DANNY LENNON: Dr. Christopher Melby, thank you so much for joining me on the podcast today, it's an absolutely honor to talk to you.

CHRIS MELBY: Well Danny, it's an honor for me to talk with you as well. I've listened to a number of your podcasts recently, and I find them quite informative, so I hope I could do justice to what you're attempting to do here in terms of educating a variety of health-related professionals on some of these nutritional issues.

DANNY LENNON: Your work has been incredibly informative for me and hence why I wanted to have some of this discussion with you, and there's a few different aspects that I hope to get into. But before we get into any of that work, what is the best way that you would introduce you and the research that you've done to the audience?

CHRIS MELBY: Well, one of the things I would say about my career as a research scientist is that I've dabbled in a lot of different areas. My focus recently, my primary interest recently is on issues related to metabolism, energy balance, energy imbalances, and one of the things I'm most keenly interested in is how can we help individuals who have lost weight to maintain the weight loss, because one of the biggest issues is that so many individuals who are successful at losing weight end up gaining the weight back, and I've been very interested in reasons for that, and some of my recent

research and published work is focusing on how we can minimize this recidivism that occurs with many people who have lost weight.

DANNY LENNON: Yeah, and I think that's actually a great point to start this conversation before we get into any of the energy flux concepts is to first start by talking about that challenge with weight loss maintenance. And so what are some of the things physiologically that are going on that would at least go some way to explaining why we do see such a poor rate of maintenance of weight loss?

CHRIS MELBY: Well, I think it's a very complex area, but I would suggest that there are compensatory factors that can contribute to the weight regain that we often see. And when we look at compensatory factors, we could potentially look at these as environmental factors, we can look at these as behavioral factors or habits. And then obviously there's metabolic factors that occur as well. Much of my interest has been with these metabolic factors, and one of the things that we recognize that occurs with weight loss is that there typically is what we call an energy gap, and this energy gap is characterized by a decrease in energy expenditure that accompanies weight loss, oftentimes to a greater extent than we would predict based on the loss of respiring mass, body mass, and also an increase in hunger. So we've got a mismatch then between our energy expenditure and what we actually desire in terms of our calories. So we call this energy gap in a situation where the amount of energy that we desire is greater than what we require, and there are metabolic reasons for this that we can get into if that's an area that you want to discuss.

DANNY LENNON: And just as you were talking about that, one of the concepts that I know you've written about in a few of your papers that in some way relates here might be you talked about the concept of how a genetic drift has occurred over time, to the point where we are maybe more protected against weight loss than against weight gain and kind of looked at through this evolutionary lens. Can you maybe talk about that concept of genetic drift and that protection against weight loss and weight gain and where that leaves us in this modern environment?

CHRIS MELBY: Yeah, sure. I'll be happy to talk about that, and I would suggest that there's a caveat here that I am not a geneticist, and I've not done any genetic work that focuses on this, but I certainly have been fascinated with John Speakman and some of his work, and a variety of others, Herman Pontzer. The idea here is that in order for our ancestors to survive, we've had to be able to fend off a variety of perturbations that make it very difficult, for example, in a situation of low food availability which our ancestors would frequently encounter in order to survive and maintain the human race. There has to be a way to counter this by having a reduction in total energy expenditure so as to not so readily starved, and in a situation like this then in order to maintain human survival there's been this genetic drift to protect us against significant weight loss by situation where our metabolic rate would lower in response to lower food intake. We could conserve energy by engaging in less physical activity which wasn't always necessarily easy for our ancestors to do because, in fact, they had to be very active in the pursuit of food, and so this sort of genetic drift has occurred; and at the same time, we had to be protected against predation from enemies, and so being able to move quickly would be an important aspect of survival as well. Of course, in our current environment, we don't face predation much.

There actually was a situation that arose in Colorado last year where an individual was attacked, out for a job, by a mountain lion, but that sort of thing is pretty rare, and so we're not protected, we don't need to be protected against predation, and so this genetic drift has occurred such that in our current obesogenic environment we're set up to live in a different environment, we're set up to live in an environment where there's a little more austerity with less food availability, but now in our obesogenic environment we've got a mismatch between sort of our genes and even epigenetics and the environment in which we live in which we've got a wide variety of highly palatable foods available to us. And in fact, again, we don't have to move to get our food. I ride my bike to work, and as I was coming in this morning, I drove by a coffee shop and there's a line of 10 cars waiting to get their coffee and their donut without even having to

get any movement, and oftentimes the coffee has plenty of fat and sugar in it. And so our environment has changed so dramatically in recent years relative to human existence, and we have this mismatch now that is promoting a situation where naturally obesity is going to become very prevalent, and of course we see this in recent years.

DANNY LENNON: And I definitely want to circle back to some of the model presented by Herman Pontzer and his group, and I think how that might fit into it, but for the moment I think I'd like to introduce one of the concepts that you've talked quite a bit about, energy flux. Before we get into all the details I think a good point of any discussion is to make sure we're clear on some of these terms, and to get to a point of definitions. Now, with energy flux, one of the key things that you point out is that unfortunately we haven't had one consensus definition that's being used across the board in the literature, and there's been some differences. So how do you think we should conceptualize what energy flux is and what is the best or most accurate way we should define that?

CHRIS MELBY: That's a very good question. The term energy flux, in my mind, refers to energy turnover. And I think we can best capture the measurement of energy turnover or energy flux based on what is our total daily energy expenditure, and typically what I like to look at as, because we're talking about a weight reduced state oftentimes is when we are in energy balance, so we have a match between intake and expenditure, so there's no net accretion of or storage of calories, no net loss of body tissue or weight stable and our flux then relates to how many calories are we ingesting, matched with how many calories we are expending. But we don't just want to add those two together because that's going to double the amount of true energy flux or turnover. And so we look at it then as energy expenditure in an energy balanced state and this, a high flux state, we've got higher energy expenditure, and as we can talk about, we have different ways of achieving a high flux state, because an individual could be very active or an individual could have a very large body mass, being obese individual and have similar energy flux, but the contributions to that energy expenditure, energy

turnover are significantly different. And so we'll probably talk about the need to capture the measurement of flux, both in absolute terms, what's the total energy expenditure in a matched situation of energy intake, and also a relative energy of flux, which again there's some controversy over how if we could best describe this, but I'd like the idea that a relative energy flux can be captured by the ratio of total daily energy expenditure divided by our resting energy expenditure which gives us an indication of how much of our energy expenditure then in fact is the non-resting which would include thermic effect of food, it would include physical activity energy expenditure which includes both exercise and non-exercise activities of daily living.

So I think capturing the term is not necessarily easy, but in my mind, it's best described as a state in which we are looking at energy expenditure with matched energy intake and what's the magnitude of that expenditure or what's the magnitude of the intake, they're going to be the same when they're in energy balance.

DANNY LENNON: Right. And so the logical thing, just to clarify for people, is given that we have this matching of intake and expenditure and therefore this weight maintenance condition that we could have that through, let's say, two ends of the spectrum, we could have one with a high flux as you described where that higher expenditure is going to be matched by a high intake but we could also have that presumably through a low flux where a low intake is matched with a low expenditure, both conditions are weight maintenance but there's some differences that we'll probably explore later on because one is through low flux and one is high flux. Is that correct and accurate in how I'm picking that up?

CHRIS MELBY: Yeah, sure, you're describing that extremely well. So the idea here is we have different flux states, and if we're in an energy balance state, low flux means we've got lower energy expenditure that's coupled to lower energy intake; and if we're in a high flux state, higher energy intake, higher energy expenditure. And in situations that describe the human condition, again, both of these flux states are characteristic of energy

balance. So an individual on a given day could be in a low flux state, no net gain or loss of tissue, and on another day they're in a high flux state but they've got matched intake and expenditure.

DANNY LENNON: The other thing I wanted to clarify that I think is really important that you stated Chris was that we could look at energy flux and quantify that both in the absolute term as well as in relative terms; and for the absolute term, I believe you said that was looking at total daily energy expenditure when an energy balance, and then in relative terms we would take that total daily energy expenditure and divide it by the resting energy expenditure, and that would give us a kind of relative number. Just to make it clear for people, I know you already touched on this, what is that kind of advantage of looking at it in those relative terms as opposed to absolute terms alone?

CHRIS MELBY: Well, one of the things that we are interested in is how does the individual achieve, let's say, for example, a high energy flux state. So you can have an individual who is lean and who is physically active and has high energy flux because of the high levels of physical activity added to thermic effect of food, added to the resting metabolic rate – and that individual, maybe they expend 3000 calories in a given day, and this is a routine, this is sort of habitual for them. Then you look at another person who also expends 3000 calories a day but that person is sedentary, but the majority of their calorie expenditure is based on non-exercise or non-physical activity, so it's thermic effect of food, they got high calorie intake; and then in addition to that they have an expanded body mass so they've got an increase in their fat mass, they've got an increase in their fat free mass, and in fact, their resting metabolic rate is now higher and it's contributing significantly more to their total daily energy expenditure than the individual who is leaner and was physically active. So we can have two individuals with the same level of high energy flux, but for totally different reasons. In the first case, the individual is highly physically active; in the second case, the individual is not, but they have a much higher resting metabolic rate; and so for the first person, maybe they have a flux, a relative flux, let's say, of 1.7-1.8, as we divide their total daily energy

expenditure by the resting metabolic rate, whereas the other individual who is sedentary but obese has a resting or has an energy flux or relative energy flux of about 1.4. So by using a relative flux we can get at the differences or the different contributors to their total daily energy expenditure. I hope that makes some sense.

DANNY LENNON: Yeah makes perfect sense, and I think it's a really important point from here. And so one thing, and this maybe a two-part question, first is, and I'm sure there's nuance to this that we'll explore, but in a general sense, would we make the hypothesis that a high energy flux state is "better" than a low energy flux state – and if that is generally the case, is that kind of a linear thing that the higher that flux state the better, or just some type of threshold or some sort of optimal point beyond which there's no advantage if that's kind of making any sense?

CHRIS MELBY: Yeah, I think that's a question that we really don't have good answers to at the present time. I think in our most recent paper we suggested that this is an area that's ripe for research, but I would suggest that seeking to achieve an energy flux of 1.7-1.8, this is a relative energy flux which is characteristic of an individual who is physically active and can maintain that at a lower body mass than an individual who in fact has gained weight and they are sedentary and their energy flux relatively is about 1.4. So I think that shooting for a value of about 1.7 or 1.8 has some validity based on some recent work that suggests that in a weight maintenance, weight reduced state, achieving that sort of flux state could be very beneficial in regard to long-term maintenance of that lost body weight. But is there an upper threshold? Well, then we get into work by Herman Pontzer, and the idea that when we add physical activity to a previously sedentary lifestyle, it's not really truly additive that we – when we increase, let's say, that an individual is sedentary and they expend roughly 2000-2200 calories a day, and now they become physically active and so they add maybe 3 or 400 calories a day of net exercise energy expenditure, that their metabolic rate, you would think well we just add the 400 into the 2000 calories, but in fact Herman Pontzer suggests that this increase in physical activity

actually does not contribute to such a great increase in their total daily energy expenditure, it's a constrained model, the total daily energy expenditure is constrained despite increases in physical activity by decreases in non-physical activity energy expenditure. For example, less, our lower rescue metabolic rate, maybe a lower caloric effect of food, may be the last non-exercise activity. So the individual doesn't engage in it as much energy expenditure from activities of daily living, increases in energy efficiency. And so the idea here, and this – I think that Herman Pontzer has done incredibly great work, but I think sometimes his work has been misinterpreted to suggest that when we increase our exercise it really has very little impact on total daily energy expenditure, and that therefore physical activity or exercise is really going to be sort of a non-player when it comes to bodyweight regulation. And I think that is a misinterpretation of his research, it's at the higher ends of physical activity where the constraining occurs on total daily energy expenditure. But if you take your average individual today, who is sedentary, they can increase their total daily energy expenditure quite readily by engaging in regular exercise, increasing their physical activity. It's not constraining until we get to the higher ends of physical activity.

DANNY LENNON: Right, and I think that's a critical point, and like you say, I think there has been a misinterpretation of that or at least of not making a distinction between what we might see at the extremes of energy expenditure in a hunter-gatherer population, for example, versus the average person who is going from completely sedentary to doing some degree of light or moderate activity are two different states to compare. So based on that, one of the other things that you discussed throughout the paper is that that potential benefit of that higher energy flux through physical activity as opposed through just being a larger individual is that's clearly going to have some degree of association with metabolic function, and you talk about metabolic flexibility and how that plays in. Can you maybe just touch on that slightly and the role of having that high energy flux through physical activity as opposed to just body mass, for example?

CHRIS MELBY: Let's take a scenario where an individual has lost weight, maybe they've lost 10% or 15% of their body mass, the majority of that was fat tissue. There have been improvements that have occurred in their health as a result. We know that even a modest weight loss oftentimes can produce changes, beneficial changes in blood lipids, in blood pressure, in insulin sensitivity and subclinical inflammation, etc. So there's quite a few benefits that come, that accrue with even fairly modest weight loss. Now, at the same time, some of those metabolic changes that occur actually contribute to an increase in appetite, for example, where the body suggests that I'm sort of in a semi-starvation state and I need to replace those calories, I need to increase my food intake. And so there's this tendency then, as we've talked about during the, or following weight loss to regain that lost weight, and of course then we lose some of the benefits of the weight loss so that blood pressure comes back up, we see insulin sensitivity then change, we see changes in blood lipids, etc., that accompany the weight regain, and of course we're negating then the benefits of the weight loss. So in a situation that has occurred though, the individual has lost weight and are we expecting them to maintain the weight loss if they're in a low flux state, we're expecting them to maintain a low calorie intake in the face of all this highly palatable food that they're exposed to on a daily basis? And I think that for the individual to maintain that weight loss, they've got to be incredibly vigilant, and it's, for many individuals, this is just not going to be very possible.

So what happens then, of course, is they end up returning to a high flux state, but it's at the cost of the dramatic increase in their body mass. So their metabolic rate goes back up and their total energy expenditure goes back up, but it's because they're gaining their weight back rather than because they're physically active, whereas you take an individual who has lost weight, maybe it's entirely by diet not even physical activity as a contributor, but if during the weight maintenance phase, they increase their physical activity, they can help maintain the weight loss with its many benefits that accompany the weight loss. And at the same time, we know that physical activity is one of the most important aspects of maintaining good metabolic health, flexibility, being

able to respond to various perturbations that we have, improving insulin sensitivity, improving blood pressure, improving blood lipids, lowering our inflammatory response, giving us the resilience that we need to handle the various threats and challenges that we have to maintain homeostasis in our daily lives. So in the second scenario, the individual has maintained the weight loss, both individuals have reached a high energy flux state, but the one individual who gained the weight back to reach high energy flux is at the cost of seeing these lack of improvements or the return to some of the negative aspects of health, the higher blood pressure, etc., whereas the person who has maintained the weight loss with physical activity is experiencing the benefits of that physical activity as well as the weight loss.

DANNY LENNON: Yeah, and I think this is the key importance of having an appreciation for the whole concept of energy flux and looking merely beyond energy balance because, yes, it's technically true that if we're looking at weight maintenance we want to have energy balance, we want energy in and energy out matching up for sure, but as you've brilliantly described, Dr. Melby, we have this kind of drive to move back to that high flux state, and so if that's not going to be done via that increased physical activity then there's going to be an increased high flux state coming or at least a drive to get that high flux state anyway and that's going to end up coming from increased energy intake and then this weight regain, and that seems to be borne out across most of the literature as well, in that we see the benefits for exercise in weight maintenance and that tends to be a lot stronger than inducing weight loss in the first place and I think an understanding of what you just said fits in with that and gives some degree of clarity around that understanding.

CHRIS MELBY: Yeah, well, one of the things that's fascinated me over the years is this idea that that exercise really doesn't contribute to weight loss, and in fact when we look at sort of head to head comparisons where individuals are put in an exercise program versus individuals here that have the responsibility of reducing their calorie intake to lose weight, calorie reduction typically is going to win, the individuals are going to lose more weight. And so it sort of casts a shadow, negative

shadow on exercise, well, that's really not that important, it's not that effective for weight loss, but when you look at this, we would expect exactly the findings, because it's fairly easy for most individuals to reduce their energy intake by about 500, you can eliminate a couple of foods, especially maybe an entree or a dessert or something, and lower your intake by 500 calories. But to increase energy expenditure through exercise by 500 calories is going to take a great deal more attention and it's going to be a little bit more difficult. And one of my pet peeves here, a little bit too is that oftentimes we look at the total cost of the exercise rather than the net cost of the exercise, and I've done some calculations, just sort of a theoretical standpoint, where I look at the recommendations for physical activity, maybe it's five days a week, 30 minutes, individual sedentary, and they increase their activity now, so they're engaging; and maybe the intent of the exercise at least initially is not terribly high, it's maybe six – so six-fold increase above their resting metabolic rate for 30 minutes, five days a week. And so we calculate that, and then what we have to subtract from that, the fact they would have expended calories anyway.

So maybe a portion of the time that they are exercising, they would have spent standing or sitting, so we subtract then the calories they would have expended anyway and we determine then the net cost, and the net cost of the 150 minutes of exercise during the week can be actually quite low for many individuals to the point where we could recover that in just a single meal of where we overindulge. And so when I look at, yeah exercise isn't as effective as dietary restriction, I say, well, we wouldn't expect it to be, given the fact that most individuals who are beginning an exercise program now are not actually contributing as much to a calorie deficit as they can by way of dieting. But I would suggest that the weight maintenance state after weight loss that exercise is probably the key and we've tried to emphasize that in our paper because as we go back to this issue of the energy gap where there, as a result of weight loss – and by the way, there's considerable variability and response between individuals which is oftentimes hard to explain, but not everybody responds exactly the same way to these changes in energy perturbation

– but if an individual has lost weight, and now they are going to have a decrease in their total daily energy expenditure, and that might be greater than what we would predict based on their loss of mass and so there's some adaptive thermogenesis occurring there. At the same time, they have an increase in hunger, there's an increase in ghrelin, there's a decrease in anorexigenic peptides in the gut like GLP-1 and PYY, and that contributes to an increase in hunger. So what's the situation here? They are in a weight maintenance state but they're hungry. And in the face of our obesogenic environment what are they going to do?

And so, this is where physical activity comes in, and I know that you have had Mark Hopkins on one of your podcasts looking at things, at the importance of exercise, and more accurately regulating our energy intake to match energy expenditure, and I think that that whole group of John Blundell and Mark Hopkins and others in the UK have done such a great job in helping us realize that physical activity has an important impact on weight maintenance that goes beyond the energetic cost of the exercise itself, because it also can help them to regulate our energy intake to more accurately reflect the true energy needs that we have which also helps with weight maintenance. So when we look at the weight reduce state, if you look at some of the weight loss registries, one in Greece, one here in the United States, inevitably what shows up is the people who are successful at maintaining weight loss are engaging in significant amounts of physical activity. And it goes beyond oftentimes just a modest amount of activity that would come from maybe 30 minutes of physical activity a day; and I would suggest that probably for many individuals, whether it be because of genetic reasons or whatever, that they may need to expend significantly more calories in physical activity than another individual to maintain their weight loss, but it's going to vary between individuals in a way that again we have a hard time explaining, but I think an individual needs to recognize the importance of this physical activity.

DANNY LENNON: For sure. Do we have enough good data at the moment to know if there's differences between

different exercise modalities, or does it simply come down to the energy expenditure or the energy that can be expended during an exercise session or are there differences between different types of exercise?

CHRIS MELBY: That's a good question. I think if we're looking at just energy expenditure versus the impact of different modalities of exercise intensity, durations, etc. on appetite, then we probably don't have as much information on that. But clearly, there are certain types of activity that results in greater energy expenditure than others. For example, if we're doing continuous exercise, the so-called aerobic or endurance exercise, let's say, we're working at eight to 10 fold increase in our resting metabolic rate, we maintain that for 30-40 minutes, 50 minutes a day, that could contribute significantly to energy expenditure. On the other hand, if you were to spend 40 or 50 minutes doing resistance exercise, typically that type of exercise is going to contribute less to total energy expenditure, because the amount of work that's being done is actually less because there's significant rest periods in between sets of exercise; and sometimes people have suggested, well, the resistance exercise probably is going to be less important. I would suggest that it's a very important aspect of weight maintenance for reasons that we talked a little bit about in our paper, and that's that we can maintain our fat free mass in a way that is quite beneficial, and I'm sure that you know that there are now notions that we regulate our energy intake based on our fat free mass and our resting metabolic rate just as much, if not more so, than the signals that arise from our adipose tissue. So that adipose centric idea has been around for many years and we've got leptin that's released and that's going to influence our appetite or energy expenditure, but now there's good work suggesting that our fat free mass, a portion of which is skeletal muscle, contributes significantly to appetite regulation. And so, I am a firm believer that for individuals who are in the weight maintenance, who previously have lost weight, they need to find a mode of activity that they can enjoy or at least tolerate, and do it on a consistent basis. If more of that is endurance type of activity versus resistance, fine; if they prefer more of the high-intensity intermittent sort of exercise, the interval training,

fine, do that. But the key is to become physically active and to maintain that activity in a way that you can enjoy it and it can contribute significantly to the increase in energy expenditure whether that be again resistance exercise or the continuous endurance exercise.

But in my mind, I think that individuals should be able to engage in both, that they can do, so what oftentimes people refer to as cross-training, they're doing different modalities of exercise. For me, I enjoy sports, I also will have, when I have a ball in my hand, I'm playing basketball or something, this is my idea of really good exercise. But at the same time, I'll run, I'll lift weights, I'll do other things, because I think it's important that we recognize that a variety of activities can contribute to our overall health, and certainly to a state of higher energy flux which in my mind, as I've indicated, I think is almost a necessity in society today, and we achieve that either by becoming obese or by being physically active.

DANNY LENNON: I'm wondering about, based on all we've discussed, what do you see as the future directions of research in this particular area, are there any particular ideas that you would like to see examined over the next number of years, specifically related to this topic?

CHRIS MELBY: I think, it's a really good question, and we've suggested some areas that would be right for research in our most recent paper, but let me put this in the context of a study that we did. We did a small pilot study where we had individuals who were obese lose weight, and they lost about 7% of their body mass by dieting, and then we had them maintain that weight loss for a three-week period, so we kept them in energy balance, and then we put them in high flux and low flux conditions, we randomized the order, and it was a very short study, only they were in a high flux state for just four days. But we provided them with the food that they needed to maintain energy balance in a state in which they were exercising, expending an additional 500 calories a day with exercise, that's a net cost, and we had them doing more intentional walking as well, and then we had them in a low flux state again for the four-day period where we lowered their energy intake to match their sedentary state for

these four days; and we looked at their appetite and we looked at their resting metabolic rate, and what we found was that in the high flux state, resting metabolic rate was higher, and we found that they were much more full, given the food that they had and that they had much lower subjective feelings of hunger compared to the low flux state. Well, right there, that would suggest the possibility that we can attenuate the energy gap by being in a high flux state. However, this study was only a short one, it was only four days. Can we achieve the same thing? Can we have a higher resting metabolic rate with a higher flux state and greater sense of satiety, satiation, less hunger, more fullness, if we carried the study out now for months and potentially years? We don't know that yet, because most of our data are coming from cross-sectional studies as opposed to experimental approaches to looking at this, the potential for a high flux state to attenuate the energy gap to provide a sense of greater fullness, less hunger, and higher energy expenditure. So we need longer-term studies to do this. Based on some shorter term studies I think that we're optimistic that this high flux state by way of exercise can be very important in attenuating weight regain. But we've got to have studies that are going to last longer than these, than the ones that have been done so far.

DANNY LENNON: Before I get to my very final question, for anyone that's listening that is interested in going into more detail with your work or looking at what you've published today, is there any best places you'd like to send them on the internet, either ResearchGate a college profile, etc. that they can go and check out some of those papers?

CHRIS MELBY: I think the two that are probably most pertinent to the audience based on our discussions today are in the journal that's called Nutrients. So we've written a paper which you've referred to, and I think probably was the reason that you invited me to talk with you today, and that was on increasing energy flux to maintain diet induced weight loss, that's a 2019 paper. But we also published the paper to that, also in nutrients, I believe it's a 2017 paper that looks at this issue, if a person loses weight do they necessarily have to regain the weight, and what we're proposing in that

paper is going beyond just energy flux but also looking at ways that we can enhance our sense of fullness and satiety by higher fiber foods, higher protein foods, watery preloads, that's sort of volumetric. So ways that individuals can enhance their ability to maintain the weight loss is addressed in that paper that goes beyond just the issues that we talk about in the flux paper. So I think those two papers would be quite helpful for somebody who is interested in this area, again, who is wanting to maximize the ability of individuals to maintain the weight loss rather than lose the weight and gain it back so readily which occurs.

DANNY LENNON: Great. And for everyone listening, I will link up to both of those in the show notes of this episode and I encourage you to go and read those through, it really is incredibly useful. So with that Chris, that brings me to the final question that I always end the podcast on, and this can be completely distinct from anything that we've discussed today and it's 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?

CHRIS MELBY: That's a good question. Here I'm in a nutrition department, so I should probably say that maintain a healthy diet, but to be honest with you, I think that in our current society, one of the best things that an individual could do, the one thing would be to engage in regular physical movement that provides the health benefits not just in terms of weight regulation but provides a greater sense of accomplishment because of physical activity. I think we're meant to move as humans, and it has impact on our mental state, it has impact on our physical state, and to me, regular physical activity is probably the key pillar to a healthy lifestyle.

DANNY LENNON: Wonderful, and with that Chris, we'll wrap it up there and let me say, thank you so much not only for the conversation today which I've really enjoyed but for the work you've produced; and as I've said a few times to you, it's been incredibly useful to me, and I know to a lot of others, and it's been a true honor to be able to talk to you about some of it today. So thank you for coming on the show.

CHRIS MELBY: Well, thank you so much for having me, I've appreciated it, and I hope what I've communicated has some clarity to it, and again, it's an honor for me to be a part of your program here today. Thank you so much Danny.