DANNY LENNON: And so to introduce us to the topic and get us started, let's bring on Alan Flanagan.

ALAN FLANAGAN: Yeah. So we thought we might start with inflammation and obviously specifically the, the role of diet and inflammation. It's something that is a buzzword and has become a buzzword over the past number of years in terms of the effects of diets, or reasons for adopting a certain diet excluding certain foods or whole food groups, etc. And one of the difficulties with any buzzwords when it attains that status is because the pendulum swings in nutrition are extreme, there can be a tendency when you're on the evidence-based side to see these words getting thrown around by people pushing particular diets or their particular agenda. And so as a, as a kickback to that, sometimes we can be drawn into going to the other end of the, of the, of the extreme. So we might see claims this x food is inflammatory, x diet is inflammatory, or anti-inflammatory. And the temptation is then for people to just go, there's no real food diet and inflammation and throw the baby out with the bathwater. And so it's one of those things that is important to try and address in a more objective context because it continually comes up whether we're talking about cardiovascular disease, diabetes,

neurodegenerative disease, any chronic lifestyle, disease probably has someone out there in the in the Google Web talking about inflammation as some sort of causal factor. So we thought we'd kick off today by discussing different aspects of, of inflammatory responses and then obviously digging into some of the more dietary specific components.

DANNY LENNON: Yeah. And I think there's a couple of elements that make this a difficult topic at times for people to decipher good from bad information. One is that oftentimes, there's a lot of generic language that gets used. And then it's one of those areas that is ripe for people to put out pseudoscience because you can pretty much find a link between inflammation and like you say pretty much any chronic disease that is there. And so it almost gives them a basis to say look, inflammation is this big thing we need to take care of. Therefore, we're going to make these changes to your diet and this fixes inflammation and this fixes a, a path to chronic disease. So for those reasons, it can be hard to decipher between information. So maybe to start, how should we define inflammation?

ALAN FLANAGAN: Yeah. So in its broadest context, in an objective sense, or a biological sense, we're talking about a response to injury or infection. And that response results in either a local response or a more systemic response. So the difference there being obviously local to a particular size of injury, if I roll over on my ankle, and that swells up, my entire body doesn't swell up. So that swelling is localized to the site of that injury. But on the other hand, if I have what they call kind of chronic or low grade inflammation, that's generally systemic. So it's a general expression of markers of inflammation. And the difference between the two is largely between what we would say is acute inflammation and what is chronic inflammation. And so generally systemic inflammation is, is really what people are referring to as chronic inflammation. Those terms often get used interchangeably. So we're

talking about a response to injury or infection that results in responses involving the immune system, and the development of lesions as a result of that response. And the lesion could be, for example, pus that builds up in a wound, which is from essentially dead immune cells, or it could be a rash if we're talking about acute inflammatory responses. But if we were talking about chronic inflammation, and let's say for example, we're talking about cardiovascular disease and atherosclerosis, factors like fibrosis, or essentially, the development of scar tissue are important factors that result from the immune responses to, to inflammation in a chronic inflammatory sense. So with acute inflammation, it's often something that is a response to trauma. So the example we use there was rolling on an ankle, but it could be, you know, a microbial infection. And in the context of chronic inflammation, for example, you could be talking about a viral infection or hypersensitivity reactions like anaphylaxia. Or you could be talking about the type of inflammation that is persistent if the cause of the inflammation is persistent. And so, from a dietary perspective, probably the best example there is inflammatory bowel disease, which is an umbrella term for both ulcerative colitis and Crohn's disease. And so in that sense, the, the cause is, is persistent and obviously gives the condition its name. The difference really between acute and chronic inflammation is that the immune cells involved in either response are somewhat different. The chemical mediators what people would read or see written as cytokines, and those factors are slightly different. And then the resulting lesions are also different. So, a rash you know, as an acute inflammatory response or redness and swelling and those things that we would associate with, you know, rolling over on an ankle, but in the context of chronic inflammation, we could be talking about, again more internal processes, like the development of scar tissue, or granuloma and or potentially, you know, factors involved in, in autoimmunity. So, if we took rheumatoid

arthritis as an example, there's going to be a consequence in terms of a progressive degeneration of synovial fluid in joints. So that's, that's an example of an outcome for a chronic inflammatory condition that develops over time. So defining it, I think, just to ran that all out, we have a response to injury or infection is probably the best definition that in terms of the response can be either acute or chronic. And really what defines whether it's acute or chronic is the, is the type of immune cells involved and the mediators and obviously, the kind of clinical outcomes.

DANNY LENNON: From a research perspective, we obviously have various different markers of inflammation. The most common one that probably gets reported is C-reactive protein. I'm wondering how accurate reflection does that say a measurement for CRP give us of what the inflammatory environment actually is, if that, if that makes sense of how direct reflection of let's say, if someone's trying to evaluate systemic inflammation is taking one measure of their C-reactive protein?

ALAN FLANAGAN: Certainly, high sensitivity C-reactive protein is I would argue probably the most robust marker for inflammation in a reliable sense. It's a marker that has been predictive of outcomes in epidemiological research. And it's a marker that has been associated with direct outcomes of interventions when it's, when it's reduced. So given its predictive effect as a biomarker in observational research, and given that there is a relationship between outcomes and actually interventions, targeting its reduction, I think we could put, you know, high sensitivity C-reactive protein, or we'll just say CRP, for sure. in that realm of an important systems biomarker that has value in representing inflammation. In terms of other biomarkers, there are kind of interleukins, interleukin 146 and factors like TNF alpha, they all are markers of inflammation. They don't necessarily have the level of evidence all of them together, or individually, sorry, that C-reactive protein has,

but they can be valuable. I think from a dietary perspective, what becomes difficult sometimes is, you often see, let's say, for example, a Mediterranean diet in the context of inflammation. And you've one study that shows a reduction in interleukin 6, and another study that shows no effect on interleukin 6. And so this is where some of the issues with the nutrition research in diet has been just general inconsistencies with some of the outcomes, but certainly in relation to CRP, it's quite a robust biomarker it seems of inflammation.

DANNY LENNON: So if we start to tackle the relationship between inflammation and diet, I think you actually made a really important point at the outset of saying there's obviously places where the role of diet in changing how much inflammation we have, let's say, is taken to a nonsensical extreme or is used to push kind of pseudo scientific ideas, but there's a risk of people then taking that and dismissing anything that comes up with the concept around inflammation when we're discussing nutrition. So if someone were to pose you the question of, well, does a poor diet, however we choose to define that, does a poor diet cause chronic inflammation? How would you lead into answering that?

ALAN FLANAGAN: Yeah. So I think the first thing would be to be specific in terms of the use of the word cause and causal language. The first thing I would clarify in the context of a question like that is, we can't say that inflammation per se that, you know, diet inflammation, and a disease outcome is causal. And that's particularly in the context of the fact that with a lot of conditions like cardiovascular disease and diabetes, we have good understanding in certain contexts of what is causal, and what the, what the mechanistic processes of those diseases are. So the best way to characterize inflammation is as a mediating factor or a moderation factor. It is important, but likely not necessarily causal in and of itself, but a factor that contributes to the progression of a condition. And in the case of cardiovascular disease, for example, accelerates

the process. I think the best way to characterize this would be to say that okay, as a, as a moderating factor, does diet, if we compare different diets, is there, is there a difference in health outcomes relative to the inflammatory measure of that diet? And the answer to that question is that we could say that there is a difference and perhaps the most robust it, I mean, it is the most robust assessments of inflammation and diet has been the dietary inflammatory index. The initial one was published in 2009 from work that began in 2004. It had limitations in its first manifestation in the sense that, for example, it didn't include flavonoids, which are a really important class of bioactive food components that that have anti-inflammatory or act through anti-inflammatory signaling pathways is also didn't, and this is important when we're talking about epidemiology and nutrition research, it didn't adjust for total energy. So it was difficult to separate the effects of total energy in a diet from the inflammatory score. But these limitations were subsequently updated, and there's been extensive work in establishing the, the second version of the dietary inflammatory index. And when you use that index, which I think importantly from a nutrition perspective moves us away from kind of, and foods because it's essentially a representation of whole diet. So it's diet as the sum of its parts, which is the conceptual exposure of interest. And when you compare the within using the dietary inflammatory index between a high versus, you know, a positive dietary inflammatory index score, representing, you know, kind of a more, shall we say, anti inflammatory effect of diet versus a poor dietary index score, you do see differences across various health outcomes, particularly with regard to colorectal cancer. That's not something that would be particularly surprising because of the mediating role of inflammation. And there's an overlap in terms of inflammatory bowel disease as well. There is differences that are observed in terms of cardio metabolic disease as well cardiovascular

disease and diabetes. There was an analysis for example, using the dietary inflammatory index had found differences in risk associated with a high or a low dietary inflammatory index score. So when we characterize diet as whole, as whole diet, as opposed to focusing in on specific individual foods, and the interesting thing about the dietary inflammatory index is that rather than previous research, which tended to look at inflammation through the context of an established intervention diet, like the DASH diet, for example, the DII took into account research from different populations all over the world to come up with, with a composite score based on 45 different kind of foods, food groups and nutrients. So it represents these dietary factors that could be present across populations. And so it's one of the inherent advantages of it rather than just, for example, validating a score in a specific population like the UK, in which case you can't assume that that then applies in a cohort in Japan, for example. So in the broader sense, can we say that there is a difference between inflammation and, and diet and health outcomes? It appears that there, that there is when we look at something like the dietary inflammatory index, and we compare high versus low levels, which would indicate either low levels of an inflammatory effect of diet versus high levels of an inflammatory effect of diet on various health outcomes.

DANNY LENNON: For some context maybe to help people conceptualize this, is their examples of a diet or dietary pattern that would represent a high dietary inflammatory index score and one that would represent a low?

ALAN FLANAGAN: Yeah. For low dietary inflammatory index scores tend to be associated with omega-3 fatty acids, fish, fish consumption, for example, and high intake of dietary flavonoids, which are these bioactive food components that exist in various foods of different pigments. So dark purple, for example, blueberries, or red raspberries, strawberries, these, they are highly

concentrated in foods like berry or dark chocolate. And those compounds tend to be in the context of a diet pattern, which in effect from a food-based perspective, we're talking about lots of non-starchy vegetables of various colors, and oily fish intake. They tend to be associated with a low inflammatory index, whereas diets that are high in total energy, refined carbohydrate and sugar, and saturated fat tend, tend to be associated at a broad level with a more pro-inflammatory score or a higher dietary inflammatory index score.

DANNY LENNON: That's interesting because I had heard that the lowest inflammatory diet is one where you only eat ribeye steak.

ALAN FLANAGAN: Yeah, yeah.

DANNY LENNON: You seem to have flipped on its head.

ALAN FLANAGAN: Flipped it on its head. Yeah. Yeah.

DANNY LENNON: So I'm, I'm losing the faith in my sources of information.

ALAN FLANAGAN: Yeah. So yeah, what's and that, that narrative, of course, goes hand in hand with the whole, you know, polyunsaturated fats, the vegetable oils are inflammatory.

DANNY LENNON: Let's get into some of that stuff because I know you've made the important point that really, we should be considering overall diets and dietary patterns. And there's this trap of falling into looking at specific nutrients. But kind of paradoxically, that's where most of the conversations end up going. Right? And there's, you mentioned polyunsaturated fat. We can maybe talk a bit later about sugar or dairy or wheat or some other examples that that I came up with that are very easy to people calling them pro-inflammatory foods, and they need to be eliminated from your diet. So maybe to start with the polyunsaturated fatty acids, because this is probably I would guess the most common or at least in a lot of the conversations

that we've seen popping up. So maybe if you outline what is the common rhetoric that is given in this area?

ALAN FLANAGAN: So that the common rhetoric and it tends to come from the kind of low carbohydrate/ancestral/paleo/now carnivore, I put that all under one umbrella and dietary paradigms and concomitant with that, with that dietary paradigm is, you know, our ancestors walked out of the African Rift Valley using rib eyes and butter and, you know, ubiquitous foods in the middle of Kenya. So, so with this narrative, which focuses very specifically on kind of rubbishing, Ancel Keys, who is one of the kind of key nutrition scientists of the 20th century for, for various research contributions, not just his work on, on saturated fat and heart disease. And, and because the focus emerged in the 60s and 70s on, on saturated fats, they focus in on that period, and they say, well, actually, we were wrong about that then because what came into our food supply then was hydrogenated vegetable oils. And these are vegetable oils, largely polyunsaturated fats that have undergone chemical hydrogenation. And that alters the chemical structure of it and creates what we now know as trans-fatty acids, and which for the most part have been removed from the food supply. The problem with the 1960s and 70s is that often trans-fatty acids were not necessarily separately identified as their own fatty acid subclass. They were often considered within the some of polyunsaturated fats. And a lot of early polyunsaturated-based foods like for example, like Flora or margarine contain very high levels of fatty acids. The inflammation myth seems to have been born out of a small intervention in the 1960s known as the Sydney Diet Heart Study. And in that intervention, participants were randomized to consume a high polyunsat, well, what was supposed to be a high polyunsaturated diet, where they were given spread, a margarine spread as a food-based intervention for them to use and add. And over five years there was

quite a dramatic increase in cardiovascular mortality in the intervention group. And that generated the myth or seems to have generated the myth as far as I can glean from, from the annals of history. But the difficulty is that the spread that they were given contains very high levels of trans-fatty acids. This mistake was seen in a couple of other interventions around the same time. The Minnesota coronary experiment was another one. So a couple of studies that failed to account for that. Now we can retrospectively look at those studies and know why there was that increase in risk because we know that trans-fats have a really negative impact on, on health, to the extent that they've been largely removed from the food supply. In some countries they've been banned. And in others they've just been reduced in conjunction with industry to the point that they're not really present in foods. So that seems to have been the root cause of it as far as this association between polyunsaturated fats and inflammation. The difficulty is that it seems to that then being applied to the whole class of fat subtype that is polyunsaturated fats. And there's two levels, I think to look at this. One is which omega-3 fatty acids, which I don't think anyone irrespective of what diet they believe in or otherwise would, would say are not, or are pro-inflammatory. We know mechanistically that omega threes have an anti-inflammatory action. But the focus has been on omega-6 polyunsaturated fats or arachidonic acid and the omega-6 polyunsaturated fats are the precursor to arachidonic acid, which is the substrates for a type of mediating process in the body of inflammation that's associated with a pro-inflammatory state. So this kind of reductive reasoning has been applied where people have said, well, if omega-6 polyunsaturated fats are the precursor to arachidonic acid, and if arachidonic acid is the substrate that we use to produce these pro-inflammatory mediators, then high levels of omega-6 must be pro-inflammatory. And there's some degree of where you can see someone's thinking with

this. The difficulty is that there's no evidence to support it. There's no evidence that increasing omega-6 polyunsaturated fats changes circulation levels of arachidonic acid. They remain quite stable. Circulating levels of arachidonic acid remain quite stable. Studies have overfed people up to 500% extra omega-6 polyunsaturated fats and seen no change in circulation levels of arachidonic acid. More persuasively, mechanistic research in terms of cell culture studies in vitro has never shown an inflammatory effect of those fats either. So there's no experimental evidence to even support the hypothesis. And there's no evidence from human studies that really, really, you know, large amounts of omega-6 polyunsaturated fats don't increase this marker for, you know, the, the substrates for pro-inflammatory pathways or arachidonic acid. So there's, there's a lot of holding on to this idea based on the Sydney, and I still, if I get into this conversation, I've had people send me the Sydney Diet Heart Study and I'm just like, why this is it you're still relying on a study from 1965 to support this? It's amazing.

DANNY LENNON: When you said like there's, there's no research out there, there literally isn't other research that people are citing in support of [an argument in these 00:29:00].

ALAN FLANAGAN: No, people, people's select blog posts, it's amazing. When you get into this omega-6's inflammatory arguments, what you get back is if someone is going to cite research, they're going to send you the Minnesota coronary experiment or the Sydney Diet Heart Study, or they're going to send you a review paper done by someone who clearly supports the kinds of, you know, the narratives that we're talking about, and reviews only those papers. And the other option is you'll just get sent a blog post by, you know, you know, paleomom.com about why we should never have listened to Ancel Keys, and it's all omega-6 that are pro-inflammatory. So when we say there is no

evidence of an inflammatory effect in experimental models, there is literally none.

DANNY LENNON: So that's the polyunsaturated fat issue. Others would be sugar is obviously one because what doesn't sugar do? Dairy in various contexts can be discussed here as well. And then there's some other related to some grains. So are there any of those that you'd like to jump in to and maybe to explain or which of those seem to be the most common that you've seen discussed in relation to inflammation?

ALAN FLANAGAN: Yeah. So I think, I think the three foods there, sugar, wheat, and dairy all seem to be equally as ubiquitous in the conversation around inflammation. I think with sugar, what we need to know, understand is a lot of the focus in nutrition in terms of the quote, Western diet is less focused on isolated nutrient components and focused on the sum total of the dietary pattern. And it could we say in that context, that the dietary pattern is inflammatory will, yes, in terms of research we would have looking at the diet pattern and the dietary inflammatory index, the typical characteristics of a Western diet that are low in fiber, high in refined grains, refined sugars, saturated fat is, is actually lower now than, than it was in previous years. And is a diet that's high in total energy and very low. And then, more importantly, what's missing from that diet, like the protective compounds we talked about earlier, you know, vegetables and fruits, flavonoids and omega three fatty acids. With sugar there are interventions that have compared quite high levels of either fructose or glucose, or even sucrose, up to say 80 grams. And generally, there is some effect, it seems in terms of an increase, but what's interesting is that those effects even compared to control groups are not particularly high. And when you look at the studies individually, even the effect is not consistent. Whether we're looking at CRP, which we talked about earlier, that's, that's quite robust or we're looking at other inflammatory biomarkers. So, the reason these

studies are important is because rather than looking at, you know, total diet pattern, they're, they're obviously isolating sugar specifically either sucrose, glucose, or fructose, you know, and giving people quite, quite high amounts of it. And so I think overall, it's, it's very difficult on the basis of the current evidence to, you know, to really see a difference in any of those sugar types, whether it's even high fructose corn syrup, or just, or sucrose, which is 50/50 glucose and fructose molecule and sucrose is more common. We don't have high fructose corn syrup in the food supply in Europe. But sucrose is, is the main sweetener in, in, in Europe, in the food supply in Europe. Often what these studies lack is, is an actual isocaloric comparison. So you're, you're, they're, they're often just comparing the effects of the sugars themselves. So if they're finding no effect in a randomized trial, it's because there's no effect as between those two interventions as opposed to testing a high sugar diet versus, you know, a very low sugar high fiber diet, which I think would be probably a more adequate comparison. But I think at this point to say that sugar is inflammatory, absent any other context is difficult to substantiate by reference to plot evidences there. I think then if we think about sugar in the context of the typical diet pattern that we associate a high sugar intake with, then that total diet pattern, I think we could make a case is inflammatory, and but that diet is the sum of its parts for all of those characteristics we mentioned earlier.

DANNY LENNON: Before you move on, I just think it's, it's useful to see that there's a parallel between this and most other discussions around sugar of like, is sugar bad for x? And most of the time it comes down to, well, what's the exposure to that sugar? And that includes how much of it that you're consuming, how often you're consuming a high or low intake, and then, like you said, within then the context of other foods and nutrients which may mitigate or exacerbate the

detrimental impact of any thing we're doing with diet.

ALAN FLANAGAN: Right.

DANNY LENNON: And it only makes sense to consider what does your overall diet look like to see those effects? And that's kind of true for most of the things we could say about sugar. Right?

ALAN FLANAGAN: Right.

DANNY LENNON: And, and so I think inflammation is a great example of that.

ALAN FLANAGAN: Absolutely. And I think, to touch on that in the context of the Western diet, you know, if you look at overfeeding studies that there is this kind of potential for postprandial i.e., like in the post fed stage oxidative stress to, to increase an, low grade inflammation to increase in that postprandial periods in response to really high energy meals, particularly where they are of that typical Western diet composition. And so, you know, when we talk about the, the current food supply and the ubiquity of energy dense foods and the Nova classification of ultra processed foods, you know, this is a diet that is very energy dense, very easy to have a significant amount of over nutrition, over energy. And so I think my personal opinion is it's, it's impossible to separate what people are talking about the inflammatory effects of diet or the Western diet, in particular, from the total energy content that that diet provides. Within that total energy content, then you get the contributions of things like sugar and, you know, and fats and refined starch and low fiber and all of these other variables. So, so yeah, it comes back to this idea of the, the nutrients, any nutrients, this is just a fundamental principle of, of nutrition research is any nutrient never exists in a vacuum. And so while there may be an effect, a specific effect, a biological effect that you can look at, you know that, that that activity is not independent from

the other mediation and moderation nutrients in the diet and the total diets. And I think that really, that statement there, so we don't kind of double back and repeat everything we just said really encapsulates the evidence for wheat. I mean, if you take someone that has celiac disease, there is clearly a need for the elimination of wheat as the dietary intervention for that condition. There is an inflammatory effect, obviously, before elimination of, of wheat and diagnosis. And but again, that's specific to the context of an individual with an underlying autoimmune condition. The, the extrapolation that was made from mechanistic research looking at, for example, activation of zonulin or other potential pathways. And I think, you know, in particular David Perlmutter is, is guilty of sin of this with, with the Grain Brain book was this real over extrapolation of mechanistic research from a disease stage from actual condition and to effects of a specific component of diet on, on the brain mediated by inflammation of course. And that's another food that or, or a specific component of diet that's absolutely impossible to separate out from the total diet pattern that is the Western diet. And, you know, the, the idea that in normal healthy individuals absent a clinical condition that requires elimination, that there is a specific inflammatory effect of wheat is at this point unsubstantiated by, by reference to research in, in a healthy population subgroup. And so I think that's one that people kind of need to knock on the head as well, you know, this idea that grain is going to give you dementia is ridiculous when we consider the role that grains play in the context of healthy diet patterns all over the world.

DANNY LENNON: Yeah. Well, I mean, if people do enough looking at someone like Perlmutter, he, it's just so outrageous some of the claims he has made.

ALAN FLANAGAN: Yeah.

DANNY LENNON: He can be immediately disregarded. But I think In reference to whether that's wheat, gluten,

grains more broadly, and even actually dairy in this category, I see a lot of it coming from discussions that start out looking at various autoimmune disorders and knowing that inflammation is a key process in those and looking at ways well, how can we reduce inflammation? And then there's oftentimes recommendations to eliminate certain foods. And indeed, then there's some basis where in a lot of cases some types of elimination diets may be used to beneficial effect in some of those clinical settings to see at least an acute benefit in some cases. And then that gets brought out to say, well, either for anyone looking to reduce inflammation, or if you eat these foods, it causes inflammation to the point where you may develop something and it's just misunderstanding the, the differences between clinical situations and not essentially.

ALAN FLANAGAN: Right. And that's, that's where we have to as much as it's important that we disabuse people of potentially either useless or in some cases even harmful information particularly as I said in the auto immune space. There's a lot of information that just seems to get just get passed down that doesn't really have any real kind of hard evidence behind it. What I also think that it's important in a lot of these conditions to recognize that there's still a lot we don't know. And I, you know, I think part of the reason why autoimmunity is an area people that deal with autoimmune conditions are so are a vulnerable group to misinformation is there aren't a lot of useful answers for a lot of those conditions for people. And so you try everything through the, through the normal channels and you still don't really get a lot of resolution. And so that's why it becomes attractive to turn to other channels that may not necessarily be giving good information. But if we take, for example, the gluten thing as an example or wheat gluten, you know, we know that obviously eliminating gluten is the intervention for celiac, but we also know that there is, is huge genetic overlap in, in all autoimmune conditions and the colloquialism

that having one or the biggest risk factor for having an autoimmune condition is already having an autoimmune condition in the sense that they often tend to overlap. You get anecdotally someone with rheumatoid arthritis, -for example, who's tested negative for celiac, but subjectively is, is, you know, strongly of the opinion that the, the difference in their joint pain, with or without wheat gluten in their diet is something that they notice. And, and so I think there are these areas where rather than just dismiss the potential for something when we don't have evidence, and particularly with autoimmunity, I'm a lot more kind of sensitive to people that have those conditions. And my answer then will always kind of be look, reality is we don't really have that data yet. And it doesn't mean that it's not potentially something there. So that's where we come back to the kind of very individual level like, is there potential for harm in doing this type of assessment? But, but unfortunately, people with autoimmune conditions are a very vulnerable group to misinformation. And that makes that conversation quite difficult. And so what it comes back to is, when we say there is no evidence for something, there's, there's two meanings to that that are really important distinctions. One is the context where their research has been done. And there is no evidence from that research to support the claim being made. In that case, we say there's no evidence from research. But then there's the case where the research simply hasn't been done. And in that case, we have no evidence, but we still also don't know. And that's where we have to be, you know, scientific in our mindset and say, well, actually, that's a different context to we don't know, by reference to evidence versus we don't know, simply because we don't have the data. And they're two very different things.

DANNY LENNON: We've kind of got through quite a number of subtopics with inflammation and diet there. Is there anything that we've skipped over or

missed that you think is important that we reference?

ALAN FLANAGAN: I think, well, dairy is probably one we'll just wrap up on in terms of that because it's another pretty common one, to keep this short, but there really isn't evidence of, of an of an inflammatory effect of dairy in the, in the context of a food group that is much maligned, but overwhelmingly the totality of evidence supports it as a healthy food group. From an intestinal health perspective, particularly dairy is one of only the few sources of the short chain fatty acid, butyric acid, and we know that short chain fatty acids have anti-inflammatory properties in the gut, we know observationally that dairy has been associated with significantly reduced risk of colorectal cancer in various populations, whether that's the Adventist Health Study-2 cohorts, or certain of the epic cohorts in Europe. There is a suggestion in two studies that have looked at very specifically the difference between casein protein types. Broadly speaking, it's characterized as A1 casein versus A2. They have suggested that A1 protein is potentially inflammatory in, in, in terms of markers of intestinal inflammation. However, those studies were conducted in Chinese populations who have very high levels of lactose intolerance anyway, and I think it's really difficult at this point to, to hang anything on that research. Although it is one area that I would say, you know, there's, there's, there's something in terms of further research that that could be looked at in that context. But at this point, it doesn't give me anything to say that there's a reason why getting that niche about your source of dairy protein would, would be something I would be telling people to do.

DANNY LENNON: Yeah. I think that rounds us on that topic. So let's jump into our next segment that we're going to do. These are questions from members of currently who are supporting the podcast on Patreon, although that may change in the future, and we'll call this segment, I have a

question. And so we're gonna take one relatively shorter, concise question that we can hopefully answer relatively quickly from those people supporting the podcast each week. And so for this week's question, I have one here from James Valaitis who asks, for my second meal, I avoid the use of oil to fry my vegetables and to keep my fat intake down. One and every few days I usually slightly burn the vegetables. Is the carcinogenic risk of this high enough that I should be throwing them away and starting again? They will be noticeably blackened and taste slightly burned. Okay. So that is our question. I will give a few thoughts on how I would go about answering that. And then Alan, if there's anything stupid I say or anything you would add on top of that, we can, we can jump into some discussion around that. So I think maybe for some context for people why James is talking about this burning of food and this carcinogenic risk, in this case because he's talking about vegetables, it's down to the presence of acrylamide, which occurs naturally in the cooking process when we have starchy foods. So this is most often things like potatoes. It would include root vegetables. It would have grains like breads and so on. And when they're cooked at high temperatures, we get this formation of acrylamide. Now, at least for most classifications I've seen for this so like the IARC would classify this as a probable human carcinogen, that's the International Agency for Research on Cancer. And we need to be wary that this both references acrylamide that is present in food, but this can also be present in various industrial forms and products as well where it has known carcinogenic potential. But the issue with it in food is probably from what I can tell a bit more trickier to work out. Now, where I tend to go for stuff like this is probably to look at what EFSA put out on this and looking at the EFSA report, they tend to probably be quite precautionary and maybe conservative on some of these, but do conclude that it's likely to increase risk of cancer due to increasing risk of gene mutations and tumors and so forth. Now, a lot of the data seems to be

from a quick glance, a lot of rodent models that are done and a lot of the kind of mechanistic work as well, as opposed to there's not a clear answer I can see in any of the human epidemiology, and we might come back to that in a moment, because I'm sure you may have seen some of that, too, Alan. One thing that I did find interesting in the EFSA's report was a couple of things. So they, they give a kind of breakdown of the average exposure. So in the average population where most people are getting exposed to acrylamide, about 50% was from fried potato products, about 35% was in coffee, and about 25% was in breads or soft breads. And then you had, the rest was kind of made up of like biscuits and crackers and crispbreads. Right? So first off, most of the exposures, probably from foods, we wouldn't want to have a higher exposure of anyway. But there's some interesting stuff when you look at differences in cooking methods, preparation, and then between different types of foods. But to keep it specific to James's question, I would say that there's still a lack of, I would say, a really clear answer as to how much we should put specific focus on acrylamide. In other words, how much of a focus that should be in when we're making food decisions. If we are having an overall dietary pattern that is helpful, I think the human epidemiology doesn't seem to be that strong from what I've seen. Maybe I could be wrong on that in relation to cancer risk and dietary acrylamide, but I obviously do take a lot of note in EFSA, and so on reporting that that would be known as having carcinogenic potential. So it comes down to again to someone's own risk tolerance, I guess. And if they did want to try and mitigate the amount of acrylamide in the diet, it would come down to the number one like the, the foods that you're consuming. Like we said, it's typically starchy foods and when you're cooking them at high heat, so it's going to be mainly like roasting potatoes, toasting bread, things like that, in relation to the James's question to be frying or roasting root vegetables, presumably, boiling and steaming,

don't produce acrylamide. So you can kind of change around the cooking methods. You could consider how well the foods are cooked. So the typical recommendations from food safety authorities tend to be going for like this golden yellow color as opposed to a brown color when you're roasting potatoes or toasting bread. And then one kind of study I thought was interesting that I came across was in the preparation of potatoes. When if you were chopping raw potato into slices, soaking them for there was two different conditions 30 minutes and I think two hours was the other one. Doing that before frying or roasting, reduce the acrylamide formation when they were cooked. Now they are ways that you could of course reduce acrylamide within the diet, but again it comes back down to how much focus do we want to specifically have over this one thing as opposed to is my overall diet healthy and is my likely exposure through the roof. So my answer is given that you're not, you don't have a way to measure in your home, the acrylamide in each piece of food you eat, having a general idea about ways that would be very high in terms of your cooking methods and food choices, but not necessarily wouldn't be a target I've ever really recommended. Hey, everyone needs to change their, their diet around in a dramatic way

ALAN FLANAGAN: Track your acrylamide in My Fitness Pal.

DANNY LENNON: Exactly. And so to even get more specific to James's question, I would certainly say please do not throw out vegetables if every now and again, you've slightly overcooked them. And in this case, it may not even be root vegetables, so it may actually be fine. So that would be the way I would answer the question. Do you have any thoughts on cooking of vegetables, acrylamide or any of the data in this area?

ALAN FLANAGAN: Yeah. The only thing that that I come back to and it's, it's always been something that interests me in the context of dietary carcinogens is the fact that for the most part

with the exception of say processed meat where we have a preformed potential carcinogen in the actual meat process from, from salting and curing and all of that, when it comes to acrylamide and these factors, these dietary carcinogens actually require metabolic activation. They're not, they're not directly carcinogenic prior to a metabolism. And what makes that really interesting is there's actually a lineage of research going back to the early 90s. Professor called Paul Holliday, who published widely on dietary carcinogenic compounds and anti-carcinogenic compounds. And there are a lot of compounds in the diet that have an inhibitory role on that activation process. And they can be often polyphenols for example, and or limonene, which is in lemons, and all these various kind of factors that again comes back to like eating vegetables and fruits. Well, what is interesting is that it suggests some degree of mediating effect. So, you know, if you, for example, are frying your vegetables, you know, even just a small bit of olive oil. People have sometimes said, oh, well, it's a high smoke, it's a low smoke point. So you shouldn't cook with it. But we know, actually, from research looking at that, that the high polyphenol content of olive oil protects it. So even just because what I thought of with that question was he specifically said, I cook my vegetables without oil. Now, from the question, if I remember he said, I'm keeping my fat intake low. That's, that's fine. But I mean, even a teaspoon perhaps of oil on the pan might go some way to mitigating some of the, you know, the potential for an effective acrylamide in that circumstance due to the polyphenol content of olive oil. So that's really kind of where I wouldn't add anything to the assessment of the risk factor, and safe to say that perhaps the risk can also be somewhat moderated or mediated by the wider diet and, and even just a tiny bit of olive oil, while, while cooking, and in addition to wider intake of vegetables and fruits,

DANNY LENNON: It reminded me as you were saying, the kind of mediating factors of there's a similar issue

before endotoxemia. And there's potential for these at the problem with something like I think it was a discussion around bulletproof coffee, right, and you see this endotoxemia that results afterwards because you have this large dose of butter all in one go. And that's never where we see that occur in a normal dietary pattern. Right? So if you were to have a salad and a piece of whole grain bread and put some butter on it, that's a very different impact in terms of endotoxemia than you'd get from this massive load of butter with no other fiber or polyphenols within that meal. And so it kind of relates this same point. So, yeah, maybe the solution is a teaspoon of olive oil, and that will probably prevent them burning anyway. So we're good. We're full of answers. So with that, that's our question. Hopefully, that was useful to you, James. Now we come to a segment I'm very much looking forward to. And this is what we are affectionately calling the quack asylum, which was named by Alan. So Alan, maybe first of all, let people know what we're planning for what the quack asylum is, and then maybe introduce what our topic for this week is.

ALAN FLANAGAN: Yeah. Well, anyone listening probably consumes a significant amount of their information online and has a lot of exposure to information through social media, through Twitter, through Instagram, through Facebook, and potentially then through blogs and other, other medium. And it's impossible now to have an interest in nutrition and diet and health without being exposed to some often hilariously nonsensical to potentially really damaging and dangerous information in the online space and in the interests of providing people with a resource that they can rely on. And we thought that it would be beneficial to also help people actually preempt or recognize these types of messages, you know, whether they are on the more farcical and funny or on the more kind of dangerous misinformation side. You know, we'll ultimately probably end up with quite a mix of the two and, and, and everything else in between on that spectrum.

But we thought that today we would start with something that is something myself and Danny have spoken about offline and have quite strong feelings about in the context of the current COVID-19 epidemic, which is to say that if you've, as I am sure everyone is in confinement or in stay at home isolation, people screentime I imagine has gone up and the amount that they're consuming on social media has gone up. And one thing that's become very obvious in the context of the COVID-19 epidemic, if people are interested in nutrition is they'll have no doubt have come across various posts about the role of a specific diet or a specific food in relation to the potential to protect or quote cure COVID-19. And what we've noticed is that in the context of a global pandemic that is costing already hundreds of thousands of lives and will continue to cost lives and devastate countries and economies and communities. The idea that particular dietary paradigms are using a crisis of this magnitude to leverage their own belief system on the public is something that I think is morally bankrupt and in every respect, reprehensible. We've seen it from various paradigms, whether it's the carnivore diet group leveraging the idea that eating meat will be particularly protective against COVID-19 to suggestions from the vegan community that the reason that COVID-19 exists and is spreading is because the world isn't vegan. And so we have these dietary paradigms that in terms of what ends up on their place are diametrically opposed to each other. But what's interesting is that in terms of the substance of their approach, they're largely identical and what they are revealing to us in the context of COVID-19 is that really, the goal is simply conversion. And the means always seem to justify the end. And this is reveals numerous individuals within each paradigm, who we won't name because suffice it to say they represent the movement itself. Thus, they are willing to use a situation that has drastic consequences at an individual community, national and international level, to further their

specific view of diet and health. And that is something that I think just really shows us the kind of rock bottom levels that that some of these paradigms are willing to go to, in order to try and convince people of their quote truth and I use that word in a pejorative sense.

DANNY LENNON: I think this is a result of what happens when you start to see everything through one lens and people get so bought into this certain ideology that certainly they start to see the whole world and every issue within through the same viewpoint. And so then you have this kind of common problem, or you can only discuss this issue, right? You can't have a conversation about everything else that's going on without bringing it back down to your diet ideology or some impact around health. And I also think there's a very strange phenomenon that's happening where these people have large followings where people look to them for certain advice or their viewpoints on diet and health, typically. And now when everyone's attention is on this other issue that's going on, they can't help but think to themselves that everyone must want to hear what I think about this.

ALAN FLANAGAN: What I think? Yeah.

DANNY LENNON: I need to get some sort of viewpoint on it. And I don't need to defer to other people or to continue talking my normal nonsense because yeah, people don't care anymore, that there's this other issue and I need to get some of that limelight to some degree and, and you end up hearing like completely nonsensical things. And oftentimes these people just seem to me like they're just completely removed from reality. And you know, like I think I showed you what one of the tweets I couldn't stop myself usually I don't. But I've retweeted one of the more prominent people in, in the low carb field, who would rather than really address the issues that are facing the UK in this context goes on this bizarre rant about people getting receiving biscuits in a free food hamper. So

vulnerable people were given a free food hamper, because there's biscuits included. This is bizarre, angry rent. And it just shows you like how removed from the reality of the situation are some of these people.

ALAN FLANAGAN: Yeah. Yeah.

DANNY LENNON: It really is mind boggling.

ALAN FLANAGAN: It's mind boggling. And I think you see it, it's quite naked in the respective paradigms. And what's interesting about the kind of the low carb carnivore side of the fence is inherent in that movement now is denialism across the board whether that's cholesterol denialism, statin denialism, even though denying that fiber is even healthy. And you know, it's a conspiracy. So we'll just deny fiber. And so what was really interesting is because everyone in that movement is in this mindset of denying anything that's kind of mainstream. When COVID-19 started emerging as a real threat, there was denialism immediately reached for as a reason for explaining it, you know, it's not, it's not that big a threat. It's, you know, it's only the flu. I think Zoe Harcum had posted that, you know, why are we, we don't shut down countries because of the flu. And just this, this level of almost willful ignorance to just accepting loss, the WHO and the CDC were putting out there. And so it's like this default presumption that any information I'm getting is wrong because the channels it's coming for are whatever. And, you know, and then on the other side of the fence, you know that the idea that like we -- something that I saw was the reason COVID-19 is a pandemic is because everyone has antibiotic resistance from consuming animals. Therefore, go vegan, and there's no COVID-19 and you're just looking at that and even at the most fundamental level, it's wrong. Because COVID-19 is a virus. And you know, antibacterials will have, will have no impact on virus. So you don't even, you don't even get this baseline grounding of fact, from which the claim comes from. But it's got so

much emotional weight attached to it, that that it almost we're in this realm now of, of the basis for what you're saying something really doesn't matter if it's got enough emotional ways attached to it. It's going to gather momentum. And, and so yeah, using this particular, you know, time to, to leverage a position that you said is, is divorced from the reality of the situation that people are facing and you know that we're giving some elderly people throughout the country a custard cream is a national scandal, you know, just, just really shows how far removed they are from the reality. Yeah.

DANNY LENNON: So for all people that are leveraging the COVID-19 pandemic to further their diet agenda, they are all consigned to the quack asylum.

ALAN FLANAGAN: They are consigned to the quack asylum. Yes, they are. Yeah.

DANNY LENNON: We're gonna finish off with a short little segment that we thought might be nice to include, a random recommendation of sorts, something for you guys to check out. And it can be completely random. It's typically going to be non nutrition and focused to leave you going away with something a bit more lighthearted than what we've, we've just been discussing.

So, Alan, what this week would you like to recommend people go and check out?

ALAN FLANAGAN: I'm sure people have probably already done it, but I'm kind of late to the party and given the COVID-19 scenario have been really tucking in to Mindhunter on Netflix. And so I'm kind of halfway through Season Two now and I'm really into us. Yeah. It's, it's brilliant.

DANNY LENNON: I have no idea what this is. You're gonna have to give me the like non, non spoiler explanation.

ALAN FLANAGAN: Yeah. The non spoiler explanation is it's a series on the, the origins of the behavioral science unit within the FBI, which basically started really ad hoc because, you know, these couple of agents that are that are the main some of the main characters in it started interviewing, like serial killers while they were in prison to try and codify their behavior and come up with these kind of profiles of various kind of tendencies and stuff like that. So, so that's the kind of overall, you know, kind of background to it. And, and it's yeah, it's really good.

DANNY LENNON: I might actually look at that. I had no idea. I'm terrible at looking for Netflix stuff anyway, so great. So what I thought I would leave people with is a song but very specifically, I would advise people to go and watch a certain version of this song. So it's one of my favorite. I've probably posted it on social media. It's song is Ocean by John Butler trio. And there's a version where John Butler himself on his own does a solo studio version. So if you're looking on YouTube, it's just under Ocean John Butler 2012 studio version I think, and it's a 12 minute instrumental song done on his acoustic guitar. And not only is it just insane level of talent, like I can't even comprehend the level of skill that's in here. And the emotion, it's, it's weird. It's like a song that takes you on a journey and I usually don't talk in songs like those terms, but it's genuinely one of the few songs that I've listened to and get emotional. And even though there's no lyrics like that's kind of the it's, it's, it's absolutely insane, and to watch it is kind of cool. And John Butler trio, more generally are a great band and most of their songs are lyrics. This is just one specific instrumental. And funnily, I was supposed to be going to see them in June in London, but I presume now that may not happen.

ALAN FLANAGAN: No, [may 01:08:54] not happen, no.

DANNY LENNON: So there we go. Yeah. So yeah, they are, they are from Western Australia. So the other two

members have kind of changed a lot over the years. So John Butler's only the real mainstay and it's really centered around him. But yeah, he's, he's, he's cool. And you'll see in the video for people who are into music, he, he takes a 12 string guitar, but he basically turns it into an 11 string. He always removes the high octave G string. And it's just, yeah, it's insane. So that's my recommendation for the week.

ALAN FLANAGAN: Nice.

DANNY LENNON: Okay. With that, I think we're good. Thanks for conversation, man.

ALAN FLANAGAN: Yeah.

DANNY LENNON: This, this was good. I hope, I hope we get more of these going.

ALAN FLANAGAN: Yeah, definitely. Looking forward to a few more.