Welcome to On The Line a podcasts for today's wildland firefighters brought to you in part by the black. We're joined in the studio today by one of our regulars, Dr. Chuck Dumke from the University of Montana, Department of Health and human performance. Chuck is an exercise physiologist and our other guest is Luke Alford. Luke is one of our former undergraduate and graduate students. He's now part of our administrative staff in the HHP department. Gentlemen, welcome to the show.

Chuck Dumke: Thank you.

Luke Alford: Yeah, thanks for having me on.

Charlie Palmer: All right. We are going to follow up based on tremendous feedback from Jose's bag 1.0 and it's kind of a lie. We think we heard from two people that they thought it was kind of cool, so overwhelming feedback on Jose's bag. We are doing another Jose's bag. 2.0. Unfortunately as we talked about in the first Jose's bag, Jose is gone. He's left us back to Chile, reached out to him for an update. He said things are going well down south, so filling in for Jose today is Luke. Before he left, Jose gave Luke his bag. So Luke is going to start pulling things out of Jose's bag. I'd be too complicated to call it Luke's bag. Now we're just going to stay with Jose's bag. So Luke what do you got in the bag?

Luke Alford: I have a ground coffee in a French press.

Charlie Palmer: All right.


Chuck Dumke: Uh, bout 200

Chuck Dumke: Milligrams of caffeine? or Pounds of coffee?

Charlie Palmer: Oh No, I just think of coffee. He's an old jerky boys. A little skit there. But anyway, so in the bag then you've got some coffee and a French press. So Chuck, what can you tell us? We're talking about caffeine then, at least from my experience of something that's just synonymous with wildland firefighting is,
that cup of coffee or multiple cups of coffee. So what do we know about caffeine?

Chuck Dumke: Well, we're in danger a little bit with being redundant with some of the stuff we talked about in Jose's bag. One point. Oh, right. In our first podcast on this where we talked about, you know, central nervous system stimulators and those were then found in some of the multi ingredient pre workout supplements like C-4 and things like Red bull, but certainly coffee is a part of a lot of people's day and I wouldn't blame a wildland firefighter for having their own coffee because having been in a fire camp, you know, the big tanks of Folgers and things like that just don't do it well. Right when you're a coffee head. So Caffeine. Yeah, I mean it's a methylxanthine that can be an antagonistic with adenosine receptors in your brain, which adenosine is what makes you sleepy. So in essence it can keep you awake and be a central nervous system stimulator, and I use this term in our first Jose's bag called a sympathomimetic, which means that it stimulates the sympathetic nervous system and can have an effect on our entire body in every tissue in our body. It crosses the blood brain barrier into our brain, can have an effect on blood flow, can have an effect on the stimulation of muscle to contract and so there's been decades of research on caffeine and how it affects performance and how it affects a number of different things. Now, interestingly though, there is huge individual responses and varying responses and in fact I just went to a conference this year, American College of Sports Medicine in Minneapolis, Minnesota, and there was a big talk on how a certain gene associated with having a negative effect an anxiety effect with caffeine. So in those people with this particular gene, they had essentially a reverse effect of what the literature demonstrates as an ergogenic or increasing performance effect of caffeine.

Chuck Dumke: So that individual variability makes it very difficult to make broad sweeping statements. But in general, right? Caffeine keeps you awake and one of the most sort of notorious and in age old ways of taking in caffeine is a product called no doze. Right? The actual tablets that you take in a to essentially stay awake and write your college papers at night when you were doing that...

Charlie Palmer: or pull a night shift if you're a firefighter.

Chuck Dumke: Exactly, exactly. So there can certainly be some benefits. You know, there can be also some risks. For example, if you're one of those gene carriers and you have actually a negative effect or an anxiety effect to caffeine intake, there is certainly a heart rate, palpitations, jitteriness, you know, sleeplessness. But if you're actually trying to stay awake, that may be the benefit you're looking for.

Luke Alford: Chuck, I just want to focus on the benefits because I don't have the anxiety. How much caffeine do I need to take for it to help me out? Like what's the performance increase threshold?

Chuck Dumke: Most of the research gives or delivers caffeine in a dose that varies between three to nine milligrams per kilogram of body weight. So Luke is a big dude. Let's
Charlie Palmer: Which usually is equated to about four cups, correct?

Chuck Dumke: Correct.

Charlie Palmer: But then you get this variability in this cup of super strong, this cup is weak and so it gets confusing pretty quickly, right?

Chuck Dumke: Yeah, it can. And in fact, you know there's a difference between arabica caribines and Robusta beans, Robusta to having more caffeine. The way you prepare the coffee can also have an effect on how much caffeine ends up in your cup. You know, whether it's drip, which is higher than an espresso, all those different things. And for those reasons, in fact, the research that gets done when you're delivering say 400 milligrams of caffeine is typically done with tablets and that also makes it easier to have a placebo. Right? You can have a placebo tablet, you can have a caffeine tablet, and indeed there's even some research to show that coffee is less effective than tablets in its performance enhancing effects because there's a bunch of other things in coffee. Right, but you know, that doesn't keep people from drinking coffee and of course there's a bunch of other products out there with caffeine. We've talked about a lot of them. Red Bull, of course, all the sodas and things like that

Charlie Palmer: Oftentimes criticized as being a diuretic in that if you drink too much of it, you're going to start urinating too much and go through the process of dehydration. What can you tell us about that? Is it a diuretic? Because it seems like the research is kind of mixed on that.

Chuck Dumke: Yeah, it really is. And if I were to kind of try to summarize the research, I think one of the big differences is if it's taken in during exercise, so exercise is an antidiuretic, so when you exercise, you actually produce hormones that help preserve your body water. So, you have those two competing with the caffeine effect on diuresis or getting rid of water and then you have the exercise effect of retaining water anti-diuretic and typically the exercise effects trumps the diuretic effects of the caffeine. However, I can't always say that when you take it, the situations by which a person is exercising in the heat cold, whatever can have those varying responses and like you even pointed out, the individual variances can also play in there as well. So, in general, the diarrheic risks of coffee or caffeine are typically overplayed a little bit.

Chuck Dumke: Especially if a person is exercising now, I won't then just leave that as an answer as far as like risks in the heat. However, because being a sympathomimetic, right, stimulating the sympathetic nervous system. I did a quick little review of the literature knowing we were going to talk about this and there's very little to
kind of suggest elevated risks when exercising in the heat, but just sort of a
using physiological logic, right? If there is a redirection of blood flow away
from the skin by being a sympathetic stimulator, that puts somebody at risk of being
able to dissipate less heat. Now again, that's could be individual, but the point
being it's not just a diuretic effects of the coffee or caffeine that one might need
to worry about. It's also redirection of blood flow that the path of my medic
might induce. So in general and less, the dose has become extreme if one stays
below the four or 500 milligrams. I think that there has been little implication in
elevated heat related illnesses.

Charlie Palmer: I've noticed at least with myself at times that when I've got easy access to
coffee, like in a fire camp or something like that, it's very easy to just drink way
too much of it. Oftentimes then I'll get some sort of symptoms. My eyes will
start twitching or I'll feel jittery and um, Ooh boy too much. But what can you
say about that in terms of. Because again, coffee is just so much a part of the
fabric of, of wildland firefighting and at times that just very, very easy. I think to
drink perhaps too much of it. Is there a downside to that? Do they just have
coffee 24 hours a day ready to drink? Yes, in a fire camp. Oh yes. There's always
coffee available. If you're on a fire where there's not a camp set up, you're just
going to be packing it. You're going to be carrying it with you and you know
that's part of the break. Oftentimes as a sit down and pour yourself a cup and
that could happen then several times a day and does happen.

Chuck Dumke: Well one, you know, it's hard to not point out, you know, simple moderation at
a given sitting. Be Smart about your intake. I'm a human man. I'm not good at
moderation, but when excess. And the other point about that is the half-life,
right? So, coffee has a half-life and your liver clears your coffee. A number of
different things factor into that half-life, but the halfhalf-life is somewhere
between five and seven hours. Okay? Meaning your liver is going to clear the
majority of that. A caffeine within about five hours. Okay? So that doesn't mean
that you should be trying to hit your ceiling of four or 500 milligrams three times
a day at each of your meals. But it does suggest that, you know, spreading your
coffee out throughout the day is smarter than one humongous Bolus, right, of
10 cups of coffee.

Chuck Dumke: Interestingly, you know, some of the things that can factor into the clearance,
you know, tobacco, whether it's chewing, whether it's smoking actually
decreases the half-life. A birth control pills increased the half-life, so it's actually
will be around longer if a woman is on birth control. So there's some interesting
interactions there, but it's simply speaks to the fact that you're not going to
benefit by having a humongous dose in the morning and don't expect it to carry
you into the sleepless evening that night. So spreading caffeine out throughout
the day, but being careful and for it to, not to interrupt your sleep patterns
would be a prudent recommendation that way.

Charlie Palmer: Yeah. So I think that might segue perfectly into the next topic in Jose's bag,
which that Copenhagen. Oh, going out to cope. Jose's a chewer. I didn't know
that. Well of course maybe he's just holding. Maybe he's just packing it around
just for friends. Right. So that's for mom. Okay. Jose. Um, all. Alright. So again, something else, very much a part of the fabric of wildland firefighting. Interestingly enough, we don't know what the percentage of wildland firefighters is that use smokeless tobacco or tobacco of any form, the smokeless form Copenhagen or anything else, much more prevalent patio. Brian is working on her doctoral dissertation that she's got a survey out as far as health behaviors of wildland firefighter. The title of that survey is wildland firefighters health and behavior study. We're going to put a link to it up on, uh, the podcast site so you can find it there or you could simply google search, wildland, firefighter health and behavior study.

Charlie Palmer: And you could get to it there. Patty would be very appreciative if, if as a firefighter or a former firefighter, you would take that survey for her because then one of the things that we'll do is give a little bit more information on tobacco usage in our population as far as the regular population of 18 years old and older. We know that based on some CDC work that on average, a three point four percent of the population uses smokeless tobacco. It's higher for males at six point seven percent, much lower for females, less than one percent. It's going to vary geographically. So Wyoming as a state has the most, uh, prevalent usage of smokeless tobacco, about nine percent. Montana's not too far behind it, seven point six percent. Again, this is completely a guess, but I would say at least one in 10 firefighters chew tobacco.

Charlie Palmer: And like I said, that's a complete guess. Why is that? It's a great question. I multiple factors. I think the job itself aligns very well with it and you're outside so much. It's easy to, to spit. It's easy to have it. Uh, the hours are long, the work conditions are difficult. Uh, so it's a great, again, personal perspective and it gets a great to fatigue countermeasure. So it's just a, it's easy to have one in, it's easy to put one in. Um, you don't have to worry about where you're going to spend, where you're going to spit, there's lots of people around you who are doing it as well, so culturally you don't stand out by doing it because you're surrounded by a lot of other people who are doing it as well. Chuck, what, what can you tell us about nicotine and Copenhagen and smokeless tobacco products and things like that. And then I'll offer kind of my perspective as a chew or former. Sure,

Chuck Dumke: there was, I was waiting for it to come up. Right. So this was a little bit out of my wheelhouse of course being a physiologist and nutritionist is far as you know, chewing tobacco, but because knowing you have been a chewer, I was looking in trying to find some sort of positive effects of doing tobacco...

Charlie Palmer: I'll provide those.

Chuck Dumke: Yeah, exactly. You go right to the Copenhagen website and the first thing you see is this is an addictive and causes cancer product you need to and is not a substitute for a healthy substitute for smoking tobacco, right? Or actual smoking. I don't want to sound like the after school special, but it increases oral cancers and cardiovascular disease risks and coronary artery disease and mouth gum and teeth issues, and it's not a safe alternative to smoking. And it's
interesting how only in the surgeon general, only in 1986 came out with that statement that people used to think it could lead towards me smoking less and therefore decrease lung cancer.

Chuck Dumke: But it opens up the host to a lot of other things. It increases mortality, right? You're going to die more likely and earlier as a result of it. There is however no clear kind of dose response. Um, I read a story one time about a major league baseball prospect who chewed in between starting at 12 years of age and was dead by 19 years old. So as little as six years of chewing can put a person at risk to die at 19 years old was not a result of a car accident. Interestingly, of course, it's also very prevalent in major league baseball. Right? And the collective bargaining agreement with the players association in 2011 major league baseball decided that no major league player could be seen with chewing tobacco. And I think that's probably, uh, you know, in their interviews before and after a game and you know, all these other things.

Chuck Dumke: And only in 2016 did they say any new player entering major league baseball cannot use chewing tobacco because of the young kid seeing the players doing it and thinking that it was okay. And indeed the lawsuit that happened as a result of that 19 year old was the product of that kid apparently watching major league players for one who the thinks that, you know, chewing tobacco is just basically a dried tobacco plant, right? Um, certainly it is that, and it's just nicotine that's in it. And indeed, there's actually over 3000 chemicals within chewing tobacco, of which 28 are already identified carcinogens and things like polonium, right? Which is a nuclear waste product has been found in it. Lead formaldehyde, cadmium cyanide arsenic. Right? And we don't need to go into the chemistry of all of those. I think most people will recognize that they're not really that healthy.


Chuck Dumke: Right? I know. And uh, so why are people choosing it? And I was looking for something in the positive category. Charlie and I am going to have to rely on you.

Charlie Palmer: Well, there's a lot. It gives you that really cool Jean Ring, right? Yes. You get worn into the back pocket. It doesn't really work in fire pants though. It doesn't, it doesn't show up in your fire pants. But I mean clearly there's benefits to it. I mean, otherwise, why would people do it in such a prevalent.

Chuck Dumke: You're suggesting that all human behavior has some benefit to it?

Charlie Palmer: Well, I mean those are all logical arguments that you listed as far as why not to do it.

Chuck Dumke: Well certainly it's, it's an oral fixation. And certainly I, you know, I grew up in a rural place in Wisconsin and I was, I was probably 12 when I was behind the bar
and trying some chewing tobacco. Right. And of course puked it out right there on the spot. And so I, I, you know, almost every teenager in the seventies and the eighties probably had that experience and there's, there's a buzz to it, right. There's certainly a head buzz to it. And so nicotine does act on adenosine receptors similar to caffeine. We already talked about caffeine and can give a little bit of a sympathetic nervous system head buzz, so to speak. And it does cross the blood brain barrier. But whether that's positive or not, you know, crack cocaine also gives you a buzz. So. So

Charlie Palmer: it seems like it is a cultural thing and I mean, Charlie, did you know anyone who started chewing like after they joined, you know, a fire squad and fire team? What's. Yeah, yeah, lots of people, myself included in that. I mean like chuck, I had tried it as a kid and it wasn't a great experience so I didn't follow up on it, but then once I did get fired, that is where I did then become a tobacco user and used tobacco for a long period of time. Years and years and years I would quit, oftentimes are taper down my usage, but once fire season rolled around, I would be right back to chewing and I've been amazed. I've kind of quit now for about a year and I am amazed at how powerful the craving still are that I am within inches oftentimes of just saying I'm going to drive to the store and buy a can because I really, really want one right now and have been able to resist that, but I'm still pretty blown away by how powerful the cravings are for it.

Charlie Palmer: So it is. It's an amazing drug. Its grip has to be powerful because I would think that just accidentally picking up a spitter and taking a swig of it would be enough to like never again will I have that stuff around me and I think every tour has done that, has had that experience. So yeah, I mean I as a, as a person in the, in the health professions, I absolutely understand that it's just not good for you, but there's another side of me that just really, really enjoyed tobacco usage and used it and used it frequently as a firefighter because it just fit with what was going on. Tired, put you in, have a meal, put you in a hit the ground after a jump. Absolutely. Put a in a as a celebration of that. Just so many things to associate with the job of having a chew and I think that was part of the difficulty for me of being able to try and quit was just so many positive things that I associated having a chew with made it that much more difficult to quit.

Charlie Palmer: So I'm going to kind of speak to the other side. I guess which is a level of responsibility, I guess if you're gonna chew her for those chewers and everybody knows the Mooch, the person who kind of choose but doesn't carry their own. So, I would advocate for not being a mooch. If you're going to do it just by your own can. Uh, if you are going to Mooch off people, buy them a can, pay it back, be responsible with your spit bottles. I mean, some folks chew the hardcore can chew and swallow. I was never in that crowd. If I tried to swallow, I would immediately throw up. So I needed a drool bucket, but be responsible with those things. I mean, we all know the person who leaves it laying around or they're rolling around in the truck or the engine or whatever, or the crew buggy.

Charlie Palmer: If you're going to do it and you're going to drool into a water bottle or whatever, take it with you and pick it up, dump it out and be smart about it. And then I
was in this category of thinking I need to quit and trying to do it during a fire season. And that's just super difficult if you're going to decide to quit and break the habit, it's going to be very, very difficult. And I would say even more difficult during a fire season, I would challenge being the fire seasons don't really end anymore. It seems like. So if you want to quit best for your health, but realize it's gonna be really difficult.

Chuck Dumke: So I wanted to make sure that I didn't sound hypocritical because basically we've, we've now talked about to psychoactive drugs, right? Caffeine and chewing tobacco and nicotine and basically so far I've talked about how one's okay up to a limit and but one is not okay. And so, uh, that can sound kind of hypocritical, right? When even talking about how the mechanisms might be similar in being adenosine regulated, but you know, we could talk about a lot of other psychoactive drugs that are out there that are okay. And some definitely not. Okay. And we can't, you know, that has to do with all their individual chemistries. But one way to just sort of quickly answered that without getting into the chemistry's is the fact that tobacco continues to lead as the number one reason people die. That's associated with a health behavior, right? Even above physical inactivity. So tobacco continues to be the number one. People die prematurely and that's both chewing and smoking and caffeine is not on that list. So you're unlikely to die from caffeine. You know, if you overdose by the way, there's an interesting anecdote from one of our studies where we missed dose and the person did end up in the hospital, but nonetheless they did not die. But Tobacco has been associated with premature deaths. There you go.

Charlie Palmer: There's your afternoon special a take home. Alright Luke, you had asked me about a story that I had that I should have followed up with this on the spit bottle thing is I went through TSA earlier this year here in Missoula. I was flying out to work on a project and have a backpack that I've had for years and it's got lots of pockets in it and just went through the TSA check and ran the backpack through the, through the machine or whatever. And the TSA Gal. Then on the other side, they see something and she pulls out a spit bottle that, I don't know how old it is, but it's been in there and she has no idea what it is and I'm just kind of paralyzed and couldn't say anything or do anything. Uh, and she opened the top then and sniffed it and really was super close to throwing up right there on the spot.

Charlie Palmer: It had to be the nastiest thing ever. And I thought, alright, I'm getting cuffed and stuffed and pulled into the little secret room here for interrogation. And she just put the cap back on and kind of shook her head and threw it in the garbage can. And I felt awful in that. Like, Oh man, I need to just need to be more responsible and keep better track of my stuff. That's my spit bottle story. That's one of the hardest jobs in first jobs effort and he made it worse. I do my best. I imagined that their, um, their alert system was triggered because they have these radioactive substances and shoe chuck mentioned. Yeah. What was it? What was the term?

Chuck Dumke: Polonium is the nuclear waste byproduct. Own Intuition.
Charlie Palmer: Give me some more polonium. Alright, look what else is in the bag? We're looking at vitamin C and antioxidants, man. We've been on the c theme here, c vitamins. So we have vitamin C, we've had Copenhagen, we've had caffeine. All right. Wow. A theme Chuck, tell us, tell us about vitamin C. Right?

Chuck Dumke: So, ascorbic acid, ascorbic acid. So ascorbic acid has a long, long history. You know, it's why the English are called Limeys, right? Because they carried around on their boats when they were taking over the world to avoid the deficiency disease, of course, scurvy. So it's an essential one of the nine essential vitamins and nutrients. We can't produce it. It's water soluble. Right. So that's one of the reasons people logic that I can take excess amounts. It's essential as you pointed out and to the level the RDA, the recommended dietary allowance or the recommended dietary intake. RDI is 90 milligrams a day for men, a little bit less for women. Yet in the supplements, like in Jose's bag, lowest I've ever seen is a 200 milligram tablet. Usually they come in 500 and even thousand milligram tablets. So in that little tablet and a little vitamin C supplement tablet, there could be more than 10 times the vitamin C that you need or that's recommended on a daily.

Chuck Dumke: Right? Exactly 10 times. The recommended dietary intake is what is typically associated with mega dosing. However, being a water soluble vitamin people believe you'll easily get rid of it. And of course, how do we get rid of Water Soluble Vitamins is you pee it out, which is sometimes you're very bright p is with from your multivitamins or other supplements. So there's lots of different claims and what we kind of want to focus on is perhaps the antioxidant claims of it. You know, there's, support, you know, in your emergencies and you know, staying healthy, airborne or whatever the product might be. So you mentioned a term, let's back up the. That gets thrown about a lot, which is antioxidant, right? What does that mean? Right? So antioxidants are purposed to blunt oxidative stress, right? Oxidative stress, oxygen, right? Oxygen is actually a toxic molecule.

Chuck Dumke: The electrons and oxygen can react with other things and there are things that get produced in our body called reactive oxygen species. Right? And if you want to think of these as basically free electrons that can coupling around a cell and cause damage and coupling, is that a scientific term? Yeah, it is. I thought I'd throw that out there. Uh, and can cause damage and lipids. It can cause damage and proteins. It can even damage your DNA in college mutagenesis and that's oxidative stress. So oxidative stress as a result of the production of oxygen. Reactive oxygen species. Okay. And I'm not, all of them are oxygen, some of them are in nitrogen species, but nonetheless, ox antioxidants can clear that damage. So they can either what we call quench the reactive oxygen species, or they can fix the damage that the reactive oxygen species created.

Chuck Dumke: Now, so there are claims with vitamin C, there is claims with vitamin E, Beta carotene, right? You might've heard of things called [inaudible], resveratrol, lycopene. There's a lot of phytochemicals. There are products out there like FRS plus that are focused specifically on increasing your antioxidants. So if I'm going
to, I'm going to really reduce these reactive oxygen species. I just buy a bunch of products that have antioxidants in them and I'm good, right? Well right. That's the belief, right? So what are things that create reactive oxygen species? So a lot of people claim exercise does right. Exercise episodically, meaning right after the bout of exercise can increase in reactive oxygen species because of the increase in oxygen consumption associated with the exercise. But I don't want to exercise, I just want to buy something right? Which is what a lot of people want to do. Wildland firefighters by being exposed to woodsmoke believe that they're potentially at higher risk for creating oxidative stress or a reactive oxygen species.

Chuck Dumke: So Luke's point about just taking them in and being good, right? We don't just get our antioxidants from our diet, like in these vitamins and other things. We also have enzymatic antioxidants in our bodies, right in our nuclei, in ourselves, and in our Mitochondria. We have enzymes that also do this antioxidant quenching of reactive oxygen species. These are much more powerful than any of these vitamin E's, vitamin C5, and other things that Luke wants to buy and put in his bag. Right? So what can happen, right is when you take what I'll call [inaudible] antioxidants from Luke's bag, you can reduce your enzymatic antioxidant defense system, right? So by going through, you know, repetitive exercise bouts, you actually upregulate your antioxidant defenses and that's a better benefit or a more of a benefit than trying to megadose on vitamins, like taking a thousand milligrams of vitamin C to try to quench those reactive oxygen species.

Chuck Dumke: So, it becomes a complicated story, but we're beginning to believe and I'm looking for a really good term of this. The things that we know that get created during exercise have an ability to stimulate adaptations that better protect you for the other 23 hours or in the case of a wildland firefighter the other 10 hours when you're not exercising. Okay. But if you try to blunt that with some sort of exogenous dietary intervention, you may actually be blunting the adaptation from the bout of exercise. So I took it down a little rabbit hole there and I see your eyelids getting heavy. Charlie, do you have questions or do you need more caffeine? Maybe a chew. Mike, Where's the closest store? No, um, well we talked about this in the pre-production meeting, which is as people in the science community now, we look to the research to help answer questions that we have. And so

Charlie Palmer: on, something like vitamin C, you go and you look at the research to say, okay, I've got these questions about it mega dosing or whatever it is, with the hope that that science or that research helps to answer these questions. And yet as I kind of look at it and dive into it, it seems like the science is fairly conflicted or equivocal in the sense that the science isn't necessarily answering some of these questions. Is mega dosing okay? Is Vitamin C at high levels protect you against the colds or the flu or cancer or whatever the claim might be. The science isn't super clear. Am I right on that? Yeah, you are right. And I, I
Chuck Dumke: think at least part of the answer can be in the translation from the lab to the field in the lab. We often isolate things in an in vitro situation and basically just take that as an in a test tube sort of experiment. Right? You're not using a whole person and typically that's where a lot of the research starts and in those sorts of experiments, vitamin C looks like a superhero. It can do a bunch of fantastic things when you have like isolated cell culture sort of experiments, but then you try giving it to humans in an oral delivery and a free living human that might be a suspect to a cold and you see totally different sort of responses and that can answer some of that equivocal-ness I think. And indeed Linus Pauling, right? Um, I think it was two Nobel prizes. Yeah. Two Nobel prizes and a famous chemist and he didn't have a lot of research to support in a clinical trial, meaning in whole living in Vivo, meaning in a human experiments, but came out and said everybody should be taking 2000 milligrams of vitamin C and that kind of started a lot of this in the late sixties, early seventies.

Chuck Dumke: This whole vitamin C tidal wave if you will. And subsequent experiments, you know, in free living humans trying to reduce cold symptoms has very little unequivocal support. So some say yes, maybe a little bit, some say pretty much no. And to try to tease out those differences in an in Vivo experiment gets pretty difficult. I will say going down the antioxidant realm, I was involved in an experiment where we gave vitamin E, so vitamin E is different in that it's a fat soluble antioxidant, but it similar in that it's a, you know, an necessary essential vitamin. We gave it to people who were training for the Hawaii iron man, so we gave them 800 IUs of vitamin E, which was thought to believe by one of my colleagues to be the effective dose, right as an antioxidant even though it's well above the RDA and indeed we looked at the result, the Ironman in Hawaii cause some oxidative stress, but the oxidative stress in those that were taking the vitamin e was actually higher, so it acted as a pro oxidant instead of an antioxidant in that situation of mega dosing. Now I haven't seen necessarily the same thing in the water soluble vitamin C experiments, but in the case of vitamin e right, taking more than you need can actually result in it acting in the reverse, meaning causing more oxidative stress.

Charlie Palmer: Wow. So now we've really muddied the waters right?

Chuck Dumke: well and yes. Yes, but the point is this, right? If you are eating a balanced diet, right? Trying and getting the amounts of vitamin C, vitamin E, and all the other vitamins that are recommended in your dietary allowance, there's little to suggest you need 10 times that or even five times that. Right now I will say that not everybody is getting enough vitamin C and vitamin E from their diets. Okay, and that is perhaps a fault of elimination diets, right? You know, things like orange juice have taken a hit in the media recently because everyone says orange juice is just like soda, right? It's just a lot of sugar. You should get rid of orange juice because it's basically the same as a soda. Well, that's not true, right? It actually has calcium. It has potassium, it has vitamin C, okay. Now, partly because it's fortified and yes it does have sugar, but it's certainly not a soda. All right. As it does potentially increase vitamin C. my point being that
eliminating, you know, orange juice because you're afraid of the sugar, is also reducing your access, so to speak to some essential vitamins.

Luke Alford: Well, now I'm nervous because I have all these antioxidants and if I hyper dose them and blunt my natural immune response. And then let's say I stopped taking these, do you think, I'm, like susceptible maybe for a period of time before my body can ramp up its own endogenous internal antioxidant buffering mechanisms?

Chuck Dumke: No, I understand your logic and, and I think it's derived from hormones, right? Like if you take testosterone, you downregulate your endogenous testosterone production, but antioxidant defense systems would probably recover, so to speak much quicker, partly because of the water soluble nature of the vitamins you're taking. And all they need is the stimulus of creating some reactive oxygen species such as from a bout of exercise. And that would act as the stimulus needed to upregulate your endogenous systems.

Charlie Palmer: And then to maybe close this one out, but to complicate matters even more. Say you're looking at a, uh, mega dosing situation, whatever it might be, vitamin C or whatever. And there's also just a real possibility of the placebo effect that it's having an impact or it's working simply because you have this very, very strong belief that taking 10 times the amount of vitamin C that I need is good for me and it ends up being good for you because you simply believed that it is

Chuck Dumke: right. The placebo effect is the basis by which the dietary supplement industry is based.

Charlie Palmer: All right. Boom. All right. Luke what's the last thing that you've got in that bag?

Luke Alford: The last thing I have is something pervasive, I think in contemporary culture is coconut oil. It's taken off and I'm interested kind of in its role as a ketogenic agent. Something else that's red hot in culture right now. It's got a lot of fat in it, right? Coconut oil.

Chuck Dumke: That's right. Yeah. Okay. Maybe even all fat. Okay... (Laughing)

Chuck Dumke: Yeah, I mean it as an oil. It is 100 percent fat essentially. So coconut oil is. Got a lot of claims with it now. It's interesting. It is a saturated fat.

Charlie Palmer: So that's our 4th C Boom. There we go. All right. Sorry to interrupt.

Chuck Dumke: The claims that go along with coconut oil by being a fat in 100 percent fat even though it's saturated. And, uh, some people in the audience might remember in the, in the mid-nineties, right? We were in a fat phobic society and saturated fat was to be avoided. And it came out that, I think it was the Marcus theaters, right? We're making their popcorn with coconut and palm oil, which are two
vegetable oils that are largely saturated fat. And it was this huge hubbub about how, how could you possibly be given us all this saturated fat in our popcorn?

Chuck Dumke: Right now people are going out of their way to find coconut oil. Right? And part of that is because even though it's a saturated fat, it has one of the few natural products that have what are called medium chain triglycerides, right? Medium chain triglycerides, although saturated, are shorter in length. And because of that, they're handled differently in our metabolisms right there preferentially oxidized instead of stored. And this is something that goes along with the ketogenic diet part. High fat intakes promote satiety, so you eat bacon for breakfast, right? Even though that's not coconut oil, it is fat, right? You are satiated for much longer than if you were to have a Bagel and that is part of the genesis are part of the basis by having high fat diets, right? Is that you can basically get less calories but feel full. Right? And part of that is how fats are handled in our metabolisms and our digestive systems and how long it takes to go out and their suppression of appetite hormones, everything from Leptin to ghrelin and peptide y, all of those things.

Chuck Dumke: So those are the appetite suppressing effects. So the medium chain triglycerides that are composed of within coconut oil are believed to be oxidized for fuel preferentially over storage. So if you take in these medium chain triglycerides, you'll burn them. Okay? That's why people are putting coconut oil in their coffee, right? And using that as their a half and half, so to speak. Or what's the term for that? Putting a power coffee rocket coffee, bullet coffee. Yeah, maybe rocket coffee, bullet coffee, something like that. And you know, people are using it as you know, a skin cream. People are putting it in their hair or you know, coconut oil is perfect for everything. Apparently the research on at least the medium chain triglyceride part in our metabolism is relatively weak. We know it is handled differently, right? There is some evidence that it is used for fuel preferentially, but it is associated with this ketogenic diet idea.

Chuck Dumke: Okay. And so ketogenic diets are high fat diets and I think we're, as I've mentioned before, in a sort of carbohydrate phobic society right now, and so this is now we're teetering over to the other side of the seesaw and trying to get all the fat that we possibly can. Right? And people are eating bacon and coconut oil and everything else. Get Fat, fat, fat, fat, right? Because an eliminate carbohydrates, right? And eliminate carbohydrate, especially refined carbohydrates. Correct. Especially refined carbohydrates, but to be a Ketogenic diet, somebody has to be taken in less than five percent carbohydrate in their overall diet. How do you do that? Yeah, it's hard. You have to basically avoid not just your refined carbohydrates, but other carbohydrates such as fruits and vegetables, so this is a definition of a restrictive diet and a lot of people think they're Keto, right? And they're still having spaghetti and pasta and sandwiches and breads and things like that.

Chuck Dumke: That's not keto. Right, but it does take right? A high fat diet. A lot of people associate ketogenic diets as high protein, but the displaced carbohydrates are typically made up with fats, not protein.
Charlie Palmer: We talked this morning about some of the research that's out there that you're familiar with, an endurance populations and how they approach even if they are trying to follow a Keto Diet, they get off that diet when it's performance time and so there's some linkages there I think for firefighters. What can you tell us about that?

Chuck Dumke: Yeah, so I think part of the challenge, right, historically I mentioned in the nineties we are in a fat phobic society and we had data to suggest that, you know, performance in athletes is increased with carbohydrate intake. Right. That was extrapolated to the normal population who weren't athletes, and then we also had this evidence, perhaps that saturated fat lead to higher cholesterol.

Chuck Dumke: Okay, so those two things combined into this, I need to avoid fat and I need to eat carbohydrate, and that's why people were eating whole packages of cookies that were supposedly fat free and all these other things back in the nineties and getting high cholesterol and getting fat. Right? Well, it turns out insulin is a hormone in response to carbohydrate intake, which stimulates your liver to actually produce cholesterol and stimulates fat storage. So if you're elevating insulin right, with carbohydrate intake, you're going to get fat, and so that was part of the mis translation to the public from research. Now we've ping pong to the other side, right? Since insulin causes you to get fat and stimulate your liver to produce cholesterol, then we need to avoid carbohydrates, so we're going to the complete opposite and we're finding that, okay? Yeah. In athletes, if you take in a high fat diet, you'll elevate what we call in the field, your maximal fatty acid oxidation capabilities.

Chuck Dumke: You oxidize more fat. Okay, however, in all of the Ketogenic high fat diet performance literature, there's never been any evidence that it increases performance. It does increase your fatty acid oxidation, so now we have this body of decades of research saying carbohydrate increases performance and we have this research suggesting that you can with your diet, manipulate what we call your flexibility of utilizing fuels, right? Ketogenic diets are named after ketones. Ketones are derived from fat oxidation, but they're made to make up for the carbohydrate inadequacy of your diet because your brain needs a fuel and it can't use fat. It likes glucose, but it can use ketones so the ketones are not made so that your fat cells can work and your muscle cells can work it so that your brain can work, but your muscle cells can utilize ketones for fuel to. So, what ended up happening now, or people are trying to maximize their fatty acid oxidation with ketogenic diets and their training, but they know carbohydrate increases performance. So ultra-athletes, right? People who are, you know, training and working for hours,

Charlie Palmer: which is going to have some similarities to a wildland firefighter population.

Chuck Dumke: exactly which is why it's in Jose's bag. There you go. You know, people are realizing that, okay, when I come to perform, however I need to make sure I have carbohydrate availability, right, and I need to maintain my blood glucose and I need to take in my sports drink and I need to take in my gels in addition to
taking in other energy to meet my energy expenditure or at least get close to meeting my energy expenditure, but there are carrying into that competition, the maximization of fatty acid oxidation in their training and their diet interaction previous to that, but there's still the smart ones anyway, knowledgeable enough to know that they need to have carbohydrate availability during their performance. Now taking that to the wildland firefighter, right? They're not just doing 1:50 miler in a summer. They're out there 14 hours a day for two weeks in a row, in which case they need to make sure they have both carbohydrate availability and meeting their energy expenditure. And this is where Dr Ruby has done some research and talked about this in previous podcasts, right? We know that if you take in carbohydrate while you're working on the line, you increase your workout put and you end up with a better maintain blood glucose and by maintaining your blood glucose you're keeping your brain happy.

Luke Alford: which seems absolutely critical, right? You're out there and sometimes in life and death situations, right? You have to make decisions quick. So using ketones instead and maybe not the most preferential thing.

Chuck Dumke: Well right. And, and, and there has been sort of mental acuity tests done on individuals who are ketodic and found that they perform less well when they are ketodic than when they have normal blood glucose and are under a normal balanced diet.

Charlie Palmer: So to, to kind of wrap this element of the bag up then we've got restrictive diets. A keto diet would fall into that category of being restrictive, going a firefighter in your opinion, function and function effectively with or being on a restrictive diet.

Chuck Dumke: Well, you know, can they do it? Probably. Yeah. Can pull it off. Sure. And I'm sure there's some people out there doing it right now and probably you know, advocating for it. My beef about it is that it's one, it demonstrates the incredible flexibility of our metabolisms to adjust to what we give it. Right? All of a sudden it's like amazing and I would like to point out and there's some good research to demonstrate this, that even people who are not on a high fat diet produce ketones when they exercise and when they are in an intermittent fasting sort of thing. And that could be another whole podcast topic sometime, but it demonstrates how incredible we are. Our metabolisms are at adapting to what we have available. Ketogenic diets, high fat diets have never been shown to increase performance. Right? High fat diets are given to mice to cause obesity at a very rapid rate.

Chuck Dumke: Okay. Ketogenic diets, when they’re true keto diets and getting less than five percent carbohydrate in their total intakes are restrictive by reducing fruits and vegetables and other nutrient rich parts of our diet, which is never a smart thing. If you're ever restricting fruits and vegetables and plant based parts of your diet, that is never a good idea because you're reducing the micronutrients,
you’re reducing the vitamins and minerals, and Luke will say, well, why don’t I just take a multivitamin then?

Luke Alford: I got this bag full of Multivitamins

Charlie Palmer: Centrum silver, you said?

Luke Alford: Yeah, I mean, I start my day with centrum silver in a scoop of whey, right?

Chuck Dumke: Right. We covered way last time. No, a multivitamin alright contains the nine essential vitamins and minerals probably right, but that is not everything that's needed in our metabolisms, right? There are thousands, tens of thousands phytochemicals found in fruits and vegetables that may not be essential but are biologically active and we cannot... It's an arrogant thing to say, that man knows everything that's in food that we need. That's incredibly untrue, right? The best way to get the things that you need in your metabolism’s is by eating whole foods, right? And the phytochemicals that are contained within it. And the idea that you can just make up for a bad diet with a multivitamin is poor logic.

Charlie Palmer: All right, let's wrap it up. Luke, what do you got?

Luke Alford: Pride of Shelby Montana, Paris of the high line. Um, yeah, I, I think that the other aspect of going Keto is, from what I understand that maybe similarly you don’t want to stop, you know, you’re Copenhagen use mid-season. I understand that going Keto, like the first couple weeks can be pretty tough. Nausea, headaches, lethargy. So if this is something you're going to tackle, you might want to start well before the season starts.

Chuck Dumke: That's a good point. People talk about the metabolic switch, you feel like crap for at least two weeks if you're going to try it. So don't do that while you're on the line.

Charlie Palmer: All right, chuck, how about you? What do you got to finish things out here?

Chuck Dumke: Well, like always I chatter too much. So, um, I think we, we had a good group of C's that, uh, were related to each other and hopefully if we didn't cause more confusion, if anything that's already out there.

Charlie Palmer: Yeah, if we did generate some questions, shoot them our way and we'll do our best to try and address them gentlemen. Thanks for appearing on the show today, Luke, enjoyed having you here. Thanks for having me. Chuck

Chuck Dumke: and I encourage people to add in the comment box from our podcast, um, any other things that could be included in a, in a future, Jose's Bag

Luke Alford: My bag is full of supplements, but I always have room for more.

Charlie Palmer: Alright, thanks for tuning in and we will catch you next time on the line.

Charlie Palmer: You've been listening to on the line, a podcast for today's wildland 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.

Written Transcript

On The Line Episode 2.9 “Smart and Smarter”

Copyright: On The Line. All Rights Reserved. This transcript cannot be transferred, quoted, or shared without written authorization.