On The Line, episode two season two. Excited to be keeping things going here. Again, joined by Dr Brent Ruby from the University of Montana, and then we're super honored to have a guest with us today. Dr. Trey Coker from the University of Alaska in Fairbanks. Trey is an associate professor in the Institute of Arctic Biology. Some folks might say Artic. I'm not sure. Potato, Patado, if it matters, I'm going to say Arctic. I think it sounds cooler if you say Arctic.

Trey Coker: It's cool. And correct.

Charlie Palmer: Is it? Is it there is a right and a wrong way. Alright, I went the right way then. So Trey again, a associate professor at UAF joining us today to talk about some really, really cool research that he and Brent have collaborated on using some wildland firefighter populations in some really intriguing results that are coming out so far from that research. So Trey, welcome to the show.

Trey Coker: Thank you, Charlie.

Charlie Palmer: All right, Brent, why don't you lay the backdrop of what you two have been working on and then we'll be soothed by Trey's voice here when he goes into some finer details about where this research is going and what it might mean.

Brent Ruby: We've talked about a lot. We've done this for a long, long time. I mean the first fire season I got involved in collecting data was 20 years ago and so we've been doing it a long time, but there are certainly gaps in what we know and what we have been able to do. Some of those gaps are created by just budgets. Some of them are created by a lack of technology or instrumentation that we have available to us and so we certainly know what the energy demands of the job are. We know that the energy demands are roughly 4,000 to 6,000 plus calories per day when they're on an operational assignment. We've gone over that in detail. We know that supplemental feedings make things better. We know that there's certainly ways you can train better to become more prepared for the job, so describing how hard the job is. We've already done that. We know that's the case. One thing we haven't tackled is how does a firefighter change across the season or how do they respond to the demands of the job over the course of an entire season? Does it make them more fit, does it create a decay in their fitness? What are the things that happen to a crew member over the course of the season and so I've known Trey for a long, long time and we just kind of reacquainted ourselves when he moved to Alaska and ever since then we've
been trying to figure out how can we put a project or two together that takes advantage of both our interests because it's fun to visit Alaska and it's fun for him to come down here. I guess that sort of sets the stage for why we got into this concept or this question about how to firefighters or the season and how do we measure that.

Charlie Palmer: All right, so there's your segway Trey. Now, take it from there and tell us kind of what the study methodology looks like and how you gathered your data then and what your results are so far.

Trey Coker: That's a great introduction and to this initiative and one of the things we're interested in is the Alaska wildland firefighters have been, by definition underrepresented. I don't think there's ever been a study with that particular cohort. Another thing is we were really interested in whether or not they could preserve their skeletal muscle or lean tissue mass over the season and not unlike what happens a lot of times with a research study we were collecting data along those lines, but then also measuring changes in lipid metabolism and those kinds of parameters related to what we call metabolic health. And we really stumbled upon something that we weren't really anticipating. And that was these individuals actually gained fat mass, even visceral fat mass, which is that fat in your belly that you can't pinch, but you can see your belly getting bigger. And then...

Charlie Palmer: I think I can pinch mine, (all Laughing)

Trey Coker: There may be more there. I don't know. (all laughing) But, um, we saw increases in those parameters. And then we also saw an increase in total cholesterol and LDL cholesterol. And in fact, when I was doing the statistics, I was sitting there in my living room going, I can't believe this, I can't because it's so counterintuitive to what you would expect given the caloric expenditure that Brent just mentioned. And another way to say that as if I were going to design an exercise prescription for a person that was at risk for metabolic syndrome, it would be great if they could do a thousand calories a day of physical activity. The reality is almost nobody would do that, or it would be very, very difficult.

Charlie Palmer: What would that look like? What would burn a thousand calories in a workout?

Trey Coker: Probably for somebody that was at risk for metabolic disease and had an elevated BMI, you'd be looking at two to three hours a day of exercise, aerobic exercise at 50 percent of their VO2 peak five days a week. That's just very unlikely. It's not that that wouldn't be helpful, but it's very unlikely that you would get an individual that would be willing to do that or that would have time to do that. So these results were very surprising to me.
Charlie Palmer: So you tested folks before the season started, correct? Three different crews, so to hot shot crews and then what would be called a type two crew from the University of Alaska Fairbanks that was pulled together, correct?

Trey Coker: That's correct.

Charlie Palmer: And so you tested them preseason and then tested them immediately at the end of their season. Tell us more about the methodology?

Trey Coker: Yeah, it was immediate preseason and before they went into circulation and then as soon as I got back to Fairbanks, we brought them back into the laboratory and did the DEXA measurement, which is a body composition, highly specific body composition measurement, and then also an MRI and MRS and it's not a marriage license. That's a magnetic resonance spectroscopy that allows us to basically quantify the lipid that's in the liver or the fat that's in the liver and when you start seeing accumulations of fat in the liver, it demonstrates that there's a problem in terms of regulation of blood lipids and so it really serves as a great biomarker. It's kind of like a speed limit sign to show that hey, you know, you're getting an accumulation of fat in the liver and that's happening because the individual typically is not doing enough activity or they're following an unhealthy diet or something like that. And so that's why again, this was so surprising and somewhat counterintuitive to what we would have expected.

Charlie Palmer: So some pretty extensive testing then that you just described that they had to take part in before the season. They went and did their season, which was a couple of months long at least.

Trey Coker: Absolutely. I think they had 63 days on fire and this particular cohort. And so our cohort just means group and, yeah, very extensive. In fact, the testing in and of itself in addition to the body composition measurements, the MRI measurements, we also did, like I said, the blood lipid measurements, you know, each individual pretest and post test was spending about two and a half to three hours going through that. So a significant amount of dedication on their part to the project as well.

Charlie Palmer: And as we talked about this this morning, trying to kind of do our briefing before the show, it took me a while and I still am trying to wrap my hands around really the significance of what this is suggesting and what it means and so for the listeners to try and summarize so far, what we've covered and what the results are showing is that it's really counterintuitive or opposed to what you would predict or expect in that you've got a bunch of people, a bunch of firefighters that you brought in, tested them before the season. They went out and did their operational season, which we all know would have been very busy and active and they expended a lot physically. And yet even after the end of these 63 days or however long that period was, they came back in their post testing. You would have expected that this profile would have gone one direction and yet when you did your testing, it actually went the exact opposite direction.
Trey Coker: That's right. I would have expected an improvement. I mean, it's like I said from the outset, I was shocked as I went through this data and I even told my wife, I said, I can't believe this is. This is really a surprise and if researchers are honest with everybody that happens more than we might be willing to admit, but the point being is that if, if an individual were to do that type of activity, we would expect improvements in metabolic health, a decrease in blood lipids, a decrease in what we call intrahepatic liquid or just liver fat. And we saw just the opposite. And another way to kind of hopefully translate that as we did a similar, uh, what I call a back country hunting study. Some people are very interested in the benefits of back country hunting to your health. And so these individuals, they did 12 days of an Alaska back country hunting trip and we saw improvements in these same parameters. So similar type of situation and that they're in a remote setting. There's load carriage involved. There's all these components that drive up energy expenditure. But we saw just the opposite of what we did in the wildland firefighter study and so, you know, it's interesting because you start to think about why that's the case. And then you start thinking about what are the differences between those two scenarios. And I don't think that they're, I mean, I don't know that much about what the differences in dietary intake might be, but that's an interesting possibility. Um, chronic stress as another one that can have a detrimental impact on the parameters that we've been talking about, insufficient sleep. It's kind of tied in with chronic stress to some extent. And then smoke exposure. So the whole thing, Charlie, it really boils down to, it's not like we have this super definitive data set on 17 firefighters, but it really begs a question as to what's actually taking place and why.

Charlie Palmer: So what's next? Then like most research does, it ends up generating more questions than it answers...

Trey Coker: It's good job security though... (All Laughing).

Charlie Palmer: It definitely sounds like that applies here because now, it suggests that there are these other variables that we might not yet quite understand that would be impacting why these results were the way they were. So what's next

Brent Ruby: Man! Absolutely. I mean that's definitely it. I mean, Trey and I, we spent... We've spent so much time talking about this, like calling each other, which means because the time difference in Alaska, Trey's phone calls to me, come in, right when my wife gets home from work and she's ready for me to sit down and let's have dinner together. This then Trey's call comes in, hey, look at this data. This is incredible. Jo's like, "is that Trey again on the phone?" Yep. Oh, he's always calling dinnertime, but we have talked back and forth, back and forth about this paradox. Just like he said, it's a high energy demand job that requires a lot of work, but there are these other aspects of the job that may come in and counter the otherwise. What you think of as the benefits from physical activity? It it's almost like those factors are countering that or suppressing that potential benefit. Perhaps. Like the stress, like the sleep, like the smoke, like the Diet or when we first started talking about the data and I immediately navigated my thought process to the diet knowing full well what the catering contract is all
about, what the food choices are out there and thought, well, this definitely provides evidence that the catering contract needs some serious revision. But, that's too simple of thinking. It's looking only at one dimension. That would be like saying, well Jeez, we need to get these guys to work harder so that they do capture the benefit of the physical activity component of the job and so to put all the emphasis on we need to change the diet, is not comprehensive enough. We need to look at all aspects of the operational environment and how perhaps each one of them individually affects some of these health parameters. And again, this is only data on active fire line crews. We have not looked at incident management teams which are exposed essentially to the same diet in some ways more sleep deprivation in some ways more stress and maybe you take some of the smoke out of the equation, but that's another direction we could go. Like Trey said, I mean this is just a pilot study, but it, it really gives us a unique snapshot into some potential further questions.

Charlie Palmer: So Trey, I'm a firefighter sitting out there listening to this and what are some take homes? What are some things where like, okay, wow, that's fascinating research, but what can I do if this is indeed the case that despite the fact that I'm very, very active in my job, there might be some things going on that are at risk to me.

Trey Coker: Well, I think one thing is, hopefully we can provide additional information on this topic in the future to give individuals information that can help them. And that's really the focus of this work is, not just come and say, Whoa, look what we found here, but, this collaboration demonstrates an ongoing dedication to the task of trying to answer the questions that you just posed and we don't have enough information right now to be able to definitively give that answer. But there's a few things that I think are low hanging fruit in terms of helping us understand how we can protect ourselves not only on the fire line but in general. And, those are, I mean we know a lot about healthy choices and things like that. And the point is not trying to follow some super regulated diet or whatever. But by and large, the vast majority of the time making the right choices. And then also during the off season, whether you know, whether we're a firefighter or whether we're a back country hunter trying to keep ourselves in good physical condition. And so there's just general rules I think that are applicable to this particular situation. And then let folks like Brent, myself, and the rest of us to just continue to work. You know, Matt was talking earlier about some things that you can do to help prevent injuries and those types of things. Those are all just general recommendations that I think still hold true.

Charlie Palmer: Okay. So on the geeky science part of this, you've submitted this to the Journal of the American Medical Association, correct?

Trey Coker: Yes.

Charlie Palmer: Okay. So tell us about that process or anything that you have and it's in review. So it has not been published by them yet, but I mean that is in the science geeky part of this whole thing. That's the gold standard, right? I mean that to get
something published in JAMA is a pinnacle. So anything you can share about that process,

Trey Coker: These science geeky journals or whatever, they have something called an impact factor. Okay. And JAMA has a really high impact factor and one of the reasons why that's the case is because a lot of clinicians read it. And another reason is that articles that get published have significant impact. And I think this particular topic, the results that we were able to collect and that we were able to find out, have considerable impact with this particular group or this particular population. And, I think it's very important for individuals, clinicians and families to understand what those impacts might be. And so we'll see. You can't put the cart before the horse here, but at least they didn't send it back and said, you know, this is, this is not worth publishing or whatever. They're still taking a look at. So

Brent Ruby: It's a good sign. That's a really good sign. And I mean it just begs, begs for more followup, more specific follow up so we can isolate the impact of diet. We can isolate the impact of stress or sleep or smoke. Those sorts of things are potential. I mean we have plans. We've, built a collaborative team across Alaska, Montana, Idaho, and even California with crews with proposed project that takes this data and expands it significantly across a wider range of fire crews. Like Trey said, this is only a group in Alaska and the reason for using the group in Alaska was because his access to the instrumentation that was necessary to get all this data. We don't have access to that instrumentation down here and so the goal is to expand it across a broader range of operational stresses. So like we mentioned they had in their season which began in May, late May, early June, and then the last scans were done in September roughly. So over that typical fire season, four month window, they accumulated the average 63 operational days. Well that means there's a chunk of operational days, there's a chunk of regular training days and then there's a chunk of days that are sort of off days where they can choose to do whatever they want, eat whatever they want, have whatever lifestyle they want and those filter into likely some of these results. So by expanding the study and including crews from the northern rockies where we might have a slightly higher number of operational days and then expanding that into California where those crews. I mean last season I was talking to a hot shot crews in California. I mean some of those hot shot crews had over 130 operational days. That's double what we were able to see these crews in Alaska, so being able to assess the same kind of changes over a longer season, more days on fire, more high energy expenditure days, less days downtime. That's going to be really important because we can't just superimpose this data on anybody that puts on a yellow shirt and goes out on the fire line. It is very specific to that operational setting, so it's really important to try to expand it further because most of our studies have focused on the acute operation, like how do we make the job safer within the operational shift or within this 10 day window, how do we feed them differently? How do we do this and that, but this is looking at how do we make this job safer over the course of an entire season and then the next season and the next season, the next season. Like we don't think these crew members are constantly decaying in
health because they show up beginning of the next season ready to go and pretty fit. So there may be a reset window. Those are all things that we hope to work towards in this next proposal that we've sent in. So we'll see.

Charlie Palmer: So if we're going to conclude this and wrap it up, uh, about each of you take a shot at closing comments.

Trey Coker: Well, it's great to be involved in this project. You know, my background coming into this is really been more focused on those individuals who are most at risk being older individuals or people that have really high BMI was. And so, you know, it's been great to be a part of this project, number one, and to work with Brent and the rest of the people involved in this whole group. And the closing comments are really that, you know, I've mentioned the, point about job security earlier and you know, all joking aside, I mean, the point here is to really be able to continue the work and find out what some of the contributing factors are. Because one of the things we didn't necessarily talk about is that there may be some crews that are more predisposed to these metabolic issues or metabolic problems than others and to find out who those individuals are so we can implement and what types of counter measures we can implement to help mitigate some of these detrimental alterations. And so that's a really important thing. And, that's why I say, you know, all joking aside, we are dedicated to this task and hopefully we'll be able to continue this work and not just, I mean I can tell you we literally were turning firefighters away in Fairbanks because we didn't have enough support and enough financial resources to do as much work as we wanted to do. And so hopefully we'll have additional support and we'll be able to, capture that in the future. And that will make the message even stronger and even more specific.

Brent Ruby: Yeah. I really liked just mentioned it briefly, like countermeasures. If we identify these problems, there may be countermeasures that can be dropped in both preseason and the training window during the operational setting. There can be countermeasures that are inserted, this might look like altering the work rest ratio at certain times of the season to give them more rest, to take a little bit of that stress off to add a little bit more sleep to the mix. It could be in the form of an educational program that talks about Rehab after each assignment window, like maybe two days off is inadequate or if two days off is all you've got. Here's how you need to approach that two day off window. I know it's hard to say don't go crazy with this dietary intake or this liquid dietary intake or whatever, but make some smart dietary choices in that rehab setting to better reset the individual prior to the next heavy operational window. Or there may be some dietary counter measures that can be thrown in during the incident and we don't really know what those look like, but we have some teasers that can be implemented while they're on shift or once they come off shift. That might counter some of the negative impacts of that kind of workload or the smoke exposure or what. So those are all on the table as potential next steps,

Charlie Palmer: gentlemen, thank you for sharing your work with us. Fascinating stuff. And we'll do a followup. So, if and when you get that new data, we'll cover that here as
well and hopefully it's enlightening and gives us some more direction on where to go from that point. So again, Dr. Brent Ruby, Dr. Trey Coker from the University of Alaska Fairbanks. Thanks to UAF for loaning him to us for awhile. We'll send him back when... When are we sending sending you back?

Trey Coker: This evening I think.

Charlie Palmer: Oh really?

Trey Coker: But it's been a great trip. It's really been fun.

Charlie Palmer: All right, so with that being said thanks for tuning in and we'll see you next time On the Line.

Outro: You've been listening to On The Line, a podcast for today's wildland firefighter, our audio engineer's Mike Matthews, production assistant Joey Moore, and I'm your host Charlie Palmer. Thanks for listening. And we hope to connect with future On The Line.

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