



Danny Lennon: Alex, welcome to the podcast. How are you doing?

Alex Leaf: I'm doing great, thanks for having me on.

Danny Lennon: My pleasure. I'm looking forward to this, and hopefully we'll be able to get into some good discussion around a number of topics. But before we get to any of that, I'm kind of curious to get a bit more into your background because at least from what I can tell it's been quite varied with various different experiences in different realms that are maybe not quite a traditional route to where you're at now, and I think that kind of probably helps in many ways. But from a kind of overview perspective, how do you typically relate to people, your background and kind of where you ended up with all this kind of nutrition stuff?

Alex Leaf: I guess, I usually start by telling people that I worked for examine.com as one of the researchers. I'm also one of the editors for the Examine Research Digests that we put out. Other than that, I help teach a master's nutrition program at the University of Western States, and I do a little blogging when I have time. But I definitely didn't get started in this field, I actually began working for Examine before I even had a formal education in nutrition. I did get my master's in nutrition from Bastyr University in 2016, but before that I was in business, undergrad with a degree in accounting and philosophy and ethics.

Danny Lennon: That's pretty interesting that as you say you started doing this work with Examine before you had completed that master's.

What was the draw to nutrition that was a big enough thing for you to have such an interest that you decided to go and move away from accounting and business and pursue this, and not only that but to have such an interest that Examine were able to see that you are pretty sharp on this stuff, but before like you say graduating with that master's?

Alex Leaf:

So growing up I was very active throughout my life, I did wrestling for about a decade since I was in elementary school, and I developed some unhealthy relationships with food and body image because of the obsession I needed to have over weight class management. And this got me more into nutrition and fitness in general because I wanted to know how to optimize my performance but also improve my health and try to overcome some of these bad habits I had developed. And so while I was studying accountancy during my undergrad, I spent all of my spare time reading blog posts and getting more into the nutritional science starting with an interest really in the Paleo diet back in 2010 and 2011, and then starting to question why for example I couldn't have dairy, and then digging more and more into the research and communicating with thought leaders in the field just to ask questions to try to understand the whys behind what everyone recommends.

Danny Lennon:

I often find that quite interesting when there is this intrinsic curiosity that drives someone to be learning and questioning ideas as opposed to, I suppose, falling into an education, like just getting into nutrition program, taking what's told to them and that's what they learn; whereas, I think it just tends to be a bit different, not in all cases but a lot of the time, when it's this kind of like I say intrinsic curiosity driving you to ask questions and to say, "Well, why is this the case?" or "Why should I believe this? What is behind that?"

Alex Leaf:

Yeah, I think the biggest part of it is that it's simply motivational. Everyone has certain tics to get them to go down various rabbit holes, and for a lot of people it's genuine curiosity. And so, they have an intrinsic motivation to accomplish something, which is something that tries to be promoted in a lot of when you look at like health coaching or any of that type of thing, it's about promoting self-efficacy within the client because it's well established that intrinsic motivation is a significantly stronger driver than extrinsic motivation when it comes to accomplishing tasks and achieving goals. And so, if we want to consider learning

to be a goal, then I think it's rather intuitive to say that, "Well, if I genuinely want to learn about this topic I'm going to be more successful than if I have to learn about this topic because my grade in school depends on it."

Danny Lennon: One thing that struck me about a lot of the ideas and thoughts you've put out and pieces of writing etc., has been the diverse range of different topics that can span across, and even when we take that to be within this area of nutrition and health, within them it can be often common to see someone have a very specific, narrow focus, particularly if they're involved in research; whereas for you, I think you somehow managed to go quite deep on many topics which is kind of rare to see. Usually, I often see it's someone super deep on one specific thing or other people where they kind of dabble into many different things but at a more surface level. Has again that been something you've been cognizant of and has it been again driven by – you have this curiosity and interest in so many diverse different topics within nutrition that you wanted to pursue each one?

Alex Leaf: I wouldn't call it a pursuit, it might be more of an accidental finding. And I certainly wouldn't – I wouldn't consider myself an expert on most topics at all, because I haven't gone down many of the rabbit holes. I may have dug a couple of inches deeper than other people would have in a more diverse array of topics, but I certainly haven't dug as far as I would need to be considered an expert on them. It's more of a side effect I suppose of the work that I have to do for Examine, with writing about research on a daily basis, and updating supplement databases, blogging about various nutrition topics forces me to read about a lot of different things. And then that knowledge just accumulates over time and builds upon itself, and the beauty of nutritional science is that everything is connected in some way so you can usually identify patterns between ideas and start to connect dots once you have enough dots to work with.

Danny Lennon: Yeah, I think that idea of pattern recognition is an incredibly powerful one. And beyond that, to kind of touch on what you said, I think a lot of the benefit can be gained almost if people want to call it an 80-20 rule or various different ways of seeing other people express this idea but you can go, like you say, relatively deep by maybe getting like 80% of the way and still be far more advanced in your understanding than most, but maybe that last like few percentage points for someone who spends their

whole life on one specific topic is a lot of extra time for small incremental changes. But nevertheless that's probably an idea for a different day. To get into some of the real nuts and bolts of this discussion, I know you have mentioned previously that one of the big areas that's an interest of yours is around protein controversies as you had termed that. So first from an overview level, what are some of these primary controversies that are present that could be ground for us to maybe tease apart over this discussion?

Alex Leaf:

Nutrition science will tend to operate in circles and so we've gone from days of hyper-focusing in on fat in the 70s and 80s with Ancel Keys to now we are hyper-focusing in on carbohydrates over the past 20 years with low carbohydrate and ketogenic diets. And now we're starting to see a shift to a hyper-focus on dietary protein with things like the carnivore diet, what people would term high-protein ketogenic diets, and just eating more protein in general especially in response to the increasing rates of obesity that we're seeing in the world. And you have interesting hypotheses put out such as the protein leverage hypothesis, and you also have a bunch of longevity research suggesting that low protein diets are optimal for aging. And so we're starting to see a lot more data on the effects of protein in the diet come out, and this has led to a lot of debate and disagreement on various topics as protein is related to health.

I would say the historical concerns over eating more protein have been related to kidney health, bone health, both of which are secondary to metabolic acidosis. But more recently we're starting to see a bigger focus on the effects of protein on lifespan, the microbiome and even the body's ability to process protein through the liver. And so these have been some topics that I've looked into kind of in my spare time out of that general curiosity because we see a lot of health benefits with higher protein diets, and we see these in a wide range of populations, so people who are simply looking to lose weight, lose fat mass, and improve their health benefit by eating more protein due to its effects on muscle mass satiety, thermogenesis. We see athletes who eat higher protein diets due to benefits for recovery and body composition. And we see the elderly ideally eating more protein because it helps offset the loss of muscle mass with aging called sarcopenia and it helps fight against frailty which is the leading cause of death among the aging population.

So you have established benefits with eating higher protein diets and we could argue what constitutes a higher protein diet, but that aside, you have these benefits and yet now we have certain risks that a lot of people bring up. The kidney and bone issues have been relatively dismissed at this point. I mean, even leading health organizations acknowledge that eating a high protein diet does not cause kidney damage or bone health issues, but there is still a lot of unknowns when it comes to longevity and the microbiome. And these are certainly issues that we need to tease out and take seriously, because what's the point of improving your health in one way by eating a high protein diet if it's only going to reduce your health in another way, such as by causing colon cancer or reducing how long you can live?

Danny Lennon:

Yeah, I think there's so much within that and I'm glad you bring up some of those points. They've been things that I've been thinking about and talking to a couple of people recently. I'm really interested to hear your ideas on some of this stuff. I think, in some ways the hyper-focus we're now seeing on protein can in some part may be put down to an overcompensation for it previously being maybe not given the appreciation it deserves at least for its role in human health; and like you say, just improvements we can see in people's body composition, there are clear knock-on impacts on various health markers as well as clinical issues like sarcopenia which I definitely want to circle back to your ideas on.

One from the outset that I think is really interesting to look at is you mentioned this area of longevity and anti-aging and there's certainly a community that has talked both about total caloric restriction as well as protein restriction. And maybe we can kind of dissect that for people a bit of where that hypothesis and idea tends to come from – I am certainly happy to talk about some of the studies and a lot of the rodent models so far, but from a kind of mechanistic perspective at least how I've seen it, we're probably looking at the effect of protein on certain metabolic pathways. What are those kind of main mechanisms that you've seen promoted as the reason why protein restriction may be an issue in a longevity context?

Alex Leaf:

The general idea these days is that we have a bunch of studies in fruit flies, worms, and mice suggesting that calorie restriction increases the lifespan of these organisms. And we've been able to nail that down to suggest that it's not just calorie restriction, it's

protein and particularly methionine restriction that benefit the lifespan. And there's a variety of proposed mechanisms for this such as reducing the expression of mTOR, the mammalian target of rapamycin and we even have data showing that simply giving drugs that suppress mTOR will extend lifespan suggesting that that certainly is one of the primary mechanisms by which reducing protein intake has a benefit in that regard since mTOR can be thought of as one of the master regulators of growth and reproduction. When it's high, it's signaling the body to build new tissue, to have offspring, that food and everything is plentiful. On the flip side, you have AMPK which is like its antagonist, it's kind of the master regulator of the fasted state where it rises when there's a reduction of ATP levels within cells, and also a rise in ADP and AMP levels which is essentially signaling that there is a lack of energy availability and AMPK rises and tells the body to stop building new tissue and to stop reproducing and to instead focus on repairing current tissues that are damaged and preserving what is there as a survival mechanism.

And so the longevity researchers are essentially arguing that by eating a high-protein diet you're going to have excessive stimulation of mTOR which is going to reduce your lifespan, and by eating a lower protein diet you don't have that occur, and therefore AMPK is activated more often and this results in the preservation of many cells and a prolongation of life.

Danny Lennon:

Yeah and I think there's obviously a number of different labs that are working on this idea. One of the probably most well-known names that people may have heard of is probably Valter Longo and his group which have been very much embedded within this area of work. And it's certainly interesting, and as you've illustrated there's definitely mechanistic reason to take this, seriously there's like a mechanistic basis for what we're discussing. And not only that, they've demonstrated that in a number of different organisms all the way up to rodents pretty much. And on top of that, as you mentioned, rapamycin as a potential for a drug looks super interesting going forward. When it comes down to the current data that's been presented, and given that most of it is within animal and particularly within rodents, how should people view that in your perspective – because in one sense of course we know it's not the same thing as looking at human trials? Similarly for this particular research question, there are some difficulties in trying to get that done in human trials, although I believe some of that is underway. So how

is the best way for us to try and evaluate some of the literature that is now there on protein restriction, mTOR AMPK and then this kind of potential knock-on for longevity/aging?

Alex Leaf:

Yeah, so I think that fruit flies and worms are interesting to study evolutionarily conserved mechanisms like AMPK and mTOR, but when it comes to trying to draw practical conclusions about how an intervention would affect the human, we can pretty much ignore that data altogether, because we are not worms and fruit flies and I think the difference – the species difference is just too vast to even try to speculate. When it comes to mice which are definitely the most researched organism on this, because you can control every aspect of their environment and their average lifespan is only about 24 months, so it doesn't take 80 years for a human to wait and see what happens. I would argue that we need to be very cautious with drawing conclusions from that data as well.

So when you look at mice, they have energy expenditure rate per unit of body mass that's seven times greater than humans. And so they're expected to be far more responsive to the longevity effects of energy and protein restriction than humans are because we simply operate on a slower speed way so to speak. So when you have a metabolic rate that is going to be seven times faster, this results in one human year being the equivalent of nine mouse days, and it means that you're going to have a much greater generation of radical oxygen species through living and you're going to be a lot more hyper-focused on reproduction and survival, so the effects of mTOR and AMPK activation are going to be more pronounced. If you don't feed a mouse for 24 hours, they lose 20% of their body weight because the effects of fasting quickly turn to starvation in these animals due to their demand for energy requirements.

I think a good analogy would be a human infant. Infants need to consume breast milk or formula every couple of hours and that's simply because they are growing so rapidly that if you don't feed an infant for two to three hours they will enter into a state of ketosis because they need another way to supply energy for the brain and the growing body. And when you break down the calorie intake of a human infant, it turns out to be around 160 calories per kilogram of body weight. And when you compare that to an adult human who is sedentary just like an infant is, that number is about 14 kilocalories per kilogram of body weight. And

so it's a similar thing with mice, they just have much higher energy requirements and therefore manipulating energy intake is going to have far more pronounced effects on their health and lifespan.

Danny Lennon: Before we round out some of the stuff on longevity, one area that tends to get bundled in with this in most of the conversations, at least that you see online when people are talking about either protein restriction or total nutrient restriction in order to enhance longevity or just a healthier lifespan, comes down to a conversation around promoting autophagy and essentially using the restriction of nutrients and particularly protein as a method of ramping up at autophagy and therefore leading to better cellular health. From your perspective, what do you think is a fair way to make conclusions, number one, on the role of autophagy for human health but beyond that the need let's say to use something like some degree of fasting or a nutrient restriction to induce that purposely, and does that actually have the knock-on health impact that many people are hearing it does?

Alex Leaf: Autophagy is definitely an important function, I think there's plenty of data to support that, and its upregulation is dictated primarily through the expression of AMPK. I don't think autophagy should be something that is overlooked by any means because it's our cellular housecleaner, it breaks down damaged proteins and repairs cellular structures to ensure optimal function. And this is an area where there has been a lot of questions that remain open especially with regards to things like intermittent fasting, because one of the issues with a lot of longevity research and suppressing mTOR to date is that the feeding protocols have not looked at intermittent fasting in humans and its effects on AMPK. So we do have data with intermittent fasting showing that it can benefit the health of humans but how does it affect AMPK expression relative to not doing a form of intermittent fasting, and illogically you would presume that it would increase things like autophagy. And so if we tie this back into the high-protein issue, people who argue against high-protein diets – I think that there's a possibility that someone could reap the benefits of a high-protein diet by for example condensing their eating window so that they might eat two to three meals within an 8-to-10-hour window so that they can promote growth and anabolism and repair, but then fast so that they can then promote recovery like in rebuilding of tissues that became damaged while their body was laying down new tissues.



Danny Lennon: Interesting you say that and on one hand I'm glad because it maybe confirms my bias of at least having a bit more optimism around time restricted feeding as opposed to other types of fasting protocols that are out there, whether that's like 5:2 diet or other variations that people may see, I think time restricted feeding is one that piques my interest the most, so it's an interesting idea that we can essentially perhaps get the best of both worlds in such a model like that. Before I get to another area around protein that I wanted to ask about, Alex, just to kind of finish off on this longevity piece, I guess one common thought that people may have is – number one, what should they conclude based on what we currently know as to, is it something that you need to worry about in terms of longevity; and if so, how do we balance that with, as you mentioned earlier, things like sarcopenia where we see these clear benefits with age in maintaining lean body mass, maintaining muscle function and we already clearly know protein can have benefits for both, so how do we balance out these things, and at least in your opinion based on hard evidence what would your conclusions be from that discussion?

Alex Leaf: In my opinion, I believe that people need to decide for themselves what matters more: a lifespan or healthspan. When it comes to lifespan, we have no data suggesting that restricting protein intake will allow you to live longer in humans. We have some evidence in other species that hints towards an effective protein restriction, but there are some serious limitations with trying to apply this research to humans that in my opinion makes it inappropriate. So the best evidence we have for a longevity effect with protein restriction in humans is speculation. On the other hand, we do have established clinical data showing that eating more protein benefits muscle mass and function with aging and improves quality of life and reduces the likelihood of developing some of the number one causes of mortality, like frailty.

And so I like to always ask someone a question: is living an extra two to five years, keeping in mind that the magnitude of the lifespan increase would not be expected to be very large, so would living an extra two to five years be worth spending your last 20 to 30 years with reduced physical health and independence? And I think that a lot of people would say no. What's the point of living if you don't enjoy life is kind of the fundamental aspect of it. It kind of goes back to that saying like whatever it is, have fun and die young, or whatever that saying

goes. Now I'm not saying die young but you might as well maintain your health and independence and ability to live while you age. And in order to do that, we have strong evidence suggesting that you're going to need to be eating a higher level of protein, certainly more protein than you would need to eat if you wanted to extend your lifespan.

Danny Lennon: Yeah and I guess, as with many things, it may come down to there just being a trade-off in many of the choices we make. And as you say, as long as someone is informed about what that trade-off is, what the probabilities of each likely outcome are, we can probably make a good decision based on what is important to us as individuals. I am keen to talk about one other aspect that you mentioned at the outset Alex, and that was the potential impact on gut health and/or the gut microbiome. And maybe this also ties into the piece around something like a carnivore diet specifically, where not only do we have a high protein intake but we also have other things that are eliminated from the diet which may be protective against that, so the fiber intake, polyphenols etc. etc. So from your perspective, what have been some of the main things that have piqued your interest in this area of protein intakes and impact on gut health in general and then maybe specifically the gut microbiome, and where should that factor into our thinking?

Alex Leaf: So my interest in the microbiome stemmed from data that shows pretty clearly that protein makes it down to the colon and interacts with the microbiome who metabolize it just like they would any fiber, and this results in the production of several cytotoxic genotoxic and carcinogenic compounds like phenols, indoles, ammonia, amines, hydrogen sulfide, etc. We have overwhelming data that this happens in animals and we have suggestive data in humans as well. And so the question is: what are the long-term effects of a high-protein diet on gut health, and how would this play into long-term health, and how does a high protein intake interact with other components of the diet? This area, I would say, is an area where we have very, very strong mechanistic data to suggest an effect and the questions that remain are what is the extent of the effect when it comes to impacting our health, and is this effect even seen in a variety of scenarios that manipulate other aspects of the diet.

Danny Lennon: So essentially, can other aspects of the diet mitigate some of these downsides we may see, and therefore rather than seeing

this as an isolated impact of protein it may be that it has more or less of a detrimental impact depending on the context of the rest of the diet – is that a fair conclusion to take from that or are we seeing that it's likely going to have that same downside regardless?

Alex Leaf:

Yeah, so for example, we have a handful of human interventions showing that eating, what I guess some people would consider as little as 120 to 140 grams of protein, has harmful effects on the microbiome and the production of known beneficial metabolites like short chain fatty acids and butyrate when it is coupled with a low fiber intake of 10 grams per day. On the flip side, we do not see these effects in humans when fiber is increased to 35 to 40 grams. And so, this gets to one of the pieces of context which is that does the effects of protein on the microbiome even matter if someone is eating a diet that is also rich in fiber and microbiota accessible carbohydrates. And current evidence suggests probably not, but we certainly need more investigation into this issue because we do have both mechanistic data and studies in animals and human showing that eating more protein with less fiber does result in unfavorable changes that are associated with the development of things like colon cancer.

Danny Lennon:

Does this speak to something like the carnivore diet which you listed as an example at the start of the show – so even if we take something like meat, which can be probably included in an overall healthy diet, again depending on the context of what that diet is, but that is not to say that if you remove various other beneficial things that this food component is still going to be beneficial to you, and that it's again a picture of overall diet as opposed to this focus on isolated nutrients which is essentially what we're seeing here that the potential downside of this protein is very much influenced by the fiber within the diet, and who knows maybe other components that have yet to be tested like specific polyphenols or phytonutrients and so on?

Alex Leaf:

Yeah, exactly. I think we always – there is benefit in nutritional science from being myopic; focusing on very specific vitamins, minerals, macronutrients, that has its benefits. But we can't focus exclusively on it, we need to also take a big-picture approach and look at the diet as a whole as well as even individual foods within the diet. And of course, looking at the health status of a person will influence how dietary interventions affect them. Basically, there's a lot of variables that need to be considered and we can't

hyper-focus in on any single one and expect to draw reasonable conclusions from it, because there's always, "Well, what if?"

If we do take a step back and we look at the carnivore diet, I think that the real problem with the carnivore diet is when you decide the diet is no longer for you. So a meat-only diet will radically alter the gut microbiome. And once you starve a particular bacteria out of existence, it's gone, it can't come back. The easiest way to wipe out bacteria is through chronic antibiotic usage but starvation is another method, and we have data in mice demonstrating that feeding them a low microbiota accessible carbohydrate diet for as little as seven weeks significantly reduces bacterial diversity that is never fully restored when they get switched back to a diet that's rich in fiber for 15 weeks. And this phenomena is described as scars of the microbiota and its characterized by disappearance of specific operational taxonomic units. Some bacteria are more resilient and able to grow back to their initial levels but many aren't, especially a lot of the butyrate producers, and butyrate is one of the primary fuel sources of colonocytes and has well-established anti-cancer properties.

In fact, in one particular study, over three generations of feeding a low fiber diet to mice resulted in a new stable microbiota that was stably dysbiotic, and there was a marked loss in the ability to process fibers. And so, it's interesting to think about, in my personal experience dealing with people who come off of a carnivore diet, there is a very unfortunate transition period when you reintroduce fiber because you have starved many of the bacteria that are normally processing that fiber, and so you suffer a lot more distress with it. And this really sucks because it serves as a deterrent to returning to a more healthy diet in my opinion. And so then they stay on the diet for even longer which just continues to cause an extinction of various bacterial species. All at the same time of doing this eating only protein and having all the protein feed other certain bacterial species within the microbiome, is going to promote the production of all of these cytotoxic and carcinogenic metabolites that I mentioned earlier, and you're not going to have any of those short chain fatty acids or phenolic metabolites to help offset these toxic ones.

And so, I mean mechanistically, you will see a substantial risk in the increase for developing tumors and a reduction in health overall. I think a lot of the risks too we were completely unaware of simply because we see, like we have a lot of data connecting

the importance of the microbiome to every other part of the body, everything from the brain to insulin sensitivity, all these things, a lot of those effects are mediated by the absorption of short chain fatty acids because they bind to various receptors on other tissues throughout the body to affect metabolism, appetite, body composition, immune function and so forth. And so, if you're not producing a lot of those, then you're going to have health detriments that we might not have data on yet because this is such a new area of investigation.

Danny Lennon: When it comes down to making any decision really with our diet, it's always like we say a trade-off and there's probabilities of things likely to be helpful and not, and with something like a carnivore diet which is essentially the most extreme form of elimination diet someone can choose, it's okay if literally the only thing you can consume without problems is consuming meat and if you try and plant matter you are just in an absolute mess, you can make some kind of claims that for you it's worth that trade-off. But in most cases, like you say, what's probably missed with that shift in the gut microbiome is that it's a clear adaptation to the incoming nutrients. And once you have lost those specific species trying to then deal with an influx of high fiber materials afterwards is going to be extremely problematic. And one thing that I do want to mention before we start to wrap up here Alex was, previously we've talked about that there is some cases where a myopic view of nutrition is warranted and can give us some really interesting insights and enhance our knowledge, but at the same time we also want to bear in mind the overview picture of diet and be able to make food based recommendations to people. And so with that said, does some of this become difficult to tease apart when we look at something like the impact of a high protein intake on, for example, gut health and try and to tease that apart from the exact sources of the protein from perhaps the cooking methods used and all these other types of other variables that involve themselves could influence some of the stuff going on or how do we even start to think about all those?

Alex Leaf: That's a good one. There are certainly a lot of variables to consider because protein is found in every food and how are people getting that protein. I think a beautiful example of this is there was an intervention study published in 2016 that took like 50 something overweight women and it was a year-long intervention that had – half of them were advised to simply alter

the way they cooked the meat that they already consumed in their diet, while the other group wasn't advised to do that. And the advice was to stop grilling frying and charring your meat and using high heat harsh cooking methods which are known to produce a variety of toxic compounds like heterocyclic amines and advanced glycation end-products, and instead they were advised to cook their meat with gentle methods like boiling, poaching, and steaming. And over the course of one year there was no difference in – there was no change in either group in their overall diet and there was no change in weight or any of these other variables that could influence health. But the group that switched to gentler cooking methods did demonstrate significant reductions in their serum levels of advanced glycation end-products which was associated with significant improvements in insulin sensitivity.

And so you see effects on health that are observed simply by altering the way in which you cook your meat. And we even have some observational data in looking at the risk of developing type 2 diabetes, not based on how much meat you eat but based on how well done you enjoy eating your meat, where you ask people, do you your meat typically well done, medium or rare. And the people who like their meat cooked rare or medium show a lower likelihood of developing type 2 diabetes than the ones who eat well-done cooked meat. And so, this just introduces another curveball into the equation of is the issue really protein or is it the food supplying the protein or is it the way in which we cook the food supplying the protein and how does all of this interact with other parts of the diet such as how much fat was on the meat, how much fiber are you eating, how often do you eat the meat, do you have regular consumption, irregular consumption, and there's just so many unknowns.

Danny Lennon:

Because of all these things that can impart an influence on an individual level they can sound very small and minute things and people get, well, do I need to worry about how I cook every single meal. But really, it's more an idea of – there are some general clusters of advice where we have these intersections of different pieces of research from observational work and mechanistically and all these things that can start to piece together and just over time can we push more of our general dietary intake to some other things that at least have a higher probability of being more likely to be helpful or at least show lower risk.

And that kind of brings the final question before I do start to wrap up because I am mindful of your time here, to try and bring all this nuance that we've discussed and wrap it up into something kind of pragmatic and something to take away for people. When it comes down to what you have seen so far through these various different areas of the protein literature, what do you feel is the center of the bull's-eye for protein intake for most people that will likely have that balance of having the highest benefit and/or the lowest risk to them in the long run? And again understanding that that is probably person dependent, but as a general perspective of people that just want to have an overall healthy life and want to know, okay, where should I be targeting that protein intake right now based on what you know, what has the literature that you'd conclude on that?

Alex Leaf:

So I would advise people to recognize that if they're eating a high-protein diet, there are potential risks. And so let's set biases aside, there are risks to eating a high protein diet, there are also benefits, just like with everything, everything is a cost-benefit analysis. I think that the benefits outweigh the risks and that many people would be better off eating a higher protein intake. What I would recommend though is people who choose to eat a higher protein intake should also be cognizant of other areas of their diet and how they're eating their diet, and they should make a conscious effort to consume that protein in more healthful ways such as by not charring their meat and cooking it over an open flame. They should also ensure that they're consuming adequate plant matter not just for the fiber content but because I think plants are an area, one of those things where there is no controversy towards their health benefits, between the phytochemicals and the nutrient density of plants, they should be a staple of everyone's diet.

And so I guess the bullet point takeaway would be if you're eating a high-protein diet, make sure you're consuming adequate plant matter and fiber alongside it, and also don't eat around the clock. I would recommend based on pure speculation that if you're going to eat a high-protein diet you can offset the potential detriments to longevity by simply engaging in time restricted feeding and trying to achieve 12 to 16 hours of fasting between dinner and breakfast the next day. This really isn't as difficult as people would think. If you eat dinner let's say between 6 and 7 PM, then you're done eating by 7, just don't eat breakfast until 7

AM the next day which would probably only be a couple hours after you woke up.

Danny Lennon: Yeah, for sure, and it's definitely not as much of an issue as some of the longer fast people may have attempted before. And as I mentioned earlier in the podcast, the whole area of time restricted feeding definitely has caught me and I see a lot of potential for many different areas that's been investigated in at the moment, and I'm glad that you brought this up. I think the key thing I would take away from your summary there Alex, and it's probably a thing that's often missed in a lot of nutrition discussions, is that we often want black or white answers to things. And in this case, we'd be asking is a high-protein diet good or bad, and what is clear is that it's not a binary high-protein equals good or for that matter high-protein equals bad. As we could make the case with, if someone's asking about a vegan diet, there is a good way and a bad way to do it. Similarly, with a ketogenic diet, there's a well formulated one and there's one that's quite poor. And I think the same here with a high protein intake: not all high protein diets are created equal. And I think some of the things you've outlined, for example the other things that are included in the diet, the amount of vegetables and fiber and polyphenols, and the other nutrient containing items within the diet are going to influence that overall risk equation in terms of the diet we consume and not just thinking of high protein as either good or bad. And I think just an indiscriminate use of, "Well, I heard high protein is good for me, so I'll just eat a bunch of high protein foods and not really pay attention to what those foods actually are," is probably misguided.

Alex we've covered a ton of ground here, and before I get to the very final question, for those people that are listening that want to find you online to be able to contact you or just point them towards more of your work that they can check out, where are some of the best places online that you would want to direct their attention?

Alex Leaf: The best place to find my work and links to all the articles I've ever written, podcasts I've been on, and to contact me personally would be to go to my website which is simply myname.com, so alexleaf.com. And of course people can also go to examine.com to have fun searching the supplement encyclopedia database that we offer and staying up-to-date on a variety of nutrition and supplementation topics.



Danny Lennon: Awesome. And for everyone listening, I will link up to all of that in the show notes of this episode as well as a bit more about Alex's background and a transcript to this particular episode as well as previous episodes as well. And so with that, that brings us to the very final question I always round out this show on Alex, and this can be completely divorced from anything we've discussed in our conversation thus far. And it is simply: if you could advise people to do one thing each day that would have a positive impact on any area of their life, what would that one thing be?

Alex Leaf: Consider perspective. I think that if people would take more time to put their visceral reactions and judgments against what another person does, says or whatever, and instead they pause and think about why that person might have done it, we could reduce a lot of the controversy that we see and reduce a lot of the unfavorable emotional responses. Just try to see the perspective that someone else may be coming from, and understand that not everyone shares your own personal worldview.

Danny Lennon: Preaching to the choir as someone who cannot stand overly emotional reactions in place of rationality and reason, I very much am on board with that message. I want to say thank you so much for taking the time out. I've really, really enjoyed this discussion today Alex, and I think people listening will get a ton from it as well, so I want to say thanks for your time and thanks for the work you are doing.

Alex Leaf: Thank you for having me on the show. This was a lot of fun.

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