Charlie Palmer: We are back On The Line, season two. In season one, we did a nutrition pod that we framed as nutrition during the work shift and we left that one with the idea that we would follow up and do a second podcast on nutrition post-shift and that’s where we find ourselves today. Joined by Dr Brent Ruby from the University of Montana. So Brent, welcome back. As I mentioned, we covered nutrition. Such a huge topic. As I go out and do some work with firefighters across the country. If you were to poll them and ask them what is the most important topic to you, I would bet my last dollar that nutrition would come out on top of that list. So I think it’s fair that we spend some time talking about it, that we follow up with the podcast from season one with this podcast, focusing on nutrition post shift. So why don't we start by just kind of reviewing the energy demands of the job of the wild land firefighter and then how these demands are kind of met nutritionally and then we'll take it from there.

Brent Ruby: It is funny nutrition, even in just everyday walk of life folks. Nutrition's become a dominant part of a lot of people's personality and it's really difficult to change somebody's thinking if they have it in their head that this is what nutrition means to me and this is what I need. You're not going to change their mindset. It's very difficult to do that and everybody thinks they got the secret weapon and every company out there thinks they have the secret weapon with their product or whatever, and so in the world of the firefighter, when you boil it down to the very basics, nutrition is absolutely critical because the metabolic demands of the job are so high. We know from the initial studies that we've done and we've talked a great deal about those, but those really are sort of the building blocks that we have assembled all of our other research on top of and that is the tracer methodology, total energy expenditure studies that we did in the mid to late 19 nineties. And with those, we wanted to set the stage and say, here's how hard the job is, period. Now let's start adding new dimensions or more resolution to those findings. And so the range is big. It's very much dependent on the size of the individual in terms of the absolute energy expenditure. And what we typically use as the unit of measure is kilocalories per day or calories per day and it's broad from about 3000 on a lighter weight individual that may be working a little bit less all the way up to 7,000 calories per day for a bigger person that might be having an aggressive shift. So while most of the work is moderate, there are moments where there is interspersed
windows of almost sedentary activity and there are windows of very aggressive activity. And when you stack all of those together over an extremely long work shift and then tack on the millings around the camp in the morning and the millings around the fire camp in the evening, that assembles this total energy expenditure of that individual in a 24 hour window of time. And because of the nature of the job, even though there's not a lot of high intensity work, when it is high intensity, that's what taps into the fuels that are stored within the muscle. The main fuel that stored in the muscle is a carbohydrate sources as glycogen and, that's stored within the liver and in the muscle. It's very easy to deplete that. It's very easy to tax that with just short moments of higher intensity work. Ten minutes here, 30 minutes there, 60 minute hike out, whatever that will tap into that reserve. And so because of those energy demands and because of the intermittent intensity, it definitely paints a picture that suggests we got to pay attention to this. Timing is important. What they take in is important. What they take in for breakfast sets the stage. There are other things that set the stage, but we'll talk about those later I'm sure. But yeah, that's sort of the backdrop. And so that led us down a path to maybe start looking at some of the more specific elements to this.

Charlie Palmer: Right? And so in that first podcast we covered the breakfast and the offerings from that and then there's the sack lunch we dove into and then got into the dinner at night and the role that those play and how important they are and now we've kind of found ourselves in this position of post-shift, whether that be now we're back at camp end of the workday. We've had our dinner and we're getting ready for our next day, tomorrow on the line or wherever that might be, or we're post shift in the sense that a long workday is over and now I might be back at home with the ability to have some of my own personal choices in terms of what I eat. So let's focus more then on this post nutrition piece and how that might be similar or how it might be different to the during shift nutrition that we already covered.

Brent Ruby: Perfect. Well, the elements. First off, I think it's important to identify why recovery is critical. What are we trying to accomplish in this window of time? Post one shift leading up to tomorrow's work shift, which you don't know what's going to be. It could be an easy one. It could be an ass kicker. You don't know what's going to happen until you're out on the line, and then even then surprises can happen, so why it's important to focus on recovery is first and foremost, you want to restore the fuels that have been depleted out of the muscle, so restoring muscle glycogen that's not an exceptionally easy task and time is somewhat of the essence to get it back in before the next shift, at least partially, and then another aspect of recovery that's critical is to provide adequate protein, but more specifically, you can't just say protein. Protein does not encompass the specifics of what, it's the parts of the protein that are critical. It's the essential amino acids that are absolutely critical. Why those are important is we can't make those in our body. We have to get those from external sources and there's a wide range of quality foods that allow us to take in those essential amino acids, but those help us maintain the health of predominantly the skeletal muscle. We want the muscle to stay in positive
protein synthesis so that we're constantly rebuilding what is breaking down. So we're restoring that, so some people like to call it repair, but, uh, basically maintaining healthy level of protein synthesis that does not lead to a gradual decay, that is critical. And then the other aspect of recovery is a hydration. Those are really the key three components that we have to target in that post shift window. So once the shift is over, it's time to attack those and you attack those with fluids, you attack those with high quality carbohydrates, pasta, grains, breads, juices, fruits, all those things that are hard to find in an Mre. And then high quality protein foods with adequate amounts of essential amino acids. Those are things like lean meats, eggs, perhaps keenwah soybeans. Those kinds of things can provide for that. But that, that's kind of the, the rationale for why it's something we need to pay attention to

Charlie Palmer: In the literature and popular culture. There's the thing called the window of opportunity emphasis that you've got this period of time, whatever that is, post workout or post work shift, whatever that you need to capitalize on in order to start this process of rebuilding and repairing and replenishing. Is there science behind that window? And uh, what are your thoughts on that? Because I know in some of our side conversations, you've even mentioned to me that, that if we're going to talk recovery and recovery for a firefighter that really needs to start while they're still working on this shift before recovery is starting on the current shift to get ready for this. The shift tomorrow.

Brent Ruby: Yeah. The window of opportunity has really. People have really glommed onto that and without a doubt there is science behind that. There is rationale, solid studies behind that concept. At the same time, that concept is built around extremely controlled diet controlled before regimented exercise protocol, Diet controlled precisely afterwards. Everything is set to let's synchronize our watches and makes sure this methodology comes off without a hitch and it's tightly controlled, so it's really hard to take those results and superimpose them into virtually any real world setting because it's vastly different outside of the laboratory. It's especially different near or on the fire line or in a fire camp. The environment's different. Accessibility is different. Time of day, the logistics of travel, all those things. Monkey with this window of opportunity, I saw a meme poster that had a half opened window in a structure and the tagline on it said, hurry up bro. Get your nutrition in the window is closing and that's the sort of the mantra that is pushed in pop culture science in Bro science in the gym, whatever that you're screwed. If you don't pay attention to that window of opportunity and don't get this list of these critical things in within 30 minutes or heaven forbid within 60 minutes. Otherwise you're not going to do well the next day or the next session or whatever. And while there's good science behind that, the controlled science doesn't translate perfectly to the real world. So with the firefighter, the window of opportunity is not how soon do we get it in, but recognizing that, oh man, I might have between eight to 12 hours before I go big again. That's their window. And so they need to front load that window, that eight to 12 hour post shift period of time. They need to front load that with adequate fuels so that they jump start it and set themselves up more effectively for the next shift. So timing is definitely critical, but when you think
about the work shift, maybe ending in 1800 and then they've got an hour to drive back to the fire camp. If they are going to go back to the fire camp, they need to have things accessible right away so that they can jump start that and get that going. Rather than wait a whole hour until they get back in the camp. Then deal with unpacking and whatever equipment things they have and then getting in line and then finally sitting down at 9:00 at night to eat and not getting enough in and then going to bed. That's a wrong way to do it.

Charlie Palmer: So kind of highlighting to get something in you at some point fairly soon after that shift is over, is that correct?

Brent Ruby: Yeah. The sooner you can get that in to start the process, the better, and if you're just cognizant of that, it's easy to plan for that. There's things you can put aside in the rig so that you have access to them. You can stock up and take something in later on in the shift before even will come off the line to start that. It's just a matter of recalibrating your mindset so that you don't think recovery only happens when I hit the chat line in the camp. It happens once you get off the shift, it may even start while you're in this shift. So the thing I have told Cruz over and over, and I've told this to athletes as well, although athletes have considerably more flexibility in their training schedule for the most part, but one of the best ways to ensure recovery for the next work shift is to do good things. Do smart things, do nutritionally sound things in the work shift that you're presently in the work shift that requires you to recover from doing things in that work shifts sets the stage for how well you will be prepared for the next one and all the studies that are done in the lab. Most of the time they come into the lab, fasted, they do the exercise trial fasted, and then they dump all this carbohydrate down their gut and they see, wow, here's the window of opportunity. It's amazing. Look at how important it is to get it. Now while we've done studies where we've changed it, we fed them breakfast, we fed them during the trial. We still depleted a chunk of muscle glycogen, but just feeding them before and feeding them during. That changes the rules and it really diminishes the sort of the severity of getting something in immediately. If you physically feel like you have taken it out of your legs or your body in terms of muscle glycogen, that just feels like very heavy leg, very fatigued. Well yeah, at the end of the shift or towards the end, you need to step up your game and taken some of those complex carbohydrates to better prepare yourself for that recovery.

Charlie Palmer: And that methodology is a little bit more representative of how we actually live, that most of us aren't fasted of eight, 10, 12 hours, at any given moment in time.

Brent Ruby: Yeah! Most people train that way and that's, that's realistic, but in order to tightly control things and package it nicely in the lab to limit extraneous factors from trickling in and wrecking your study, you kind of have to tighten the screws on control. But when you do that, you have to recognize that your ability to translate those findings is going in the shitter very quickly. So that's why we have been adamant about, okay, we can do controlled stuff in the lab, but we
have to step outside and do it in the real world. We did a 10 hour study years ago where we took muscle samples before and then fed them one way or fed them another way for the whole 10 hours and then took muscle samples at the end of that when we fed them aggressively, which meant hourly carbohydrates, supplements, not only did they feel a lot better and they weren't as pissed off at the end of the 10 hours, but they didn't use as much muscle glycogen so they didn't deplete as much. So it's Kinda like driving an old VW bus across the country. If you fill up the tank at the beginning and trickle it in all day long, at the end of the day, you don't have to put as much back in the tank. So if you make good choices during the long work shift, it will preserve that fuel so that after the work shift is done, you don't have to focus so heavily on getting mountains of carbohydrate back into the system, but that was in the lab. That's an example of a lab study that we tweaked in order to have some application to the real world setting.

Charlie Palmer: In that first podcast. Talking about during shift nutrition, you emphasized repeatedly this idea or concept of eating every one to two hours continuously throughout that work shift to keep those glycogen stores as high as they possibly can be. And then does that really change any, if we're now talking right towards the end of that shift, thinking about the next shift, is that an appropriate strategy to keep maintaining is to just kind of keep eating fairly regularly as you move through post shift?

Brent Ruby: I like to think of it in sort of a ratio, like if you're in just sort of staging and not doing much, you know that you're not doing much. So in those situations you can probably get away with one food item every 90 minutes. If you're working more aggressively, then it's got to be one to one, so one food item every one hour maybe even tighten that a little bit. Same thing with hydration. You can tighten that up and then pull back a little bit during staging or low activity. That practice, it delays the depletion of glycogen from them, skeletal muscle, but that practice also provides immediate energy to the muscle. And so it's like a surrogate source of muscle glycogen that you consume. It gets into the stomach, it goes right to the muscle, and it's a lovely bonus. Whereas if you don't have that extra source, then you're just pulling things out of the muscle, out of the muscle, out of the muscle until it's gone. And you can get away with that if the event is two hours. But if it's longer than that, it's really hard to do that at the intensity that you want to without having extra onboard stuff.

Charlie Palmer: So with that in mind, what have you seen that in fire fighters with this really long about experience that you have and focused on the nutrition side? What, what sorts of things stick out to you?

Brent Ruby: Well, the one of the measurement tools that we've used considerably in the lab is the muscle biopsy technique. What that allows us to get is actual piece of muscle and we can then homogenize that and look at how much carbohydrate is in that. If you have that when they're arrested and you have that when they're not rested downstream or after they've been fatigued or depleted, you can show that discrepancy. And then make suggestions on how to fix that and
that gives you an idea of how much has been taken out of the muscle. It allows you to compare that to lab studies and so on. So we have taken, I know we’ve probably mentioned this in a previous podcast, but we have collected muscle samples from crews on a fire here in Montana and we took a pre shift sample and a post shift sample. These are 12 plus hour shifts. They were located in a spike camp which made it much more complex because even though we have the mobile lab system that allows us to go out there, thank goodness we have full solar capabilities because we needed all the power we had to support collecting those samples. They were also on an exclusive MRE Diet during the post shift window. So they were tapping into sort of the shift food or the sack lunches that were being provided by the incident, but after the incident they were on their own and they were going right to the MRE’s. The glycogen levels in the muscle at the beginning of the work shift for a lot of the participants in this study. This is only in like 11 or 12 people. Uh, but that’s a lot for a study like that that you’re going to tap into the muscle and then come back to it.

Charlie Palmer: Let’s say hats off to those subjects who agreed to do that because that involves cutting into their leg.

Brent Ruby: Yes. (Laughing)

Charlie Palmer: Grabbing of muscle sample out of it with kind of a corkscrew.

Brent Ruby: You make it sound like one of those games that you like, the claw comes down and.. (All Laughing)

Charlie Palmer: Their nose didn’t light up, red when you touched the side, but I mean that’s a pretty onerous procedure that somebody is agreeing to. You’re going to take the muscle out of their leg and then that requires a stitch or stitches to sew that back up.

Brent Ruby: Well, especially in that setting because we want to keep it obviously quite clean,

Charlie Palmer: Right! So anyway, hats off to those folks. They agreed do that.

Brent Ruby: It was awesome. And uh, we have done, I have done thousands of those samples in the lab, but I’ve done quite a few in different field settings as well with fire crews and with some other groups. But um, it’s one of those things where you can’t know what the findings are right then and there. You have to bring the samples back. You have to go through the analysis in the lab and so it takes a while and so it’s exciting to take the samples in the field, but then you’re like, oh wow, I wonder what’s gonna Happen? And then a month later or whatever, when you finally get back and get to them, the story starts to unveil itself and that's kinda the nature of research. You end up spending all this time collecting it and it takes forever to unfold the results. But when we got back and we analyzed them, it’s like, wow, are you sure that’s the beginning of the shift number? Because some of the in over half of them, the pre shift sample, the
sample that they took before they even went out of the line before 6:00 in the morning, it looked like the samples that we pull out of the leg of people that we have purposefully depleted the muscle in the lab. So when we deplete the muscle, we take a lot of it away with a really aggressive cycling protocol that we use and these firefighters were demonstrating those numbers at the very beginning of the shift before the left, that spike cam. And they've got 12 plus hours of who knows what, some load carriage, some upper body digging, some this and that. But other things are unpredictable. If they got to move from here to there quickly, that's a glycogen requiring event. And if they don't got it, they're not going to have it. That's where it's risky. It's in a day to day window for athletes that train. You can get away with a mistake here or there and you are in the middle of your training session. You think, I don't feel so good. Well, I just thought i'll hit it hard tomorrow or whatever. Whereas if you're on the fire line, you don't have necessarily that option, but all hope is not lost. I suppose if you recognize that you have not fully recovered in that eight to 12 hour window. There are things you can do in the early part of that work shift to sort of set the stage and rewrite the ship so to speak, and that's just being diligent about taking things in. It's easier said than done when you are about as sick as you are going to get at the food options that you have. Uncrustables, Cliff bars, who knows whatever bars, sport, drink some gatorade and this and that gets tiresome, but you don't have the luxury of going into organic grocery store and making your own food often. So you've got to get what you can get and make sure that you're getting enough of the carb and the essential amino acids in those quality sources that we mentioned before. But during the shift, in order to restore the glycogen, that's all carbohydrate.

Charlie Palmer: And that speaks to the resiliency and the strength of firefighters. It seems like. I mean, that they're able to pull that off and still do the job. Maybe not optimally, Not Ideally, but they're still able to meet the demands of whatever those 12 or 14 hours look like considering how spent they are from a physiological stand point.

Brent Ruby: Right? And they tend, especially the experienced hot shot crews that most of the studies we've done with hot shot crews and uh, when one of the early studies, the very first energy expenditure study, we were meticulous about monitoring the energy intake, not only at breakfast, not only on the shift but in the aftermath of the shift. And so in that window post-shift we paid particular attention to how much carbohydrate they self selected. And they took in, in that four hour window. Now we use a four hour window because that's standard for most lab studies. You take the muscle glycogen away and then you feed them specifically over a four hour chunk of time and that allows you to compare your results to this other lab study and so on. So we looked at what they self selected, what they consume, self selected in the post shift for our window.

Brent Ruby: And in that group it was about two grams of carbohydrate per kilogram body weight. Well no, firefighter should be responsible for food math out on the line or in the camp. You don't need to mess around with trying to convert....
Charlie Palmer: What does that mean?

Brent Ruby: How much do I take in? So to put it into simple perspectives, that's about if you, if you say for a 175 pound dude that's about 160 grams of carbohydrate that they consumed in that four hour window of time. What that looks like is two cups of Pasta, a Bagel and an eight ounce glass of orange juice.

Charlie Palmer: That doesn't sound. I'm still hungry.

Brent Ruby: I know and you're begging for what was the sauce on the pasta or what did you put on the Bagel because you can add to that, but that's their self selected. Now the self selected intake is a function of what they feel they want to consume given the options and what's available. If what they would like is not available or they would be happy for something that they didn't really like. It's their third or fourth choice, but even that might not be available. That becomes a problem. So that's when crews often end up or individuals end up taking it into their own hands and consume stuff that they have brought. But, I think it's important for them to recognize that what we have measured them doing is not enough in terms of making sure that that glycogen is going to be restored the next day.

Charlie Palmer: There's the summary I was trying to grasp onto which is they didn't eat enough.

Brent Ruby: No,

Charlie Palmer: They self selected. They were driving the bus.

Brent Ruby: Yeah. They got to decide.

Charlie Palmer: And when they decided they didn't eat enough.

Brent Ruby: Right. The thing that was crazy in that study is, and we've seen it multiple times and we've monitored dietary intake total calorie wise, they tend to do pretty darn well. They seem to navigate to a, I don't want to say adequate, but they maintain close to energy balance. So they matched the energy expenditure with energy intake. The problem is how that is stitched together. The components of the energy intake are out of whack. And when you look at how the MRE is structured, first and foremost, the MRE will not work for muscle recovery. It will not work unless they start making the packaging out of like pasta or some sort of rice box that you can saute that up. And you'll be good pull some morels off an old burn and you're good to go. Um, but they, yeah, the MRE does not have an adequate amount of carbohydrate to restore glycogen. No Way.

Charlie Palmer: So That's interesting to me because it seems like there's just this cultural mantra or whatever that we eat too much. And here, it seems like what the message is, is you need to eat more.

Brent Ruby: Eat more of the right stuff.
Charlie Palmer: Okay.

New Speaker: There is a great potential to eat too much fat and too much protein on these fires. There's no question just from looking at the Diet and looking at the structure of spike camp options. Like I can't keep going back to the MRE, but the fricking MRE is not going away. It will not go away. And the, yeah... that's a different, a totally different sermon. But, uh, what is available and what is potentially appealing takes away from a person's ability to access maybe what is more needed. So when you are, when a giant steak plops down on your plate or a big thing, of ribs, that's appealing because that's...

Charlie Palmer: I'm interested tell me more!

Brent Ruby: But when you, when you navigate to that, then you push the other stuff aside, like the grains, like the pastas, like the things that you're like, well I can get that anytime. Why would I want to pass this giant rack of ribs? That's pretty good and it is as long as you don't push the other stuff completely aside. The body's not going to be able to take that protein and be like, oh, we recognize that you need glycogen will just take this and switch it around and tuck that aside in the muscle and you can use that later. It doesn't work that way.

Charlie Palmer: How does all this then compare to what you've seen in the lab because you have this ability to compare and contrast with your own studies of what you've seen in the field and what you see in the lab.

Brent Ruby: We haven't duplicated a recovery study like this in the field. We've done one field study where we had. We collected the samples in the lab and then they left the lab on a bike to do the depletion trial outside, but that's different than fires still. But in the lab, we've done loads of muscle recovery studies using the same methodology, varied feeding protocols, different types of food. We've changed the environment, we've done all sorts of manipulations in that four hour window to try to look at how do these new interventions or doses or timing or whatever, how did those affect your ability to put glycogen back in the muscle? In fact, we've done, oh my goodness, we've, accumulated 153 research subjects over the years in all those studies combined which amounts to 612 muscle biopsies in all those studies combined. Uh, in the four hour window we feed, again, these are very controlled studies. So we feed them right after the exercises over and then we feed them two hours later. The dose that we provide consistently amounts to... When you consider that example of the 175 pound firefighter, if you transpose that person's body weight into this study, we would feed them a 150 grams of carbohydrate right after the exercise. And then two hours later. So in that four hour window we would feed 300 grams, whereas with firefighters we've measured those. Their intake in that four hour window is more like 160 grams, so it's considerably lower for the firefighters. Then in sort of an optimized lab environment where we just almost force feed them with different sources. 300 grams of carbohydrate looks very different than 160. It looks more like two cups of Pasta, a cup of rice, a Bagel to two inch roasted red potatoes, a banana an eight ounces of orange juice. Now nobody's
going to sit down and eat all of that in one dose. That's why it becomes important to space it out over time. And crews can do that very effectively. If they come off the line, have something, have something else, and then get back into camp and then have meal and whatever. By doing that they're going to be more effective immediately getting carbohydrate in, and then when they get back to camp, their carbohydrate needs are not going to be distracted by perhaps tastier protein, fat options that will happen in the camp.

Charlie Palmer: Yeah. So instead of thinking, all right, I'm done with my shift, I'm just going to hold off, I'm not going to eat anything, I'm going to get back to camp and I'm just gonna chow down because it's catered and there's gonna be something good for dinner. I'm just going to wait. That's not good strategy then.

Brent Ruby: That's not good strategy and I know that they're probably just so tired of eating out of a package. I'm so tired of these foods. I'm with you brothers and sisters. I know what that is like if I have to ever eat another gel in my life, it will be too soon. But those feelings, you have to set those aside and say muscle does not give a shit. If you don't want to eat that. The muscle expects you to perform tomorrow and in order for that to happen, you've got to take this in now. So plan ahead. All you gotta do is plan ahead and say, okay, what do I absolutely not like after shift? Well, I don't like Cliff bars, but I do, I kinda like this cracker thing and I liked this. I like that. We'll figure out, compare what your habits are with other people, what your interests are with other folks in the crew, and then you can kind of keep each other accountable and say, Hey, I know that you like raisins after the shift because you're weird. I've got a box of raisins. I'll trade you for that or whatever, but then you can use what's available in the crew rigs or you can just simply plan ahead and just tuck something aside, have that ready, get in the car...And it would be really good if you had something that was a combined solid and the liquid source because liquid carbohydrates going to get into the stomach and out of the stomach and honest way to the destination muscle faster than a solid so you could potentially keep some powdered products in the rig because they are going to travel well and then you can just mix them with water. And there's an enormous number of recovery oriented beverages out there or powdered drink mixes. But what's important is you don't need to dump a bunch of protein in the gut at that point. You need predominantly carbohydrate.

Charlie Palmer: Could be a powerade or Gatorade?

Brent Ruby: It could be, but the, the off the shelf in the bottle, powerade, gatorade, those don't have an enormous amount of carbohydrate in it. One 16 ounce thing is going to have maybe 40 grams of carbohydrate in it. It's pretty low. And when you think about, well, Geez, it'd be really nice to get 100 grams in, in that short window. And what does that look like? We've started to tweak and play around with some different recipes and uh, that may be coming down the line soon. We'll see.

Charlie Palmer: How about other factors that impact recovery? Maybe environmentally.
Brent Ruby: Oh, environmental is, is a big one and nobody talks about that. All they talk about is what's the perfect dose of carbohydrate? When should you take it in? Should it be liquid? Should it be solid. That's what people focus on. But we did a project just want to another one of these muscle recovery studies. And we thought, well not everybody gets to recover in an air conditioned laboratory with all these good looking scientists around, they're in different settings. And so what if we put them in the heat and so we had them recover in the heat versus the lab, so they did two trials, one trial, they recovered in the lab and it's air conditioned, one trial they recovered and he chamber, which was hot about 90 degrees, so not enormously hot but different. And we fed them exactly the same in that four hour recovery window. And uh, they did not recover as much carbohydrate or glycogen within the muscle in that four hour window compared to when they recovered in an air conditioned environment. So it'd be really nice if once you come off the line (sarcastically), you could go into an air conditioned environment and recover with the optimal foods that are provided for you. That's not gonna happen.

Charlie Palmer: We will pass that along... (All Laughing)

Brent Ruby: But the vehicles might be a little bit cooler. And so if you have the luxury of getting in a cooler place like the vehicle, then that's another reason to take things in, in the transport time back to the camp. Because when you get back to the camp, probably not going to be the optimal environment. It may be harder. Well, if it's late at night, it might not be depends, but uh, the environmental temperature, especially if it's hot, that will delay it big time.

Charlie Palmer: All right, so let's talk how. How can crews position themselves to help get this done? This post shift kind of nutrition focus.

Brent Ruby: It's all practical solutions. There's nothing in the research papers that's going to be, oh my gosh, I'm so glad you read that research paper because now you have all the tools necessary to make no mistakes out there. That's not the case at all. The solutions are very practical suggestions and those are consume things rapidly when you're working hard. Plan ahead and practically lay things out as if it's a supplemental Excel spreadsheet that you have assembled. You go into the shift with a plan in terms of, okay, what I like to do. And you can develop these habits that help you to remember to consume things at these irregular intervals. But then at the end of the shift, make sure to set aside a secret stash of the go to things that you know, even if you come off the line, not fatigued. If you come off the line where you've been coal trailing an, your hands are just completely black and your that's going to maybe not make you want to eat something I don't know, a or you come off completely exhausted, have those different pockets of special sauces, special needs, special needs bag. And then that's available and just assure yourself and help others develop that habit of building a special needs sort of bag at the end of the work shift. And maybe it involves some liquid and some solid sources that are varied and even though you like, you might have habit that develops where you're like, oh my goodness, I just can't get enough of this orange gatorade. I'm going to always put that in there.
Well, at some point you're going to get sick of orange gatorade. Everybody does, and so be ready to provide some more diversity. It doesn't have to be a sport drink. There's nothing magic about that. Could be the little eight ounce orange juice if you have the little 8 oz orange juice and chase that with a little more water. You could potentially get some electrolyte tablets. There's a ton of them on the market and just pop one of those in a nalgene bottle and have a little electrolyte. Not that that's critical, but it changes the flavor of the water and makes it a little bit better, so play around with those sorts of things. That's probably the simplest practical solution scheme.

Charlie Palmer: How about critical supplements. There's got to be something out there. It's just going to make this easy for...

Brent Ruby: So many magic bullets. Oh, wouldn't that be awesome? No, there is no magic bullets. The only magic bullets are the food options that you will actually consume because we could make the greatest bar on the planet, and if nobody liked it because it tasted so bad, but it had all the critical lab researched elements in it. Said, we've done all the research for you. I got to do is consume. This was it tastes like, wow, we couldn't quite get that dialed in, so just deal with it. They're not going to consume it. So the magic bullets are the food options that actually end up traveling to their destination, which is in this case of skeletal muscle. And, there are no liquid or powdered or other supplements that are going to do a more bang up job than regular food. Now there are lab studies that might indicate otherwise, but I would challenge almost any of those and say, well, have you demonstrated your effectiveness outside of the laboratory? Because most of them have not. Most of them, haven't even demonstrated their effectiveness soundly in the laboratory and yet they claim this, that, and the other. The only supplements that tend to work effectively to change muscle glycogen is carbohydrate sources. You've got an enormous array of what those might look like. Could be potatoes, could be a banana, could be liquid, could be bar, could be this, that, whole lot of sources. Convenience wise products that have some essential amino acids embedded in them that might be a little more engineered than regular food. Those could be effective and they definitely transport better than the high quality essential amino acid foods like we mentioned before, like lean meats and eggs, soy beans and quinoa. But jerky, I mean a good quality jerky is going to have some of those essential amino acids in it so you can save that, set that aside. That's probably the best secret weapon rather than going into GNC or any other nutrition store and say, I'm a wild land firefighter, what's the best thing for recovery? You're going to get an earful of non-research backed recommendation by somebody that's probably never been out on a fire line...

Charlie Palmer: and I'm going to ask it. So how about the old pork chop in a bottle?

Brent Ruby: I did see a an ad the other day for a hot dog water.

Charlie Palmer: I saw that too. No thanks.
Brent Ruby: A bottled water with hot dog in there.

Charlie Palmer: I'll pass. But what I'm driving at is then this would be post shift nutrition where you're back at home, unit or home or whatever, not where you're out on the line, but the you have a beer or two. With the belief in some that hey, there's carbs in there. There's some nutritional value in that beer that I'm going to drink, but there is some evidence or some research out there that, that alcohol has a negative impact on, on recovery.

Brent Ruby: Well, when you think about recovery, I have a habit of looking at recovery the way that we've looked at in a lab, so I think almost squarely at the muscle when I think about recovery, but recovery means a lot of different things. And there are lots of different human dimensions that are represented in recovery. Recovery means reconnecting with the person or the persons that you've been away from for 14 days. That's part of recovery. Recovery is having time maybe with a dog that you haven't seen for 14 days. That's recovery. Sleeping on a regular bed with a regular pillow in air conditioning, being able to choose and make your own meal. Being able to choose where you go for a meal, getting adequate sleep. Those are all things socializing. That's part of recovery perhaps, but like so many things, if that's overdone, then that compromises recovery. So you can have too much of a good thing. So a little bit as no problem a little bit is not going to damage the muscle, it's not going to hasten protein synthesis. There are studies that show that alcohol use will slow down protein synthesis, but again, that's in a lab setting and it is a potential limitation or a problem, but you just pay attention to that. So a little bit goes a long way in terms of its effectiveness at helping you manage those other dimensions of recovery and not getting in the way from rebuilding or restoring the skeletal muscle that you need to.

Charlie Palmer: Cool. Final thoughts. What do you got? What are a couple of final take homes?

Brent Ruby: I think we need a, we need a muscle recovery product that tastes like a good beer.

Charlie Palmer: We'd be rich!

Brent Ruby: Gator-Ale, Gator-Ale!!

Charlie Palmer: Trademark that quick. Mike Mike, get that trademarked... (All Laughing)

Brent Ruby: Write that down. I think the take home messages are pretty simple. It's interesting to think back on all the studies that we've done in all the crews that we've had the pleasure to work with. But the job is hard. The energy expenditure is high. That's never gonna go away, it's not ever gonna go away and so glycogen depletion happens and you have to be ready to address that both while it is potentially happening and after it has happened, after the shift is over. So the decisions that you make in the present shift have a tremendous
impact on how particular you need to be in the aftermath of that shift and so that's really, really critical. Recovery begins in that current shift. We've said that over and over and that's. That's just you just to stamp that in your head. Don't try to fast. There's no reason for saying, I'm just going to avoid it because it'll make me tougher for the next session. While you might be able to pull that off in a weight loss strategy or a gym or training at home, there's no room for that out there. There's no room for these whacked out diets that are restrictive. There's just no room for that because you do not know. While you can get away with that for a few days, not knowing what you've got in store for yourself or the rest of the crew for 14 days makes that a wrong, wrong strategy. Well, I've seen and what I've noticed is carbohydrate can be in short supply out in those camps and in the MRE especially. So you have to seek it out. You've got to like retune your metal detector and you gotta find it. You have to calibrate your carbohydrate detector. So you've got to be able to scan the horizon of, okay, there's no super awesome carbohydrate in the meal, but look at all these options in the sidebar. So in the salad bar or the fresh fruit bar, the whatever, those kinds of things, what you don't get that evening, you might be able to capture and get a headstart on the next morning. At breakfast so that breakfast can be considered sort of a bridge. Not only does it start the shift, but it's also one of the last meals that sets the stage for your final. It helps close the window on your recovery, your post shift recovery. It represents the beginning of the next shift, but it really represents the end of the recovery window as well, so seek out those carbohydrates and then recognize that because there is minimal times between these work shifts that is different than in a lab setting.

Brent Ruby: That is different in most athletes. Most athletes are going to have longer than eight to 12 hours before the next training session. Some of them have 24 hours and so because of that timing, both during the shift and after the shift is of the utmost importance for these crews because they have a very short turnaround time to help restore stuff. And you're probably not going to restore it completely. Which means if you've depleted the skeletal muscle on day one of a 14 day or what ends up being a nine day. If you've depleted on that first day, you got to get back on that horse and figure out how to get yourself back to baseline as fast as you can because otherwise you're just going to keep going down, going down, and then in three or four days into it, then it becomes a real danger.

Charlie Palmer: Well, appreciate your inputs. I trust that. We are probably not done with nutrition. We'll poke around on it, I'm sure to some future podcast as well.

Brent Ruby: It tends to never go away. Those are always questions that always crop up on with crews that I've talked to for certain.

Charlie Palmer: Yep. Brent Ruby, thanks again for your time. We'll catch you next time On The Line.

Speaker 4: You've been listening to Ont The Line a podcast for today's wild land firefighter. Our audio engineer is Mike Matthews, Production Assistant Joey Moore, and I'm
your host Charlie Palmer. Thanks for listening and we hope to connect with you again in the future On The Line.

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