



Transcript of “Uncovering the Science of MCTs with Melinda Culver”

Bulletproof Radio podcast #151



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Dave: Hey, it's Dave Asprey with Bulletproof Radio. Today's cool fact of the day is that a breed of dog, in French called something like Dogue de Bordeaux ... I said that entirely wrong. My wife, who speaks French, would be very angry with me for that. If you are from France or Canada and you speak French, I apologize. I only learned a little bit of Spanish, so hey, that's just life.

Anyway, this kind of Dogue de Bordeaux breed has the shortest average lifespan of only five to eight years. The longest average lifespan is Chihuahuas, those small annoying yap dogs, with an average of 18 years. In May of 2013, the world's oldest living dog, named Max, was a Louisiana Beagle-Dachshund-Terrier mix. This dog passed away at 29, which would have made him 203 in human years.

I have actually had six Dachshunds. I like Dachshunds because they think they're Rottweilers. They just don't know that they're small sausage dogs. All of them have lived until 17 or 18 years old, which is remarkable. I have one now who may not make it that long because his genes are completely awesome because of bad breeding practices.

I wrote a blog post a while back about actually putting him on the Bulletproof Diet, and actually reducing the amount of raw vegetables he was eating, and increasing the amount of fat in his diet, and what happened with his weight especially after we neutered him.

I didn't think anyone else knew about this kind of stuff, until I came across Melinda Culver. Melinda is a veterinarian with a PhD from Washington State University in Animal Sciences. She actually uses MCT oil in dogs and cats. I'm like how is it possible to find a vet that knows about this stuff. I was very excited to have her on the show.

Melinda, welcome.

Melinda: Thank you. Thank you so much for having me.



Dave: Let's just jump into it. When or how did you think about putting MCT oil in cats and dogs? What brought that up? Was this research you did in your dissertation or just clinical experience? How does that work?

Melinda: It didn't really stem from my dissertation, although I did a lot of work with fat cells working on my PhD. This actually stemmed from my current position at my company, in which I have discovered medium-chain triglycerides or caprylic capric acids. These were actually completely unknown to me before my current position at this company.

The great thing about it is I started to learn more about them, I realized that these have a phenomenal benefit in the animal world just as we see in the human world. They're largely unknown in this particular industry, so I'm really excited to try to bring them out to our dogs and our cats and horses as well.

Dave: So you're putting MCTs into horses?

Melinda: There are a few products that use MCTs in horses. It's not as common in the United States, but it has some applications. It's being used in other areas like New Zealand and Australia.

Dave: For people who are listening, we'll take a step back. If you don't know what an MCT is, and you might not be able alone on this, it stands for medium-chain triglyceride. These are extracts of mostly coconut and sometimes palm oil that have specific biological effects. They're much more concentrated than coconut oil, which is the most famous source of them.

Can you define MCTs a little bit more for people who are listening, who maybe aren't familiar with this. Bulletproof Brain Octane is the very shortest MCT we make, upgraded MCT. These are products that I manufacture, but this is more about the science behind them. I'm not trying to sell my stuff here, but that's why we're talking about it.

Melinda: Sure, I'd be happy to. MCT oil or medium-chain triglycerides are specifically oils or fatty acids that are in the 8 or 10 carbon chain links. Capric and caprylic acid are the two.

Dave: Aren't there ... Sorry to interrupt. Aren't there like four links of MCT technically? You see the coconut oil that people say are 62 percent MCT, but they're actually not?

Melinda: You're allowing me to get on my soapbox. Coconut oil is proudly touted as a huge store of MCT. In reality, it is not. If you look back in historical document, yes. Shocking, right? If you look back in the historical documents, you'll see that from the '30s and the '20s, when they actually started to do work with C8s and C10s, that was the only, those were the only two chain links in which they considered to be medium chain. Everything else 12, 14, 16, up higher, were long-chain fatty acids.

Somewhere around the '70s, if you start to look through the literature, you'll see that there's kind of a change in how some of these academics are researchers are naming them. They've kind of snuck the 12 in there and they call that a medium chain. Right about the time where coconut oil and palm oil were making a big push in the industry, right?

It turns out that C12 does not behave at all like a C8 or a C10. It does not follow the same metabolic pathways. It ends up in your lymph system, like every other long-chain fat that you eat, which then allows it access to your adipocytes or your fat cells, where it's more than happy to be put into fat stores .

Dave: So when a coconut oil company says you should eat coconut oil because it's 62 percent MCTs, there's a bit of marketing in there because the predominant MCT they're talking about actually doesn't act like an MTC?

Melinda: Absolutely. You are 100 percent correct. Most coconut oil is ... Again, it's a crop. You're looking at where it's grown, when it's grown, how long the growing season is. Anywhere from 5 to 15 percent C8 and C10 fatty acid, the rest is all C12 and higher. It's in essence a fat.

Dave: That is definitely my experience there. We have C8 and C10, which are the MCTs that we are talking about in this podcast. There's some stuff that you can buy out there that talks about it being whatever percentage MCTS, but

they don't tell you which MCTs it is. That's because you can actually cut costs by including MCTs that aren't actually MCTs.

Whether people are going to use this for themselves or for their animals, let's just actually focus on animals for now. Dogs, cats and horses. I think there's more dog listeners than cat listeners, but I'm not sure. Let's start with dogs. There's probably fewer horse listeners because horses eat a lot and they're big and expensive and all. I grew up and my sister had a horse, so I know how big and expensive they are.

Let's talk dogs first, and let's switch to cats, and let's round it off with horses.

Melinda: All right.

Dave: What about dogs? How do we do this?

Melinda: You know you certainly ... As far as feeding MCT to a dog? You can just top-dress in on their food. It's really heard, because most of the time you would say if you're looking to affect a weight loss in an animal, and as we know obesity is huge in humans and it's just as huge in animals. Estimates are anywhere from 50 to 60 percent of our dogs and cats are obese. You would not necessarily want to add an extra fat, which is why coconut oil would not be the best thing to add to your dog's diet.

An MCT oil would actually work wonders because of the metabolic pathway. It's metabolized so quickly, and it's formed ketone bodies. The ketone bodies are used all over the body for energy, such as the heart, the muscle. The brain's a great user of medium-chain triglyceride ketone bodies.

You can certainly just top-dress onto your dog's normal diet, be it canned food or the kibble. That would be one way to do it. There are some diets out there that are starting to incorporate medium-chain triglycerides into their formulation.

Dave: Like a pellet food for dogs.

Melinda: Exactly.

Dave: Is there an amount you should do? I admit with my Dachshund, Merlin, he gained a bunch of weight after he was castrated, when he was about 3. We castrated him because he started marking everywhere. Okay? Sorry, Merlin. This had to happen. When he gained, like ballooned up, I just started pouring a little on there. My big concern with humans is what we affectionately call disaster pants. MCTs have a highly laxative effect, especially the ones that are less pure. I was concerned that I'd have something worse than marking from my dog in the house. Projectile diarrhea is never fun when you're a Dachshund.

That didn't happen. Is this a problem if you overfeed fats to dogs?

Melinda: It can be a problem, but you have to feed a lot of fats to dogs. The studies I've seen in which they've fed MCTs to dogs, they fed it up to 15 percent in this one feeding study. They determined that there were no adverse effects from it. There were no changes in stool, volume or consistency. At about 15 percent the researchers reported that the animals had decreased their food intake, which you and I probably know comes from a different reason other than they can attribute it to a palatability issue.

Dave: So, dogs like, "This is gross. I'm not eating it."?

Melinda: That's what they said, but we know from the effects that MCTs actually have on the body that it's quite possible that wasn't the reason that they had decreased their food intake.

Dave: This could be simply because they had adequate energy and they weren't hungry?

Melinda: That would be it. The satiation effect of MCTs. Exactly.

Dave: Hmm. I've never given Bulletproof coffee to my dog. I don't think dogs process coffee that well. It certainly works on me. It has the MCTs, which I don't care about food anymore.

Melinda: That's right.

Dave: I could see my dog not caring about food anymore. That is in the fact that I've noticed Dachshunds tend to be food obsessed. Not quite like a Labrador, but they're pretty hardcore. We put Merlin on an every-other-day once a day diet, so intermittent fasting for this little guy. You'd think he'd be miserable and like most dogs eat their way through a sofa. But on this he didn't care. He walks around wagging his tail all the time. He was totally satisfied. When he was hungry, he ate. He wasn't picky when he ate. That was that. He lost this weight. He came down in a couple of months. It was painless. To this day, he's like, "Oh, food? I guess I'll eat. Okay, whatever."

I'm the same way. It's so cool, because no one wants a dog who's like standing there staring at you while you eat, ready to pounce. Screw that noise. Give him MCT.

Melinda: Exactly.

Dave: Is that what you've seen, because it was dramatic for Merlin.

Melinda: Yeah. I've seen a similar effect, and it's supported by some of the research. Although I'm not sure if the research is attributed to that.

Dave: Okay, they might have just said that dogs don't like MCT?

Melinda: At 15 percent or higher, yes.

Dave: He won't lick it off your fingers like he would bacon grease, but still you pour it on food and he'll eat it. He generally eats raw meat, a small amount of vegetables, desiccated liver, and some various vitamin things. We get MCT and sometimes butter, so he gets a little bit more long-chain fat if he's eating more lean grass-fed raw meat. He's a small dog. The bison femurs, he can't lift them. We try to give him bones, but he keeps swallowing them, so he doesn't even get that many bones. He gets magnesium and calcium. I don't know what else. What am I missing there for an 8-year-old Dachshund.

Melinda: Most dogs are able to process or manufacture all of their nutrition that they need. Essential fatty acids which you covered by the grass-fed beef, always something. Usually an imbalance of essential fatty acids will show up in the skin, so there will be flaky skin or a full hair coat, or even allergies may pop up.

Dave: What does that mean if they had allergies or dry skin? They need more fish oil or something?

Melinda: Not always. What has happened is there is a hypersensitivity to the immune system to external allergens. Sometimes it's the food they eat and it shows up in their skin. Sometimes it's environment. Something like we would have for hay fever, but in animals it's not a respiratory issue. It's a skin issue.

What we believe happens or what the growing evidence is showing is that there's a dysregulation of how the skin is actually built. The brick and mortars that put together the layers of the skin are not functioning properly, which allows a lot of these allergens access to the immune system whereby they should actually be blocked.

Some of these animals become hypersensitive to normal everyday allergens like mold and grass and trees and those types of things.

Dave: It's interesting you mentioned mold. I'm definitely into what does mold do to our immune system, because it's fascinating and because I lived in a moldy house. It just so happens that Merlin's food dish was right next to the dishwasher where he used to eat. There was a leak behind this dishwasher. When it was replaced with a new one, it released 88 times more aspergillus, I think, and penicillium if memory serves.

He stopped eating, so did the other dog who was with us. Entirely did not have any interest in food. Wouldn't go near it. The whole family got sick. It was actually really a negative time. These were toxin-forming species.

He has been more hypersensitive ever since then. In fact, so have I. Funny how molds can do that. But your mentioning that this can be not just from an allergic response, it's actually a collagen disorder in the skin.

Melinda: Yeah. There's thoughts that it has something to do with a ceramide, which is one of the, for lack of a better word, the fatty acids makeup of the skin. There are some thoughts about this in people, too. Psoriasis and eczema, disorders of the ceramide production ceramides 1 and 6, and so on.

In animals, we think it might be an issue with ceramide or how it's packaged. The skin isn't as airtight as we would like it to be. It allows the immune system access to external allergens. This could be partly from genetics, because this is something that your body's done. I actually do think there's quite a bit of genetics the predisposes certain dogs and certain breeds of dogs to having skin disorders that may be aren't as structurally sound as a normal dog's skin.

Dave: Certainly even in humans we're finding a big amount of genetic variance for collagen formation. Some people have stretchier, basically, collagen fibers than others. There's some really bad collagen problems, but it turns out the variation's amazing. I actually should be giving Merlin, I just thought of this, actually collagen peptides. I put them in my coffee sometimes, and they're a Bulletproof product, so I tend to have them around the house.

Do dogs benefit when they eat collagen directly. I had actually just hadn't thought of giving it to him.

Melinda: I don't know if I've seen anything that says they do. But I don't know if I've seen anything that says that they don't.

Dave: Well, I'll put some on his raw meat MCT stuff and see what happens.

Melinda: There you go. I know that when you're feeding dogs, and sometimes these allergic dogs, we think that they're having fatty acids issues, we'll feed them essential fatty acids, usually a fish oil because it's an EPA or DHA type of thing. A lot of these dogs have improvement in their clinical signs, which is

usually one of the only ways we can tell if they're getting better from the product.

Less itching, redness decreases. Some of them are actually able to resolve some of their problems that their having with the skin. Some of them just get a reduction, so there may be another component happening, or may not be 100 percent fatty acid related. Especially if you're dog seems to have some sort of allergic tendencies or potential allergies, essential fatty acids are a really good thing to add to the diet.

Dave: Okay. That's really cool. I think anyone listening to this who has animals and isn't providing a little bit of supplemental help, especially if you're feeding kibble. Honestly, yikes. Maybe you want to do just a little bit there. Do you recommend that people use dry dog food formulations for animals?

Melinda: I tell anybody who asks me that that they need to do what is right for their animal and also what is right for them. Sometimes people like to feed a raw diet. A lot of veterinarians are against raw diet because there's salmonella issues. There's always some issue with raw food. I can understand that. Some animals do absolutely wonderfully on this diet. Some animals do superb on Dog Chow, you know. So I'm not going to say that there's not a diet that's not out there.

If you're thinking that your diet isn't working, or maybe your animal is overweight or lethargic, having skin issues, there's always opportunities to improve or check another diet. Maybe he's having an allergy to food. I know that one of my cats is allergic to quite a bit of foods out there. You just have to keep trying and see. If dry food fits into your schedule and your lifestyle, then you need to do what's best for you and for your animal at the same time.

Dave: That's a very politically correct answer that won't offend anyone.

Melinda: I try not to be all preachy about it. I feed a dry kibble as well.

Dave: There's also the notion if you have a big dog, grass-fed meat's kind of expensive. My sister raises Maremmas, which are these giant Italian 150 to 200 pound dogs that like eat bears for lunch, or something. She raised them. She thought about feeding them her chickens, but she's like, "But they'll eat all of my chickens in a week, and then they would kill them all." They get like frozen Tyson Farms chicken, which is about as good as it gets when you got salmonella.

I don't know if that there is an answer if you have a big dog. Merlin eats like this much meat. It doesn't matter. I could feed him filet mignon and I wouldn't notice it because it's very small. Maybe the argument there is buy smaller dogs and feed them better? Who knows.

Melinda: Exactly.

Dave: Let's summarize for dog owners. Up to 15 percent MCT in the diet. Pour it on their food. What happens then is the dogs are less hungry, less food obsessed, and they tend to lose weight. If I'm kind of summarizing this correctly?

Melinda: And they'll beat you at chess.

Dave: (laughs) Does it actually change their behavior?

Melinda: There's been quite a few studies out there demonstrating, especially with the older dogs, the ability for the ketone bodies that are formed from MCT consumption to help in cognitive function.

Dave: Shocking that it also works in humans the same way. I love it.

Melinda: It's funny. A mammal is a mammal, isn't it.

Dave: So you can teach an old dog new tricks as long as you pour MCT on their food?

Melinda: Absolutely.

Dave: That is so cool. I had no idea. All right.

Let's talk cats.

Melinda: All right.

Dave: What do you do differently with cats?

Melinda: A lot of people like to say that cat's are just small dogs, but they're absolutely not small dogs. Unlike dogs ... Dogs just tend to eat a lot. They tend to go through ... Their feeding behaviors are different. They tend to go through these gorging-binging-fasts cycles. It has to do with how they would kill or come across some carrion and then they would eat, and they might not eat again for a couple of days.

Cats are quite different. They actually hunt all day long, looking for tiny small meals. Mice, crickets, whatever. They're very good at kind of pacing themselves and eating all day long.

The other issue we have with cats is that they're an obligate carnivore. They're unable to make taurine in enough quantities to stay healthy. They also in dire need of arachidonic acid, so these need to be supplied by the diet. An omnivore diet like a dog or a human doesn't quite give them the load that they need, so they're obligate carnivores. They must eat meat. So people out there who are thinking they might be able to switch their cat over to a vegetarian diet, there's sorely mistaken.

Dave: I've seen cans of vegan cat food. It just makes me sad, because those cats are all neurotic. It's not fair.

Melinda: It really isn't. It's nice that you've chosen to be vegan, but your cat would never choose that as an option.

Dave: The last two cats I had were outdoor cats that I inherited. They lived in a barn. Their names were Carne and Asada, which if you know what that means it's kind of funny. They were outdoor cats. Like you said, they snacked all day long. They would literally eat just about anything they could get their hands on, which was good because they were mostly eating the mice I didn't want in the house. To try and feed them dog food, I don't

think would have been very successful. To feed them on a schedule like Merlin, I think they would have gone crazy and probably try to eat me, too.

Melinda: They do. They go a little crazy with the meal-fed method of feeding. Another thing that happens to cats that doesn't necessarily happen to dogs is that they become insulin resistant, like people.

Dave: Interesting.

Melinda: They also have obesity-induced diabetes like people. It's important to keep your cat thin for the same reasons you would want to stay thin yourself to avoid insulin resistance and diabetes, as well as the joint issues and so on and so forth. There has been some talk that this kind of meal-feeding that we're doing to cats is actually inducing an insulin-resistant effect.

Dave: Because they eat a lot at one time instead of just walking around grazing.

Melinda: Exactly. They're getting spikes and glucose spikes and insulin spikes. I think a lot of veterinarians still recommend meal-feeding because the problem is over 50 percent of our cats are obese. But it's not necessarily I think because of them eating too much at one time. They have different metabolisms. In contrast to a dog, cats require higher amounts of fat, higher amounts of protein and very low amounts of carbohydrates in their diet.

People would say, "Well, they shouldn't have a carbohydrate at all because they're a carnivore." But if you remember when you eat a mouse, you're actually ingesting small amounts of carbohydrates that the mouse would have eaten. There's always some. They recommend maybe 8 percent carbohydrates. The protein levels are up around 30 percent, and the fat levels are around 20 percent. This is completely different than what you might want to feed your dog as far as a ratio.

Dave: Some enterprising listener today is probably thinking about making a special device to like release small snacks to your cat all day long rather than feeding them one meal. Is that actually something interesting?

Melinda: It is. They have them for dogs. You can put their meal in a little ball, and they roll them around. It spits out little pieces of kibble and it keeps them active. Certainly I have seen them for cats, because it would be a good exercise for them.

The other problem with have with cats, and this is true with dogs as well, but more so with cats because dogs will often get to go out into the yard to go to the bathroom or go for a walk, is that the cats are getting no interaction and no exercise at all. Of course we recommend 15 minutes of exercise for your cat a day. It's great mental stimulus and it really kind of gets them moving.

They need to be moving. They're hunters, they hunt all day to get their food. We bring them indoors and try to keep them safe, and we make them go insane because we don't give them enough interaction.

Dave: If you're going to modify your cat's diet ... Meal timing matters. Let's talk about that, because a big part of the Bulletproof Diet Book ... Quick plug: BulletproofDietBook.com Please go pre-order, because we're just now in that phase, and I'm so excited about this.

I talk a lot about meal timing for humans in there. About what to eat when, and how it has huge impacts on how you feel and on your metabolism. What you just pointed out is that for cats meal timing is an issue that may be tied to diabetes. I never asked about meal timing for dogs. Is there a different between cats ... You want to have lots of small snacks, basically. For dogs, what should we do differently if we're going to really hack our pets?

Melinda: I really like to get my pets, my dogs, on an ad-lib diet, which means that they eat whatever they need at the time. It's often hard because sometimes they're just hardwired to eat whatever is in the bowl because they don't know if any more is coming. It's some sort of innate ability to determine that this is the only food they're going to have for some time.

Dave: Humans have that same thing. That's why we eat like all the cookies.

- Melinda: Yes. Exactly. I'm not going to get any more cookies so I must eat them. There are quite a few dogs out there I've had people tell me, "I just put the food down. They just eat a small amount all day. Whenever they're done, they're done." That's great, but a lot of the dogs can't do that. I don't know if it's something that we need to train from puppyhood and stop trying to do the meal feeding at puppyhood. A lot of times we'll put down the bowl and the puppies eat it all, and then that's it. They don't get any more food all day, so then they kind of learn that meal feeding is going to be the way to go. All the puppies that I've had, I've left food down and they've learned to pace themselves and not eat all of their food all day. This may not work for every animal. I actually prefer ad-lib feeding.
- Dave: Which means you just put down a bowl of food and let them eat it when they want it.
- Melinda: Yeah. Figure out what their daily intake is supposed to be, so that you're not giving them too much food. It's quite possible they would eat all of the food that you would put down through the course of the day. Just let them nibble throughout the day.
- Dave: On cats, it's kind of the same thing. They would just nibble. For dogs and cats, your optimal meal timing is throughout the day. On cats, you don't want them to eat it all at one time, but on dogs you don't really care if they do or don't.
- Melinda: Right.
- Dave: Very cool. What percentage of MCT, given that cats like higher amounts of fat and higher amounts of protein, what percentage of MCT would be appropriate?
- Melinda: There is a little bit of a hiccup. There has been far less research done in feeding MCT oil to cats. One study was done in the '80s, in which they determined that the cats don't like MCT oil because they started to not eat their food once they added it I think at 5 percent. Of course, there may be another answer for that. Maybe the cat wasn't necessarily hungry. Of course, they figured it was due to a taste aversion.

My cats will actually lick the oil off my fingers, off the spoon. If I put it on salad, they will actually eat the leaves of the lettuce to get the MCT oil off. So I'm not quite sure what these researchers were feeding or doing, but my cats have demonstrated something different.

I would just start with a teaspoon, 5 mL, and just kind of drizzle it on the dry, or you can mix it in with some canned and see how that works.

Dave: The 30 percent protein that cats like. Gluten is protein, so we could just give them a bunch of gluten extracted from wheat and they're fine?

Melinda: Mm-Hmm (affirmative).

Dave: Does the type of protein matter that you're giving to your cats and dogs?

Melinda: The correct answer would be you should feed up good high-quality protein, but I have yet to see a protein that couldn't be digested by your internal enzymes. You want it to be correctly balanced. In cats, taurine is the amino acid that you're really looking for.

Dave: You want to make sure the amino acid ratios are right. You haven't seen more auto-immune conditions in dogs? More rheumatoid arthritis lately? In humans, there's masses of immune-system issues that come about even in non-celiacs. There's eight kinds of cross reactivity that we've measured with the lining of your nerves, with your brain or with your joints, et cetera. I don't have data because I just haven't done research on animals. You're not too concerned about feeding grains to dogs and cats?

Melinda: I don't really like feeding grains to dogs and cats. Unfortunately in the world, that's exactly what we're feeding them. You can't make a dry kibble without some sort of grain. A lot of times they will say grain-free, but they've just subbed out the corn or the wheat for something like barley or some other type of grain. To make the kibble you need a starch, so you're going to have some sort of starch.

Dogs are able to digest the food quite well. I think normal dog food is about 95 percent digestible. They do quite well with the starch. Maybe we

are not quite aware of how it's affecting the body. Maybe we're having more issues with obesity because of the extra starch. Or maybe it's simple. I know you're not a big fan of it, but it may be just as simple as calories in, calories out.

Dave: Calories actually matter. Counting calories is a terrible way to lose weight. The bottom line is that if you lock someone, like Ray Cronise does, in a metabolic chamber and measure every little calorie, if you don't poop it out it's going to go somewhere. The problem is that you have very little control over how your body uses calories, and how many you put in and that your body changes. In a dog, you can at least control what they put in.

Melinda: That's exactly right. It works quite well in dogs. You just don't feed them as much, and you try to get out more. They actually lose the weight.

Dave: It may also increase their stress, thought, right? You look at stress behaviors of a hungry dog. Part of the problem in humans is that when our stress goes up, our performance goes down. It's like, "Oh, look. I induced a famine. and I told my body that a tiger's chasing me for two hours a day. Look, I lost weight, and life sucks." That's the conundrum that we're all trying to solve in the healthy way.

Melinda: (laughs) No, that's really true. "I'm not eating any fat, and I can't think properly."

Dave: Exactly. So there's a comfortable middle there. I'm the first to say that calories are a scam. When people tell you, "You need to count every little calorie going in." I'm like, "You didn't count them going out. It's a scam." I'm down with the fact that a calorie exists, and it's just about as good as a gram for measuring your food.

Melinda: Yeah.

Dave: As long as you know your hunger. (laughs)

So we don't know the percentage of MCT for cats, but we know start with a teaspoon and see how they do.



Melinda: Yep.

Dave: The kinds of changes that people would see in cats would be less hunger, more focused. Do cats learn new tricks, too? Do they get better cognitive function?

Melinda: There's no research out there that says that they do. Probably because nobody wants to work with cats, because I think somebody said it was easier to train goldfish than to train cats.

Dave: (laughs) Yeah, cats are kind of mean. If they don't like what you're doing to them, they'll let you know.

Melinda: But there are great advances in these cognitive tests for cats. They're trying to. They just don't learn the same way that dogs do. The whole way of training dogs and training cats are completely different. Repetition and reward by giving a pat on the head or a little bit of food doesn't necessarily work with cats. You kind of have to relearn your way of dealing with them and getting them to do your tests.

I would say that ketone bodies are formed in cats and in dogs and in people from the metabolism of medium-chain triglycerides, and the ketone bodies are used in the brain. There's no reason why they would not work to enhance brain function.

Dave: There are different processes for making MCT oil. I have found mostly by titration with disaster pants as I was just going down the path of creating Bulletproof and all, there is something called C17, which can be present in MCT oil. Is that something that you've looked at in respect to animals and MCT. I don't even know if this is something that's part of your set of knowledge. Is it?

Melinda: I have not looked at it. A lot of these odd-length, odd not as in strange but odd as in not even, chain-link fatty acids haven't been studied as often because they're just not as common.

Dave: I have noticed that the less pure sources of MCT have a much higher percentage of basic GI distress worked to use the polite word. It looks like it's because of C17, but I don't know for certain about that. We know that C17 causes those symptoms, and we know that it's a byproduct of some MCT manufacturing processes. It sounds like that's not an area where we can have a great discussion.

Melinda: (laughs) It's never a great discussion in that area.

Dave: As long as you talk about disaster pants, it's at least funny. I have to say thanks to Kelly Starrett, the guy who runs the San Francisco CrossFit. He wrote this book called "Becoming a Supple Leopard". He coined the term. He's got a lot of people at his CrossFit gym drinking Bulletproof Coffee. He's like, "Well, if you take too much, you're going to find this out." Certainly any MCT will do it, but certainly different ones do it in different degrees.

Melinda: That's definitely a good thing to know. I will look at C17.

Dave: I think it's actually an important variable that is just overlooked because a lot of times for economic reasons manufacturers of all food products, they come up with a limit. "Well, we can test that limit for like 5 bucks and the next level of limit testing is 50 bucks. We're not going to spend 10 times more on quality testing. Besides, who cares because the legal limits here." Or "It's so small no one will notice." But it actually can have a biological effect. Mixing in some binders and stuff can do that as well. I don't know. Maybe I just pay attention to that kind of stuff in an unusual way.

Now we've got cats, we've got dogs. We haven't talked horses. What in the heck are horses doing? I always fed them buckets of warm oats if it was cold, and hay and stuff like that. Apples where you take the seeds out if you're really careful.

MCT in horses. That actually surprised me when you said that. What is going on with that?

- Melinda: Of course the theory is again that because of the burst of the ketones from consumption of MCT, and it can be used as an energy source in the muscles, that this would help racing animals or performance animals.
- Dave: (laughs) That's usually called brain octane oil, that high octane hurries. Anyway, sorry. But that was actually the trainers do in racehorses.
- Melinda: There has been some work, a little bit of work, in racehorses. The problem is, again, horses are so big and they're so hard to feed appreciable amounts, and then how are you going to test? Did they run the race two seconds faster today? Is it because they're just faster today, or is it because ... So a lot of times they look at respiratory, just a whole bunch of stuff they try to look at. And it's expensive. Expensive to test them, expensive to house them.
- There's not a huge volume of information of MCT in horses. There are some products that do tout MCT and some of them that tout coconut oil, although those are mostly weight-gain ones. (laughs)
- Dave: Shocking.
- Melinda: Shocking. Sometimes it's just for better digestion because of how easily they are able to be digested in our geriatric animals. This is across all animals: Dogs, cats and horses. If you need an energy source and you're not necessarily the best digester of food or fats, MCT is a great source. There's been research in cats that show that as they age the ability to digest fats decreases. In contrast to kind of most people and dogs, as they, cats, age they actually need higher fat diets because they're not putting on the weight. They're actually losing the weight. I'm sure you've seen old skinny cats around.
- In horses, the goal is to give them a burst of energy. Horses run a lot of glycogen.
- Dave: Glycogen, just for people who've seen glycogen. It's basically what your body uses to store carbohydrate after you eat it.

Melinda: Yes. They're great at gluconeogenesis, and they're great at getting the glycogen back out for use in times when they're running. The ketone bodies aren't necessarily as crucial for them as say in other species. But in the studies I have seen in which they have fed MTCs, or even a high-fat diet, this was kind of before when they were looking at high-fat diets, which if you feed enough will induce some sort of ketosis. They have shown that the ketones are actually used by the muscle, and they have a sparing effect on the glycogen and the glucose. Does that mean that it's going to help them run faster or run farther? Possibly, because at some point the ketones will be used up and they will have ample stores of glucose left, whereby other animals may have used up all their glucose and glycogen stores.

Dave: That's kind of interesting. So if the horse is going to bonk, to use a term from when I used to be a long-distance cyclist, when you basically run out of glycogen and the world is coming to an end. If I don't eat something now, I'm going to die. Not really. You just feel like it.

In a racehorse environment, when that happens, having the ketones ready, which the horse mitochondria can use, maybe not as normally or as effectively as they use sugar, but at least it's there, so they have more energy. Okay.

Melinda: Yes.

Dave: That makes sense. You said something that has me all curious. When we look at the way fat is digested by the liver, and then we look at the way MCTs are digested by the liver. I know in humans it's very different when you're looking above the 10 length. In animals, is it kind of the same way? Can you walk us through what happens when you ingest an MCT versus ... when an animal ingests an MCT versus when an animal ingests a longer chain fat. What does the liver do? What is the digestive process there? I think people who think about the kind of fat they eat would probably love hearing this.

Melinda: You bet. We can start off by saying the fat digestion issue begins in the mouth. In people, we have a lipase in our mouth and we have lipase in our

stomach, and it starts to digest these fats as soon as we eat them. In dogs, they have no lipase in their mouth, but they do have it in their stomach. In rats, they have it in their mouth and in their stomach. In cats, they do not necessarily have a lot in their stomach or in their mouth. All animals, human throughout all of the animals species will have it. Pancreatic lipase. So the pancreas will release a lipase to digest the fats once it hits the small intestine.

Your ability to kind of get a super-boost from MCT may differ depending on what animal you are. Humans, we can start digestion in the stomach. There's been some research that say that we can actually absorb some of this MCT or fatty acids, medium-chain fatty acids, from our stomach.

Dave: If they were micelles, maybe they'd absorb faster though the stomach?

Melinda: Mm-Hmm (affirmative).

Dave: If you're listening, micelles. That's what happens when you put it in a blender with coffee. Anyway. Go ahead.

Melinda: That's right. When it hits suspension, exactly.

In all animals, it's going to digest in the small intestine, most of it. In the small intestine the lipase will come and cleave off all the different fatty acids. If you're a medium-chain triglyceride, and MCT oil, you're going to get all of those little fatty acids released. They're going to pass in through the intestine, in through the intestinal cell that's called the enterocyte. It's going to go into the intestinal cell. It's going to go out the other side of the intestinal cell because it's freely diffusable. It freely moves across the membranes.

Now you if eat a long-chain fatty acid or a long-chain triglyceride, or if you just got done eating your streak, which has a bunch of long chains in it, it's going to take a little bit more time. In the intestine, it's waiting for the pancreatic lipase. Pancreatic lipase is going to come. It's going to start cleaving off some of these long chains, but they don't freely diffuse into the

intestinal cell. They actually need some sort of transport. We think it's a protein-mediated transport.

Inside the cell, then they get balled back together into triglycerides. The body has to take them apart move them into the cell, put them all back together into the cell, then it packages them into this little chylomicron, which is this little ball of fats and could have some vitamins in there. Could have a couple of other things in there. It packages them all up and it spits it out the other side of the cell.

But it doesn't go into the bloodstream. It goes into the lymph system. The lymphatics that travel all around your body, and it transports what we call chyle. Chyle is kind of this milky white substance. It's milky because it's full of fats.

Now remember, the medium-chain fatty acid or medium-chain triglycerides that we ate were freely diffusible into the intestinal cell, and they're freely diffusible out the other side. They don't need to be repackaged. They just move, and they move into the bloodstream, which is the portal vein. The first stop for the portal vein is the liver.

The liver is great, because it's going to take that medium-chain fatty acid into the liver cell and it's going to take it into the mitochondria and it's going to process it very quickly into a ketone. Beta hydroxybutyrate is the most common one, but you get some acetoacetate as well. These ketones then leave the liver into the blood and are transported throughout the body for where they're needed.

Now remember our friends the long-chain triglyceride now sitting in this sludgy milky chyle, transported all around the body. It finally makes it up into where it's going to be put into the bloodstream. That's thoracic ducts up by your heart in your chest. Once it's in the blood it can do its magic. It can do all sorts of things that fats like to do in there.

For the most part, it just ends up in your fat cells, to be perfectly honest, because it may not ever make it back to the liver. In most cases, we eat far more calories than we need, far more nutrients than we need. Our body

will preferentially use things like glucose because it's a much faster source of energy, and our body's not going to use fat because that's a very difficult source of energy to get. It will just store it for times of famine.

Now, our MCTs, again, that was very quick. Once they hit the liver, they're all processed and they're not actually available to be put into fat cells. That's just as simple as that. They're gone.

Dave: So, it's a pretty different system. In the liver, they're turned into ketones. The liver, when it needs mitochondrial function, can use the ketones itself to oxidize toxins or to do its digestion process, do its protein formation. Then the rest of the ketones become circulated through the blood, and then they're used the same way glucose would be used. Well, slightly differently in the creation of ATP, but they're used in the brain, in the body. Anywhere that you need extra-good mitochondrial function.

Melinda: Yes.

Dave: What are the parts of our metabolism or parts of our bodies, whether animals or humans, that have the most mitochondrial density, that need the most mitochondrial function?

Melinda: That's a good question. I'm not sure I know the answer to that one. I would say the muscles.

Dave: Yeah, but by weight ... That's actually a great answer. I didn't know the answer to this. It's totally a trick question. It was part of the research I did for my book. The highest density was prefrontal cortex and the cardiac. But that's density per gram. In terms of overall use, you nailed it. Yeah, it's your muscles because you have a lot of them.

Melinda: Ha! (laughs)

Dave: I didn't mean to put you on the spot there. I was like, "Oh, wait. Maybe that isn't common knowledge." It took a long time to actually find the research for that, because it's not that well known, and there's a coronaries to that.

Melinda: I know that the use per ketones is, I think it's brain, heart, muscle. But if you're looking at overall body weight, it's going to be muscle more than the other two.

Dave: Awesome. Now I'm going to ask you one more question really fast, and then we have to get to our final question. We're coming up on the end of the show. This one has to do with cows. In the first book that I worked on around nutrition for basically before pregnancy and during pregnancy for humans, one of the things that came out was that by eating more MCTs, you can really shift the percentage of MCTs in your breast milk up to about 17 percent. At least, if you're a woman and you're making breast milk. (laughs)

Given that, like one of the things, well you want more MCTs because babies use ketones to get fat into their brain so they can actually assemble the other fatty acids in their brains. What happens if, say, cows? I'm going to get a cow next year, or maybe two. I'm sort of thinking should I be adding coconut flakes, or should I be adding or actually pouring MCT oil in the cow, so the cow will make upgraded butter, or something? Help me understand what fats do to milk that comes out the other end.

Melinda: You can certainly alter the fatty acid content of the milk and the species of the fatty acid in the milk by what you're feeding them. Cows are kind of a different creature because of the rumen, the four stomachs, and how much of the short-chain fatty acids that they actually use versus the mediums and the longs. I've seen some studies in which they have fed MCTs or even probably coconut in order to effect an increase of MCT in the milk. I don't think it works.

Cows don't necessarily put a lot of MCTs in their milk. The biggest animal, if you're going to try to oomph the milk content would be a goat.

Dave: Yep.

Melinda: Which is kind of what makes goat milk so much better than ... Or goat cheese, even, better than cow milk and cheese.

Dave: Goat cheese has more MCTs and it has more butyric acid, which is another big thing. Like short-chain fatty acids are a big part of Bulletproof Diet, because there are studies we see in humans, I haven't seen the animal ones, that look at the effect of feeding MCTs versus generating them from resistant starch in the gut, and they're different. They're both good. It's such a fascinating thing. I'm so glad you told me I shouldn't give MCT to my cows most likely. That's good to know. Not that I even have a cow yet. When I get one, it's going to kick ass. I tell you.

All right. Final question, and the one that every guest gets asked on this show, and that is: Given all that you know about animals and all you know about people, and just your whole life path, three most important recommendations for people who want to basically perform better at whatever it is they're here to do. It's not athletic, it's not just cognitive, but most important things you have to offer?

Melinda: Let's see. I would say the first one would be never stop learning. I think you should always be trying to learn something new. A new skill, a new task, a new experience. Always question, but if you're going to question, you should try to find the answer. I think it keeps you young and it keeps you vibrant. You should never just stay status quo.

The second one would be sleep is your friend. (laughs) Always get the most and best sleep that you can. There's so much that you can heal in your body through sleep. Your mental, your cognitive function is improved with sleep. Your body heals itself with sleep. Puppies and kittens, you know why they sleep so much? Because that's how their body makes them grow and their brains work. Never disturb a sleeping puppy and kitten. They need the sleep.

My last one would be love the animals because animals are what makes us human.

Dave: That's cool, and that's not one anyone has said before. I really appreciate your coming on the show and talking about not just people performance, but animal performance. I also appreciate that you're a veterinarian and a



PhD scientist in this, because you've clearly done your work and it shows when you answer these questions.

So, Melinda Culver, thank you so much for being on the show.

Melinda: Thank you for having me. This has been wonderful.

Dave: Have you heard about our new Brain Octane Oil? It goes far beyond Upgraded MCT or any other coconut product for creating maximum cognitive function. This is about 4 percent of what's in coconut oil. It's 18 times stronger than coconut oil, and it's what I put in my Bulletproof Coffee every single day. If you haven't felt the difference between Upgraded MCT and Brain Octane Oil, you owe it to yourself to give it a shot.

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