutely, but these are very specific contextual arguments that aren't necessarily a reflection of, oh, plants are bad because they're not bioavailable. There's kind of other factors going on here as well, and they're, again, very much heavily influenced by additional socioeconomic and environmental factors. These are not likely considerations that are necessarily relevant for the typically like wealthy, healthy, well to do people that tend to entertain these types of absurd and extreme diets.

So the idea that you would like deliberately, so the question then, oh, I will deliberately eliminate foods because I have the potential to get the nutrients that I need solely from animal foods, well, that kind of reduces the whole question of the health effects of any diet and dietary pattern to the basis of available nutrients. Now, not only could you make an argument that, yes, plant, animals, certain animal foods do contain nutrients that are more bioavailable – iron would be a good example of that, heme iron. That also assumes then that heme iron is nothing but a net positive, when, in fact, high levels of heme iron

are precisely the potential culprit in red meat, certainly in the absence of vegetables, and even at high levels of intake in the presence of vegetables, that would be one of the underlying mechanisms for increased colorectal cancer risk. So the idea that that's just a net good, if we're just reducing it to bioavailability and considering no other factors is pretty overly reductive thinking the kind of probably compromises on how we might actually assess the overall health effects of the diet. And that then goes on to assume then that really high levels of consumption of some of these particularly fattier levels of meats carries no health consequence whatsoever. And of course, with the levels of saturated fat, particularly from animal meats sources, rather than the potential for there to be this kind of have slight exception under dairy, an exception which is largely overblown, but exists nonetheless in the context of normal kind of diets, but for a diet this extreme, this idea that, well, bioavailability and the presence of certain nutrients that are in higher amounts in some animal foods is the prism through which we will judge the health effects of these foods. It really just ignores a wider kind of variety of factors in terms of the health effects of the foods, and there are a number of compounds that will be compounds of concern at high levels of consumption in a diet like that.

And then secondly, it's just an overly reductive heuristic to even think about the health effects of the diet because it then ignores all of the human outcome data that we have in relation to both foods, high consumption of foods of animal origin, high consumption of foods like vegetables and fruit. So it ignores all of that human outcome data that really just says, look, do these foods associated with health – and even interventions, we're not just talking about epidemiology. And then it also ignores the principle of kind of food synergy that we talked about with David Jacobs on a podcast last year, and this idea that the food matrix is quite an important mediating factor in the effects that

we often associate with nutrients. And the so called antioxidants have been a really good example of that, how, in the context of a whole food diet, you can get these benefits, but actually, if you isolate vitamin A, for example, in a supplement or sometimes vitamin beta carotene, for example, you can actually see almost an increased risk if you're giving people really high doses of these in supplemental form. And so, actually, the food matrix itself is a really relevant factor in the health effects of any given food, and, of course, in the context of a total diet that may be particularly relevant for the range of compounds that are not nutritive that we find in plant foods.

DANNY LENNON: Yeah, there's a number of really important points that I want to just emphasize again that you brought up there. One is on this kind of reductionist idea that I actually often see come up when people tend to over-index on nutrient density as being this is the thing that we need to look at with diet. Right? So what foods are the most nutrient dense? What has the greatest amount of these essential micronutrients? And then just have more and more of those, as opposed to, as you say, the reason why we look at dietary patterns and food matrices and this all in a context on health outcomes is that just more of a nutrient or more bioavailability doesn't mean greater health benefit. The second point then is around, if we again accept this idea that every nutrient you can get in plants you can get in animals isn't actually correct. What they're probably referring to is every essential nutrient we can find in animal foods, so vitamins, minerals, and then our macronutrients, well, indeed, you could kind of put that forth, essential doesn't tell us about what is best for health, it tells us about kind of survival to some degree. It doesn't really tell us about disease risk reduction as you've just outlined. We could have a diet that is sufficient to stop us wasting away in an acute malnutrition, but that, as we've discussed many times, massively increases your risk of atherosclerosis or hypertension. But at those

time points, you're not acutely malnourished, so you can have all the essential micronutrients you need, it doesn't necessarily tell you about those health outcomes. And so, yeah, if you have this over-indexing on nutrient density above all other aspects of how nutrition impacts your health, then you're going to run into this kind of thinking, which is problematic for various reasons.

ALAN FLANAGAN: Yeah, absolutely. And to balance the books a little bit if people think we're just obviously hammering in one time, which we are, for the most part in this episode, but I've seen this tactic become really common with the kind of plant based crowd and community as well, where they go from kind of talking about dietary patterns; but then, if it ever comes down to the discussion about a food of animal origin, or indeed a nutrient that is often provided by foods of animal origin, they'll go for these really like reductive foods to food comparisons, like, oh yeah, well, if you compared olive oil to fish, what would be associated with better health outcomes. And it's like, that's an absurd way of thinking about diet. So as a general kind of point for people listening to come away with like red flags for things that you might see floating around the internet is just these general reaching for really reductive comparisons or reductive kind of statements. It tends to be almost like a kind of an element of sophistry creeping into the argument. So you can see that there as well, but yeah, and I think that point though you said about this idea that bioavailability just suddenly kind of becomes a proxy for health effects, I mean, again, it even just dumbs down the process of bioavailability. I mean, generally, for macronutrients our bioavailability is really high, and we have active transport for fatty acids, carbohydrates, amino acids uptake into the body; but things like minerals and trace elements, that's usually under pretty strict homeostatic regulation. So the idea that, like, oh, there's more of this mineral and there's more zinc in an animal produce, well, it doesn't

really necessarily matter once your zinc requirements are satisfied, so to speak. And it also then kind of assumes that the metabolism absorption, distribution, and everything of every, certainly vitamin mineral or trace elements is necessarily the same when, in fact, there's a lot of difference between, there's a lot of difference in the overall bioavailability or bioaccessibility of various micronutrients and trace elements. So that concept, in and of itself, is again oversimplified way of thinking about how we would classify a food as healthy or certainly kind of a preferable source of any given nutrient.

DANNY LENNON: Yeah, and I think we're looking at this nutrient density and how much of these micronutrients we can get into the diet, there becomes a point clearly of a law of diminishing returns, that once you pass a certain threshold of enough of these nutrients, getting more and more isn't necessarily going to have a health impact. And in many of the cases with certain micronutrients, you actually see probably an inverted U here where you go higher and higher, and you actually run into problems. If you keep going higher and higher with vitamin A, you can get vitamin A toxicity, or iron overload as you give the iron example. And so, this idea of that just more and more of these nutrients that are beneficial gives a bigger and bigger health benefit is just not accurate.

ALAN FLANAGAN: Yeah, it's just not the way nutrients behave.

DANNY LENNON: Right. One of the things related to that, because we did bring up there that some of the nutrients that are in plant foods, and not in animal foods, relate to say phytonutrients, and these compounds that wouldn't be classed as essential. And, of course, one of the big ones to be brought up within some of the carnivore community or people who are promoting an animal exclusive diet is around fiber, and again, that the benefits of dietary fiber are completely overblown. Again, it comes back down to what's not essential, so why don't we

need it. And again, conflating this idea that just because a nutrient isn't essential, doesn't mean it doesn't have a health benefit, and what we consider essential in terms of nutrients isn't the way we classify something as a healthful food or a pattern that we have. And so, with the fiber, and we don't need to kind of belabor this point, because this could be a whole other rabbit hole, and there's so many claims in this area, but it's putting forth the idea, look, you don't need fiber, it's not essential, why would you need to consume it; and I think a lot of the rhetoric I tend to hear is, look, we know one of the good things about animal based diet is that all animal foods are edible, whereas clearly plant foods are not all edible, some of them are poisonous, some things like fiber we don't digest at all, so therefore, that should indicate to you that we're not evolved to consume it. And again, coming back to this naturalistic line of thinking, is there any particular points around dietary fiber that you want to touch on?

ALAN FLANAGAN: Yeah. So this has always struck me as probably one of the greatest elements or examples of mental gymnastics, and the cognitive biases and just selective cherry picking that occurs within that community, because if the claim is related to digestibility, and we're designed to just only consume these foods or preferably consume these foods, then, in terms of what we know now from human, not just epidemiology, like forget – because they'll dismiss that because it's convenient to them to dismiss that, so let's forget the EPI on fiber for a sec – controlled human interventions using very advanced methods to look at responses in the gut microbiome and the gastrointestinal tract, and what you see with animal based diets is a massive upregulation in bile acid secretion in order to deal with the actual fat composition, you don't see that upregulation of bile acid secretion with unsaturated fatty acids, for example. And in the absence of fiber, again, we know from human interventions, these bile acids pass undigested to the colon, where they undergo metabolism by more pathogenic

bacteria into secondary bile acid metabolites that are highly proinflammatory and procarcinogenic. So I fail to see if this argument is that we're somehow designed, again coming back to this idea of some sort of intelligent design behind our capacity to just eat and digest meat, then the idea that there is some sort of innate natural capacity for us to tolerate those foods, is wholly absent to any research that you could find on studies that have looked at this. I mean, you see this massive upregulation in a matter of days of these proinflammatory proteolytic bacteria, proinflammatory and procarcinogenic secondary bile acid metabolites. There's absolutely no evidence that supports this idea that we're somehow innately designed to digest these foods. And, of course, you don't see that when there's sufficient plant matter and plant substrate in the form of these non-digestible carbohydrates of various forms that we call this umbrella term of fiber, but non-starch polysaccharides resistant starch.

And so, as far as they like to claim things like cholesterol are conditionally essential, I'm sure we could apply their logic to fiber. It may not necessarily be essential for human like life necessarily at a basic sense of kind of essential fatty acids and amino acids, but it certainly appears essential to the coevolution of the trillion or so extended human genome of bacteria in our gut, and the absence of that. There are, although our understanding of this really complex area is still very evolving, the one thing that appears abundantly clear at this point is that there is a certain dietary pattern, and the presence of certain non-digestible plant matter is preferable for the species and genera that we broadly associate with health or certainly associate with higher levels of short chain fatty acid production, lower levels of proinflammatory and procarcinogenic processes in the colon; and the inverse is true when we look at diets that are either more Western or sometimes more exclusively animal based. So I find it hard to tell that if, or how we

could say that if this was some innate diet we're designed to consume, that these would be the physiological responses that occur in the gut, in the gastrointestinal tract to the consumption of these foods and these types of diets.

DANNY LENNON: Yeah, and then I know you didn't want to bring up the nutritional epidemiology, but like the one line takeaway for people would be like, it's one of the most overwhelming areas where you typically just see high fiber diets as a dietary pattern with better outcomes.

ALAN FLANAGAN: Across the board...

DANNY LENNON: Yeah, it's not even disputable. It's so hard to look at that, and then kind of take some of these claims at face value. A couple of like interesting asides that might be just funny to note, recently, on Twitter, I came across a tweet by Alex Leaf, who's previously on the podcast, and he was kind of making the point with like, if these people claiming that we don't need fiber are going to be consistent about how we're evolved, and like this naturalistic way of looking at things, he says, well, why can't they explain why we have prebiotic oligosaccharides in human breast milk, which, if they don't know, is a fiber – like, why don't they explain that with naturalistic explanations?

ALAN FLANAGAN: Yeah.

DANNY LENNON: And then when you bring up the short chain fatty acid production, it just reminded me of something that I often find hilarious. I can't remember who it was, you may have seen it, but there was someone, it's probably multiple people, but there's definitely one person that's relatively big within the low carb community, and in one of their lectures, they have this slide up and they're talking about, I think it's like gorillas or something that are eating all these leaves, and they talk about how the digestion in the gorilla of this plant matter, and their production of short chain fatty acids actually means that they are consuming a 70% fat diet.

So they're kind of like using this narrative to say, they are eating a ketogenic diet is the general gist of it, because of a short chain fatty acid production. And so, they can hold this thing to be true, and say, oh yeah, that makes sense. But at the same time then they'll say, we don't need to consume fiber, because it's not essential, and we don't care about you telling us about the short chain fatty acid production. Right? So that's irrelevant to us, but I'm also going to believe that gorillas are on a high-fat diet because of short chain fatty acid production. And so, it's like the mental gymnastics in that alone is...

ALAN FLANAGAN: It's unbelievable.

DANNY LENNON: It's unbelievable. And, of course, not everyone is making that point, but there are prominent people in those circles that genuinely have put that up in lectures. But the fiber one continually stumped me, because it seems to be such a consistent area of research.

ALAN FLANAGAN: Well, it gets into, and again, if we're thinking about this more from the point of view of, say, like the fallacy or critical thinking side, rather than even just the kind of evidence side, I think it's a really good example for people of how, when you set your camp up, as a fixed position on your belief system, you've very little wiggle room. Right? The only options at that point are to keep wading forward in a river of denial. And so, we see that with this community more than perhaps any other example. So they start out with this kind of basic, the Ancel Keys narrative, we were wrong about saturated fat, I'm going to eat more saturated fat and butter. Then we get this evolution to, I'm actually only going to eat meat, because our ancestors, because evolution because design, blah, blah, blah. And then, so at every stage, you'll get people being like, but what about fiber, oh well, what about heart disease. And so, their only options at that point are flat out denial. It's like, what about heart disease, well, LDL isn't – LDL is saving us, it's making us live longer.

What about fiber? It's all a big conspiracy, the research is overblown. And so, their only option at that point is to take enormous evidence bases, and just essentially hand-wave them off, and keep wading forward in the belief system. Because they've ingrained their colors to the mast too much, they've given themselves no room to maneuver, other than starting to get into the most ludicrous territory of just flat out denial of enormous bodies of scientific evidence.

DANNY LENNON: Right. There is some kind of sub populations that I think we'll talk about a bit later on, most notably, when we talk about irritable bowel syndrome or IBS, and in these acute settings, where differences in fiber may be relevant. And again, there's a kind of conflation of an acute intervention versus that meaning anything for people on average, but we will come back to that. But first, I wanted to address possibly one of their biggest arguments that they put forth, this idea around certain compounds in plants that are actively harmful to us. So whether they call them toxins or anti-nutrients, there's various different ways they are going to categorize different compounds there, but this idea that there are these compounds are essentially natural pesticides, and the argument is that they are aimed to hurt us in some way. So we have some compounds being anti-nutrients, so they just disrupt the absorption or reduce the absorption of certain other nutrients. So we can certainly take those claims, and then there are other compounds that are essentially acting as a natural pesticide or a toxin. There's lots to get through here, and we can probably go through some of the main compounds that we're talking about in a moment. But I think it's interesting to note that, and probably for context, I should say, we're talking here about things like lectins and phytates, oxalates, saponins, etc., so these compounds with these defense mechanisms.

One of the interesting things that I tried to find where are they kind of referencing a lot of this,

and a number of the people putting forth this argument tend to start from the kind of same logic, so I don't know if they're getting it from the same place or not, but it seemed to be a paper from Bruce Ames' research group, a toxicology paper from 1990, and it essentially, in the title and the abstract you see them say that they calculate that 99.99% of the pesticides in the American diet are chemicals that plants produce to defend themselves, so these natural pesticides. And there's a couple of then lines that if you were just to kind of read the abstract, which I'm presuming where they're pulling this from, you can see why the carnivore crowd are kind of waving this around. So the paper says about half the chemicals tested chronically in animal cancer tests at the maximum tolerated dose are carcinogens. So the maximum tolerated dose of the test chemical is a near toxic dose that can cause chronic myogenesis, often, as a result of cell killing. It is probable that almost every fruit and vegetable in the supermarket contains natural plant pesticides that rodent carcinogens.

And then, but the thing is like, so this is where they probably take that, it's like, look, here's proof of what we're trying to say, these are carcinogens, these are normal plant compounds that all of them have, therefore don't consume them. However, I don't know how many of these people actually read the paper, you go on to learn then that what is being classed in this particular paper as a natural pesticide includes all of those kinds of compounds. So things like chlorogenic acids, which we discussed in relation to caffeine, phenolic compounds, flavonoids, all these various polyphenols are also included as natural pesticides. So it's just a term they you're using, as well as some of the anti-nutrients we'll discuss in a moment. But here's the real kicker, if you go into that paper, and you go in through the text, directly from that paper, I'm going to read a quote from the authors to kind of show what the paper was

actually about as opposed to what these kind of carnivore crowd are trying to suggest it is. So the authors say, “Caution is necessary in interpreting the implications of the occurrence in the diet of natural pesticides that are rodent carcinogens. It is not argued here that these dietary exposures are necessarily of much relevance to human cancer. Indeed, a diet rich in fruit and vegetables is associated with lower cancer rates. This may be because of anticarcinogenic vitamins and antioxidants come from plants. What is important in our analysis is that exposures to natural rodent carcinogens may cast out on the relevance of far lower levels of exposures to synthetic rodent carcinogens”. So the idea here is that this whole paper was just talking about synthetic carcinogens that are seen in some rodent research, and is that as big a deal as previously thought, because we have all these natural carcinogens to rodents. This is nothing about these things are going to cause cancer in humans, it's certainly not about fruit and vegetables causing cancer, and indeed, they make the point clear that they lead to lower rates, because of compounds such as the antioxidant compounds that are mentioned throughout this paper. Yet, this is one where multiple of the blog posts that I’ve read on carnivore sites use this as referencing Bruce Ames' toxicology and as showing that there are these natural pesticides in all plants. And people are almost like, wow.

ALAN FLANAGAN: Again, it's just such an example of the lack of intellectual rigor, basic intellectual honesty and kind of epistemic humility brought to bear on their claims. It's like to take a paper that you see something that you just want to see in it, and, essentially, ignore exactly what the authors themselves are saying in relation to its relevance. I mean, it's completely unsurprising, I’m absolutely not surprised, but at the same time it's just an example of, I thought about this before today, it's just a general take home for people in relation to this movement overall, the kind of carnivore... Like, I want people to

stop thinking that this movement has anything to do with science, has any sort of concern for the scientific method for the integrity in the scientific method or otherwise, like, if science didn't exist, they'd believe exactly what they believe right now anyway; if they didn't have access to a single peer reviewed study, because they were behind some enormous exorbitant pay wall, and they only had the odd books and their own little ideas, they'd still come to the same conclusions they'd come to anyway. They're able to throw the odd paper at something, and give it a veneer that they're arriving at their conclusions because of science. They're not. There's a completely different way that they approach their whole idea, and the best analogy, or what I think the easiest heuristic for people to think about this is the actual scientific method is a forward moving iterative process. Right? We build on current knowledge, and we keep expanding on that knowledge, and it's always open to falsifiability if new evidence comes out that contradicts a previous point of view, or, at least, says, well, this aspect of this theory might be true, but this other aspect might not be the case or is disproven, fine, you kind of move forward, but it's forward moving. The opposite is belief based thinking, and that is where you already are starting from your preconceived view of the world, and you're simply moving backwards from there, gathering whatever pieces of information will allow you to confirm your preconceived worldview and uphold that belief. And there are two very different directions of cognitive processes and kind of thinking. And so, this idea, because people will always say, well, he's a doctor, he's citing studies – it doesn't matter – it doesn't matter whether they cite studies or otherwise, this is not about science, and they don't care about the scientific method. So just stop giving them that element of credit that this is actually about a legitimate scientific debate whatsoever, that ship has sailed, this is not legitimate scientific debate whatsoever.

DANNY LENNON: Right. There's a kind of couple of other meta points that kind of come from this as well, that even if there was any truth in that original point that we're making is, number one, being aware that something we see in rodent studies generally isn't something that we should hang our hat on, unless there's something replicated in humans as a general point. And then second, particularly if that relates to rodent studies that are looking at high doses of isolated compounds, in amounts that we would never see, naturally in rodents or in humans, relative to, again, what we keep coming back to, is there any evidence in humans that when we consume foods or diets that contain these types of compounds in any appreciable amount, what impact do we see on health outcomes? And that's, if you just go with that question, you're probably rarely going to go in the wrong direction, versus going down the route of isolated compounds and super high physiological doses that are used in rodent studies, is just not a good way to evaluate the helpfulness of these compounds, or any of the other.

ALAN FLANAGAN: Absolutely, and a point we've labored before on a couple of other episodes is this idea of ignoring human outcome data for mechanistic speculation, and that mechanistic speculation often does come from these kind of high dose rodent studies, kind of, devoid of human context. And they kind of, they'll scoff at that – they'll scoff at the idea that you'd only focus on human outcomes and ignore mechanisms, which, again, just goes to the previous point about how fundamentally unscientific this entire movement is, they simply don't understand or willfully ignore the scientific method and how it works. And so, you get this total kind of ignorance of a body of human evidence across multiple of these questions we're asking, and we're talking about, and the anti-nutrients one is a really good example of this. Yes, we have compounds like phytates in some grains and legumes, we've compounds like oxalates in spinach, we have compounds

that were we to take them in isolation, were you to find evidence of a proportionate negative effect, it would generally be because they have been isolated, and because they have been – or because they're being utilized experimentally in a form that doesn't reflect the fact that in a human diet, they would be cooked or soaked or subject to various kind of natural processing techniques as they occur in traditional diets, which they do. And it also ignores the fact that it goes to this point we talked about earlier of this overly reductionist way of thinking about things, because it ignores the fact that while there may be these, quote-unquote, anti-nutrients present in compounds, they're often in a whole food matrix, and with other compounds that either negate the potential isolated effect of an anti-nutrient, or, in fact, actually alter the manner in which it might behave, and phytates are a good example of that with some of the suggested research that in the context of a whole foods diet there may be kind of a benefit in things like bone health, for example.

So the idea that it just gets distilled down into this is what this kind of nutrient does in isolation or this potential anti-nutrient does in isolation, here's an experimental model that kind of showed this. You always have to then build this back up into, is that how its consumed in human diets, what kind of additional methods are applied before it's consumed, like, no one goes and picks a chickpea off its plant and eats it raw, but that doesn't happen, that's not how humans process and consume these foods in diets that include them. And actually, in the context of normal whole foods diets, there's actually no evidence that any of these compounds result in the purported adverse health effects or adverse effects on nutrient absorption that some of the mechanistic speculation would have you believe. And that's why human outcomes and context for nutrition in terms of how foods are consumed, is always really important to build back up from mechanistic speculation.

DANNY LENNON: Right. Yeah. Because, I mean, if we take phytates, as an example, where, as you say, we can see these things like whole grains and nuts and seeds and so on, and there can be some decrease in absorption, let's say, of various minerals, iron, zinc, magnesium, etc., then, again, the question of looking at that in context of a diet pattern, like you say, is, well, unless every time you consume some calcium, it's always in the context of a really high phytate rich meal, number one, that's probably not the case; number two then, what is the actual dose of calcium within that diet, and then what is the magnitude of absorption that you're reducing it by, and then what is the net effect, like, that still might not be enough to be a problem. Then you go even further, and, as you say, if you take into account the cooking method, if you look at the fact that actually, probably most of the phytate gets degradated in your small intestine and stomach. Then number two, most of it in foods is going to be removed through a cooking method, even more so if you do things like soaking or sprouting these types of methods for different types of plant foods. Again, if you are really concerned about it, there's ways around it where you can basically eliminate it. But you have to, again, look, in what context is someone going to be getting enough of this compound, that is actually having a meaningful impact on end health outcome, so that they're under-consuming a nutrient, or they're absorbing so little of a certain nutrient, and it's leading to a health problem. And it's very likely, that's not going to be the case in most diets, unless you're looking at, as you noted earlier, populations where people are already struggling to hit sufficient amounts of these certain nutrients, then you would put extra care towards that. And then there are populations, again, if you're looking at, as we noted earlier, most recommendations will typically say for people who are vegetarian or vegan, to aim for slightly higher intakes of iron relative to people who are consuming animal foods. This is a kind of a

well-known recommendation, and within that, not only the higher intakes, but then there's also recommendations typically given around, if your intake is already going to be low, you might want to be wary of certain foods that can impact absorption, but we don't see massive differences in health outcomes, at least, I'm aware of. And so, again, what is most of this concern about this loss of nutrient absorption? And the same goes to the idea of them being toxic in some way, again just seems to be based on basically nothing from what I can tell.

ALAN FLANAGAN: Yeah.

DANNY LENNON: Now, I will say though, that there is probably a lot of open question on this. There's still research to be done on these certain compounds, and what is the kind of threshold of this, is there any negative impact – sure, there could be negative impact, but based on what we currently know, it seems a stretch to say you should avoid vegetables on the basis of what we currently know.

ALAN FLANAGAN: Yeah, absolutely. And there is some, certainly in relation to say phytates and chelation of, certainly, zinc and iron and calcium, there is some current knowledge in what the actual kind of molar ratio of phytate to say iron would be or phytate to zinc would be that would inhibit absorption rates. And again, in the context of a normal mixed diet, they're largely not necessarily thresholds that will be of particular concern against factoring in things like cooking methods and otherwise; and so, I think it's that point to kind of highlight to people that nutrient intake doesn't exist in the vacuum of a single meal, and when nutrient intake, and with a lot of these minerals that people will talk about, oh, this anti-nutrient inhibits absorption of that, recall that earlier we said a lot of them are actually regulated in terms of uptake by homeostatic mechanisms. So actually, once your overall intake of these nutrients is sufficient, then there tends to be sufficient uptake in the context of a whole

foods diet that covers those recommendations. So, like you said, it's in the context of diets of nutritional inadequacy that some of these factors may become a concern, but I doubt that's really a question for consideration for 99% of Sigma listeners.

DANNY LENNON: Right. I mean, one of the good examples here is in relation to lectins within plants, and I know one of the particular prominent books in the diet book space is the Plant Paradox by Steven Gundry, which, as far as I'm aware, is a book that basically places the root of chronic disease at the foot of lectins in plant foods...

ALAN FLANAGAN: You mean he found a single cause? Oh!

DANNY LENNON: That is the root of all these, yes.

ALAN FLANAGAN: How unique!

DANNY LENNON: What an idea for nutrition!

ALAN FLANAGAN: One single nutritional compound in food, wow, yeah, that’s novel.

DANNY LENNON: Right. So again, at the most generous, we could grant, sure, there's maybe stuff we still need to work out about lectins and their impact on health, but to try and say that they're a reason not to consume vegetables is certainly not one that has any evidence behind it, and number two, that they're a driving cause of most chronic diseases is certainly not got any evidence behind it. So these types of claims, again, just tend to be quite baseless, and as we've noted many times before in the Quack Asylum, just end up circling back to mechanistic speculation at best. I think that's my general take on most of the anti-nutrients or plant toxins or other kind of claims around certain compounds that are found uniquely in plants.

ALAN FLANAGAN: Yeah, I think a simple heuristic for people to come away with from this, if they ever do encounter these claims is ask yourself, okay,

what foods contribute these, whether it's lectins, for example, rich in legumes and whole grains, oxalates in spinach and some other greens, phytates in whole grains, just ask yourself, one, okay, what foods provide these nutrients, two, what evidence do we have for these foods, what you'll tend to find is all of these foods are associated with positive health outcomes, both in terms of actual disease endpoints, and also in terms of intermediate biomarkers, whether they're inflammatory, gut microbiome, or microbiota effects on lipids, blood glucose levels, all of this stuff. It's just all in the – and so, if you get to that point, just walk away from the mechanistic meandering, because it's just working backwards to try and bolster a belief, and it's ignoring the fact that these foods, all of them are associated with positive effects on human health across a range of endpoints.

DANNY LENNON: Indeed. That could even serve as a kind of general conclusion to most of this. I think one of the final things that I wanted to end on, I think it'd be remiss not to mention it before we wrap up here, and is probably the area where I think there could be the strongest argument someone could have on an individual level for maybe following such a type of diet, or, at least, why they would be attracted to it, or why they find benefit from it, is the idea that plants or vegetables contain these certain compounds or nutrients that exacerbate clinical conditions that are already existing, such as IBS, or a lot of documented case around autoimmune diseases tend to be given quite anecdotally as well, where there seems to be a benefit from removing some degree, if not all of plants, including vegetables from the diet, leading to improved outcomes in people at least on an acute timeline, but maybe even prolonged. And so, the reason why I think this is the area with the most kind of open to discussion is for two reasons, one is the kind of lot of unanswered questions we have in relation to many of these certain diseases, and how diet affects them, most notably for autoimmune conditions; and

then, number two, in relation to something like IBS, where we do have clear evidence of in certain subtypes of IBS, something like dietary fiber as an example could exacerbate that, the presence of FODMAPs could exacerbate that, both of which are going to be found in plant foods. And so, feasibly by someone reducing the amount of vegetables and/or plants they consume, they can have a relief of symptoms, and therefore report positive outcomes in terms of reduction of symptoms. And therefore, I think that's probably why there is a fair amount of anecdotal reasoning behind benefit for something like a carnivore diet or some type of similar type of dietary pattern. Whether that is actually addressing the root of these other diseases is completely unknown, and whether in the long term does health improve or not, or is this just purely an acute intervention to help the gut not have to deal with certain compounds in a short period of time is unknown; but I think, for me, this is where, on an individual level, we just really don't know much what's going on in some of these cases, at least; in some we do, but in some we don't.

ALAN FLANAGAN: Yeah, I mean, at one level, were we to be kind of generous, like, going back in terms of using diet to assist in the treatment of gastrointestinal diseases, there's the famous kind of lamb and rice diet where you're stripping diet back to foods that might broadly be considered hypoallergenic, or indeed that there's kind of little evidence of causing any sort of intolerance or allergic type reactions, we could consider, in some respects the carnivore diet to perhaps be a really extreme iteration of an elimination diet with foods that, to be fair, largely would be considered fairly benign as far as from the perspective of what we know about allergy or intolerance, these tend to relate to the protein content of those foods. So if we think of the most common, eggs, milk, or that's often grown out of in childhood, tree nuts, peanuts, shellfish, this tends to relate to the kind of molecular weight of proteins in these

foods, and soy as well, and they tend to seemingly kind of trigger these responses. So we could broadly say that perhaps the carnivore diet serves as a form of really extreme version of an elimination diet for people. Now, the difficulty with that is most elimination diets are designed to actually elucidate what the culprit potential food is in an individual, and that's done after a particular period of exclusion by very kind of directed and structured food challenges over time to try and tease out what foods may or may not be causing someone an issue. But that's not really being done with this, people are just going full on for the meat and never coming back, so to speak. And we know that, for example, let's take the low FODMAP diet, as an example of a clinical nutrition intervention to address irritable bowel syndrome. But we know, again, from published human interventions, that one of the potential negatives is the fact that you're removing foods that are often quite prebiotic, and have other compounds, non-starch polysaccharides that are beneficial for the microbiota.

And so, this is a known kind of potential risk to manage with the low FODMAP diet within dietetics, and so, the aim is not just to eliminate those foods, it's to eliminate them to achieve symptom resolution, and where that symptom resolution is achieved, after six to eight weeks, for example, it's a structured reintroduction of various foods within the FODMAP categories, to try and assess a personal level of tolerance for that particular individual, so that they go forward without having to restrict all of these FODMAP rich foods. And often, it's a dose threshold that they find with whether it's oligosaccharides or disaccharide, for example, or lactose, that there's a kind of, there's a certain amount that they find that they can include in their diet, but maybe that causes some gastrointestinal symptoms and upset, and you're able to then balance including foods that we know are beneficial while managing your condition.

I think the autoimmune question is so much harder, and it's one place where, again, if we're kind of being true to scientific thinking, like, I think there is some epistemic humility that that has to come in on the evidence based or the scientific side there, and there's just a lot we don't know about autoimmune conditions as they relate to diet, there's a real dearth of evidence, there's a huge amount of anecdote from people using all sorts of kind of dietary interventions and then professing that their symptoms have improved. And the plural of anecdote is still anecdote, despite what many people in the low carb community would like to say, and until we have better research, looking specifically at autoimmune conditions, looking for specifically at different dietary interventions, I'm just not willing to say one thing one way or the other in relation to the potential role for diet, I'm not willing to say that there's not a place for some of these animal foods in a diet that might benefit, and I'm not willing to say that there's not. I just – I can't one way or the other, because there really just isn't that evidence despite how many autoimmune protocols tend to float around the internet related to diet. Yeah, just until we've got evidence, I just don't know that we can come down one way or the other on that.

DANNY LENNON: Yeah, and, I suppose, both of those things are in the same camp, but particularly, when we talk about things around gastrointestinal issues or even IBS, specifically, while we could grant that, we could see how someone could have an improvement in some of those symptoms by going into such a diet because they've removed these certain foods, and so, even if we grant that, as you said, that is typically because maybe they've removed a problematic food, that's very rarely how it's ever portrayed by either people following this particular type of diet, or certainly the people who are advocating for it. Instead, it's turned into a narrative around there's some sort of inherent healing property to these animal foods, or as Liver King

might say, if you get your bone marrow in liver, then everything will, your body will kind of regenerate itself to some degree. And then, it's again, going back to the arguments around the nutrient density of it's so good, gets into saturated fat is now healthy, because look at all the positive things it's doing...

ALAN FLANAGAN: Nourishing. They love that word.

DANNY LENNON: It's nourishing, right. Your LDL is high, because it's having this beneficial impact on your immune system, and that's therefore why you're getting better, instead of saying, actually, there might have been just a couple of compounds that right now you are having gastrointestinal symptoms to, you took out nearly every food you usually eat, so the ones that were problematic are also gone, and you've got some symptom resolution. That's very rarely how it's portrayed, which is much more likely to be what's going on in those situations. But if you're going to compare that to any other type of elimination diet, you could come up with, probably most of the rest of them are more evidence based for good reason, because of the variety of different food choices and the structuring back in. And again, probably, again, we just don't know in the autoimmune issue, but it could be a very similar thing of there's something problematic that's been removed potentially, but yeah, we don't know on that. But yeah, I think that is most of what I think we were planning on getting through, unless there's any particular points that you feel we haven't addressed, that you think is worth bringing up.

ALAN FLANAGAN: I think the only thing that comes to mind, and because it relates to the anti-nutrient arguments, so without rehashing the territory there, but you'll also then hear, again, swimming upstream in the river of denial, you'll hear arguments that phytonutrients and polyphenols, which we've discussed on a couple of a number of previous podcasts, are actually not just not associated with health, but are,

again, actively harmful. And this also misconstrues both their metabolism and their purpose, so no one would argue that they are essential in the classic nutritional definition, because they're not, we can survive without them. There are researchers in that area who propose them as, what they call, lifespan essential, i.e., we don't require them necessarily to live in the way of essential amino acids or fatty acids, but we might require them to live a full kind of health span. The idea that they are, you know, oh my god, the body treats them as toxins, well, the body treats them as xenobiotics, but it treats any compound that isn't a nutrient in the same way. And so, this is actually fundamental, as we've discussed on previous podcasts, to their efficacy and their action, which is the fact that they undergo rapid metabolism, both through the liver and also by the gut microbiota, and are then absorbed after metabolism by the gut bacteria, and they stay around in circulation in really, really low doses, and that's crucial to their whole mechanism of action. And what they try and point to is one or two studies that looked at antioxidant activity. Well, no one in this research area considers antioxidant activity to be the reason that these compounds are beneficial anymore. So they're reliable on – they're basically creating their own straw man, in relation to a purported mechanism of action that was once believed to be how these compounds acted, and is no longer really considered, although they may kind of bolster endogenous antioxidants defense systems, they themselves and people, I guess, in the popular space, still look at them and go, oh, they're antioxidant rich foods; again, that’s not their mechanism of action for the benefits associated with their intake, cardiovascular and cognitive, in particular. It's actually the metabolites, and it's the interaction of those metabolites with different signaling pathways, rather than their antioxidant capacity that is their whole mechanism of action. So they basically focus on essentially an outdated purported mechanism and hypothesis, and then defeat their own

straw man in arguing against their efficacy. And again, the human outcome data on these compounds, and indeed, our mechanistic understanding of why they have the actions that they do, which, as we've discussed, and we can link to the previous episodes on cognitive and cardiovascular health for these compounds, is really fascinating. But the idea that these are harmful to human health, when given as an antioxidant supplement in very high doses that we would never get from dietary intake, there is some evidence of that in a couple of older trials, and that's just a reflection of how these compounds aren't designed to be consumed in high amounts, and their natural metabolism when consumed in a whole foods diet very much processes them in a way that they're present in micromolar amounts into circulation. So don't take antioxidant supplements, but do eat your blueberries.

DANNY LENNON: Right. And one of the interesting things actually to then get back to the phytates where earlier you noted that they're not only probably not that problematic, but there's some indication that they could have potentially beneficial impacts as well, notably, things like bone health, there may be some suggestions around natural killer cells, things like this, that it seems that in the same way as phytonutrients, much of that is down to these secondary metabolites of phytic acid that can have these impacts. So again, it's – and the same with are these phytonutrients, it's kind of irrelevant just to look at them and say, oh, that's not essential, so let's forget about it. Whereas as we talked about ad nauseam in those two episodes, 406 and 407, I think, that it's all the metabolites from those can go on and have these impacts via messaging around the body, and that seems to be beneficial. So yeah, it's just, that's a good reference point for people I think to keep that in mind.

ALAN FLANAGAN: Yeah, definitely.

DANNY LENNON: So with that, I think probably we can kind of conclude with something you alluded to a bit earlier by saying, really, the real question here to consider is not does the presence of these types of compounds mean that vegetables are good or bad for you. In general, the answer is, no, they're certainly not bad for you on the basis of having these compounds. And perhaps probably the most consistent finding in nutrition, in a place where there's often conflicting evidence, is in relation to healthy dietary patterns or food groups, and the health benefit of vegetable consumption. It seems that that's probably one thing that, in general, a lot of people, I thought, nearly everyone, but seems probably most now would agree on, and is probably the most consistent finding that I can think of.

ALAN FLANAGAN: Yeah, it's unambiguous, like, you won't find anyone in a field of a lot of contention, you won't find anyone in the field of nutrition research that thinks that vegetables are bad for you and should be excluded deliberately from the diet. It's just it's such a perfect example of, and this is what – I mean, we do know this about conspiracy thinkers and the research in that area, how they're more taken by their self-perception of someone who is like going against the sheeple and the masses, but really, when you look at this whole argument for, if you stop and ask yourself, well, if the entire research and scientific community in this area thinks this, and we have this small group of people who think that, like, to align yourself with that is to just purely consider yourself as a contrarian, like, not as some sort of independent thinker. So it's merely a contrarian position.

DANNY LENNON: Yeah, when I started thinking about how some of this is framed from what we're naturally evolved to eat on one side, and then the other side of the toxins within plants, one of the things I came across was an anthropologist Mary Douglas wrote a book in 1966 called Purity and Danger, which basically examined

the concepts of purity, pollution, what is considered unclean within a society and so on, and one of her main points was “deeming one thing natural, and another toxic is about imposing a moral order on the world around you”, and I was like, that tends to shine through in a lot of these ideas.

ALAN FLANAGAN: Yeah.

DANNY LENNON: Yeah, so we're going to go for this like naturalistic idea of how we're supposed to eat, and all these other things are toxins, and therefore we need to avoid any toxin that comes into the body, and therefore we're kind of morally superior to those who don't. So it's like, that, I can see how that fits for these certain people, but...

ALAN FLANAGAN: Definitely.

DANNY LENNON: Yeah. I think that's it, so with that we can maybe consign the idea that not to eat vegetables should be in the quack asylum thought.

ALAN FLANAGAN: I think so, yeah.

DANNY LENNON: So don't eat vegetables goes in.

ALAN FLANAGAN: Yeah, and it's never coming out...

Thanks for being a Sigma Nutrition Premium member!