

Paleo Solution - 416

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Robb: Hey, folks. Robb Wolf here. Man, today's show is a goodie. It is pretty technical, goes pretty deep. Dr. Michael Rose is a bona fide hero of mine. The guy is absolutely brilliant. He is an aging researcher in a major evolutionary biology journal, deals a lot with aging. Basically, broke down the state of the art of aging research in the time before and after Dr. Rose's work. That's how influential he and his graduate students have been.

He was a recent presenter at the Ancestral Health Symposium 2018. Just amazing material. Talks about the potential benefits of, say, like kids maybe eating closer to a not processed but Neolithic diet and then the potential need for all of us to transition to something that looks pretty akin to a Paleo type diet as we age.

So, it answers a lot of questions, clears up a lot of the confusion around Paleo type diet, some of the push back that the Paleo diet concept has received within more mainstream evolutionary biology circles. I think that many of us have gotten much of this right. But as with everything, timing is of the essence. Check out this podcast with Dr. Michael Rose.

Dr. Rose, thank you so much for coming on the show.

Michael: My pleasure.

Robb: Doc, one of the more prestigious evolutionary biology journals that also does a fair amount of work in the aging realm paid you a rather amazing compliment in that they said something -- Again, I'm going to paraphrase here. They basically broke down aging research in the time before your work and the time after your work. That's a pretty remarkable accolade to receive. I think it puts you in a pretty good position to maybe give some commentary on what exactly is aging.

Michael: Aging is not a process of cumulative molecular damage. Aging is instead a loss of adaptation with adult age. I know that sounds relatively meaningless but I can make that concrete if you like to ask me more focused questions.

Robb: Absolutely. I think we'll be able to lead that one along. I think maybe a next lead into that is just the concept of experimental evolution and how that plays into -- In particular, this Paleo diet concept versus Neolithic adaptation. I think that starts fleshing out some of what you mean by this loss of adaptation due to

natural selection forces. Could you talk a little bit about that experimental evolution concept?

Michael: Well, if aging is all tied up with adaptation, meaning Darwin's notion of that adaptation to environments, then it should be tunable in response to changes in the intensity with which natural selection pays attention to the problem of adaptation at later ages. A simple way to put the evolutionary explanation of aging is to say that, somewhat like Rhett Butler in *Gone With the Wind*, at first natural selection cares very much about you and then over time its interest in your health fades because its interest in your level of adaptation fades. And to an evolutionary biologist health is really just adaptation translated into medical terms.

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Robb: At some point, it frankly doesn't give a damn if one is worth the end of that story, I guess, would be the implication there.

Michael: Yes. And the thing about experimental evolution in this context is that in a lab setting, with the kind of organisms I work with, which are food flies, you can change the feelings, if you will, of natural selection about your later health, your later adaptation by only allowing lab population of flies to reproduce at much later ages. When you do that very simple procedure, you're forcing natural selection to care for a very, very long time like a dutiful husband, if you will.

Lo and behold, it turns out there's lots of genetic variation genome wide that will happily take on the burden of keeping animals alive much, much longer simply because natural selection is now corralling all that genetic variation and pushing it to solve problems of aging.

Robb: You really detailed this in a remarkably accessible way in your Ancestral Health Symposium talk where you detailed what you characterize as like a "fly" Paleolithic and modern diet. Can you, again with the visuals, they're so incredibly helpful, and I will link to that talk in the show note, but could you go through that process?

Michael: Sure. I'm happy to. But first, let me say this was the work of Grant Rutledge.

Robb: Okay. Your graduate student.

Michael: He got his doctorate this year and is now working for the USDA, which I regard is a very helpful development. The basic idea is this. And I realized this in 2010 and then I basically talked Grant into focusing on this question for his doctorate. Because natural selection basically loses interest in us as we become older

adults, what that means is you have a very elegant resolution to the whole Paleo versus organic agricultural controversy about the best kind of diet for people.

There's no question really among people who pay any attention to evolution. But we're not adapted to high fructose corn syrup. Go down your list of completely nasty foods, Twinkies, Red Bull. Because all of those things are completely novel. Now, the original version of the Paleo hypothesis was based on faulty evolutionary biology.

What we've learned in evolutionary biology over the last 35 years is that evolution by natural selection can move with incredible speed so long as it is strongly focused on solving a particular problem, whether that particular problem is digesting lactose in Europeans or adapting to high altitudes of Tibetan populations. And we among many others have shown that in the lab, again, with experimental evolution where we can make populations adapt to all kinds of weird and nasty toxic environments.

So that led many evolutionary biologists, myself included up until 2010, to reject the basic Paleo hypothesis because we've had hundreds of generations on agricultural foods, if that is indeed our ancestry, and therefore we should be able to adapt to consuming them. But there's a logical flaw in that argument because that only applies when natural selection is strong. That means, younger ages.

Younger children, in most cases, not all but in most cases, will be reasonably adapted to an organic agricultural diet. And the basic mathematical logic of the evolutionary theory of aging suggests, unfortunately, that that rapid adaptation which should be present for those who are under 25 with Eurasian ancestry will steadily fade out with age until a point should be reached where you're much better off on a Paleo diet.

When that point is will depend on your ancestry. So, for example, if your ancestry is some combination of African and North American native then probably that point is reached very early, maybe when you're 15 years old.

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If you come from a very longstanding agricultural ancestry such as perhaps Persians, Iraqis then maybe they'll do well on organic agricultural foods until 40 or 45. But eventually you're going to lose your adaptation on agricultural foods. That was my inference from the theory. So, Grant Rutledge did an ingenious test of these ideas because they're completely general ideas that relate to any population that has undergone a changed diet in relatively recent evolutionary time which, as it turned out, completely accidentally, was true of the fruit flies in my lab which were harvested from an apple orchard in Massachusetts in 1975

where they had probably resided for centuries feeding primarily off of apple and before they came to Massachusetts probably feeding on things like apples in Northwestern Europe.

So, we felt we had a fairly good idea of what the fruit fly Paleo diet was. It was basically rotting apples. We knew exactly what their Neolithic diet was because for about a thousand generations, much longer than the human case, we've kept these diets, these flies on a banana molasses diet. And, thirdly, we tested these ideas using a completely novel diet which is relatively benign but still completely new to the fruit fly which is an orange based diet. It's novel at least for Massachusetts type fruit flies.

The theory suggests that at an early age, early adult age, are thousand generations of selection for adaptation to a banana diet should give the advantage to a banana diet over an apple diet. This comparison that we did was tilted in favor of banana because while we're exactly emulating the fly version of the Neolithic diet we're only half-assing it with respect to the apple diet because we're just using applesauce combined with yeast paste in the fly living the Paleo lifestyle, if you will.

One reason why I think that's fun and interesting is that's sort of your whole foods Trader Joe's simulation of a Paleo diet, right? Because Robb Wolf and his family, I'm assuming, don't go out every other day with bows and arrows or spears and hunt feral deer and carry them back home and roast them over with fire, right?

Robb: And it's been a while since we've had much vitreous humor or anything like that, yes.

Michael: Exactly. You don't usually eat brain, you don't eat bone marrow even though those are probably some of our longest standing foods as homo sapiens. Anybody who's going to eat a Paleo diet in our times is going to go to Whole Foods and look for grass fed beef. They're going to eat foie gras, liver. Personally, I adore bone marrow. Not everybody does but I do.

I'm still not going to be out there scrounging around for grubs, eating them raw when I haven't the chance to cook them. I'm not going to be eating an incredible diversity of animal and plant foods that are truly the Paleo diet. I mean, you go to Whole Foods, Trader Joe's and look for organic foods, tilt the calories towards saturated fats from animal sources and I could also eat saturated fats from plant sources. Of course, avoid as much of the modern central supermarket diet as I possibly can. I thought it was a fair experiment.

Here are the results that Grant obtained. The results were that, firstly, indeed, at early ages, the flies on the banana diet do as well and in some experiments somewhat better than they do on the apple diet. But at later ages, there's a switch over and the flies on our half-assed apple diet, our half-passed Paleolithic emulation, in fact, do better at later ages.

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And that's not only with respect to survival. It's also with respect to function. What's really poignant for me is at the tail end of life. You could think of that as like people over 70. In the flies on the banana diet, they're really dramatically falling apart in everything that they do. Whereas the apple-fed flies have a very gradual gentle process of aging. It's radically different.

Remember, this is just a half-assed Trader Joe's applesauce simulation of a rotten apple diet. Almost certainly in the flies that were living in Massachusetts they also fed off of more diverse sources of nutrients than just the apple. They probably would have fed on slime molds from a variety of other sources. Slime mold is a favorite fruit fly food.

Notwithstanding the fact that we're basically giving them the Whole Foods version of Paleo, not the hardcore version of Paleo, it dramatically works. Now, in the same vein, you could say, "Well, we could have adapted our flies to oranges over the last thousand generations instead of banana." If the basic theory that I verbally described that's actually Math is correct then at early ages the banana-fed flies should be consistently superior to the orange-fed flies but at later ages they should converge because at later ages evolution by natural selection in the lab has not yet had the chance to penetrate to those ages to make our banana cultured flies for thousand generations adapted.

I think that's exactly what Grant observed. He found that all through early and middle life, the banana-fed flies were doing much better than the orange-fed flies but at much later ages they didn't make much difference anymore. Those are some highlights from Grant's doctoral thesis. He did more experiments which are harder to explain. Some of them I talked about in my Montana talk. Some of them I didn't.

We have papers under review that present all this stuff in gory detail. But I'm basically satisfied with the conclusion that while the evolutionary biology community that has rejected Paleo is probably correct for people who've had longstanding agricultural diets in their ancestry for hundreds of generations, at least they're correct up until the age of 30, let's say. Sometime between the ages of 30 and 50, depending on your ancestry, the Paleo theory has been

propounded for a long time by Loren Cordain and others like yourself is, in fact, correct. That's the basic conclusion of our research on diet and health.

Robb: It's really a profound insight in everything in life. There was a degree of nuance and detail in this story that can get folks fit because people really want to create religious ideology around these things and have a one question-one answer-move on to the next topic. Yet again, this is I think a situation where it really depends where your ancestry derives from and then what the implications would be with regards to how fit you may be at a given age for a more Neolithic diet.

I almost cringe asked this question but within that kind of customization, what would the variables be for optimizing a Paleo type diet? Because we have examples of, say, the Kitavans that are quite high tuber and starch based diet. We have other examples of much higher protein and fat intake. Is that going to largely be an individual variation also? Is there a deeper operating system that would suggest something like ketogenic or significant amount of intermittent fasting, say we reach our 70s and 80s? Is there another tweak to that story?

Michael: Okay. That's a fantastic question, Robb, and I wish I had a great answer for it. I don't have a great answer for it. If I may, I'll kind of wing.

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Robb: I love wild speculation particularly from you, yes, please.

Michael: A very important thing to say, it's another aspect of what we've learned about evolution since 1980, is that populations of animals like humans or, for that matter, fruit flies in the wild have tons of genetic variation. Another way of putting it is, except for identical twins, everybody is different. To start with the trickiest aspect of this first, even though people with European ancestry like myself, presumably yourself as well, are reasonably adapted to agricultural foods at young ages, there will, in fact, still be some genetic variation for how well you're adapted.

We can probably figure that out over the next 20 to 30 years. It's a doable project. I work on similar kinds of projects for fruit flies. I won't get into details because they're frightening. I think what I just described earlier is true on the whole.

Some people, even with Eurasian to Middle Eastern ancestry, still are the low end of being adapted to agricultural foods, possibly even at young ages. For some of those individuals, even as children, they may have to adapt a Paleo diet to avoid certain kinds of chronic disorders. I think a certain proportion of what

are now called autoimmune disorders may, in fact, be a lack of adaptation to agricultural foods. Another fraction, I think, is lack of adaptation to industrial foods that no one should be eating. That's another story.

If you go on to people of qualitatively different ancestries, I think there's a very broad bifurcation or splitting you can make. One of my favorite books is Staffan Lindeberg's *Food and Western Disease* which has spectacular data on Australasian populations showing, I think, quite unequivocally that they're really not adapted to agricultural foods at all, which is no surprise. They'd only been consuming it for a few centuries.

Based on pre-1980's evolutionary thinking, Lindeberg concludes, therefore, we should all be eating pre-agricultural foods. As you know now, I think that's incorrect. Basically, there's a small minority of humans in the world who really, as populations, never adapt to agricultural foods at all. They should never go near agricultural foods at any point in their lives. Then there's a much larger fraction of the world's population which is chiefly Eurasian in origin but there's also some of the corn cultivation populations of the new world to some extent where they have that early age adaptation to agricultural foods.

But there's some heterogeneity there. I'll give you a little anecdote. I won't name names. One of the technicians who work for a colleague of mine was dealing with chronic back pain and problems with his complexion and so on and he looks sort of Southeast Asian. I asked him where he was from. He said Myanmar. Burma, I should say. I said, "Aha. Well, unlike Chinese, who are adapted to both grain and rice, you probably have very little adaptation to grain in your ancestry."

I said to him, "Even though you're in your 20s, what if you were to completely eliminate grain derived sources of starch and stick with rice and Paleo type foods?" He tried that and, lo and behold, his back pain went way, his complexion cleared up. He became healthier from that one little bit of fairly dramatic biogeographical differentiation even among East Asian populations. All right?

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So, layered on top of the most fundamental split in the human species, which is being those who are not at all adapted to agricultural foods and those who are adapted at early ages, there'll be some degree of variation in adaptation to specific foods. Now, the textbook example is literally adaptation to the consumption of cow's milk as adults which is a European to Middle Eastern to South Asian adaptation, little bit in, I think, the Maasai of North Eastern Africa.

There's that ban of adaptation to the consumption of cow and goat milk in later life. Lindeberg actually published his data on this where he plots how long you

can digest lactose against the evolutionary history of his subjects in one of his studies. That's another one. Nobody who -- reverse this. Anybody who lacks ancestry from that belt through the old world, going from Britain down to Sri Lanka, if you don't have any ancestors from that region, you probably have almost no adaptation to consumption of cow or goat milk as an adult. So, stay away from it.

Robb: Right.

Michael: But right now, making such comment is only crude. As we get better at what's called in my field phylogeography of human adaptation to foods, we'll be able to be more specific about what you should never consume at any age, what you can only consume when you're younger. However, I think after the age of 50, no matter where you come from, basically, the Paleo diet is best advised. Because whatever local adaptation to an agricultural your ancestors achieved, it didn't penetrate into the much later ages.

Robb: Man. The implication is just really profound. What could one do on, I guess, a self-experimentation level as far as trying to figure out a little bit of that? Are there lab values that you would want to see? Would you largely just go by how do you look, how do you feel, how do you perform, like adding and deleting different foods? Or even again in this case when one is constructing a Paleo type diet for myself, I find that I tend to do better on the lower carb side of things. Not necessarily full blown ketosis all the time but even sweet potatoes and yams and stuff like that, I just notice that my blood sugar regulation isn't fantastic. I tend to do better on fat and protein. Ancestry is pretty squarely Northern European although I discovered I'm about 12% Native American more from South America than Canada and United States.

Just empirically, I've noticed that my blood lipids look good. My A1C looks good. If I hover around that area and if I introduce much more in the way of Paleo type carb I start seeing things go a little bit sideways. Do you have a sense of how to map that process out?

Michael: Well, that is literally a research project I would like to do. I won't describe some of my plans for how to do that. I think that that's the kind of idea that Grant Rutledge and others are interested in pursuing. I hope they find a way to do that because, as you will fully appreciate, that's not really where the biomedical establishment is right now.

Robb: No.

Michael: Not at all. I guess, the simple thing I would say is at later ages, certainly over 50 unequivocally, often over 40, you're looking at the residual effect of a process of

adaptation. If you go back 100,000 years, all your ancestors were in Africa almost. There's some Neanderthal but it's small. And then over the last 100,000 years your ancestors migrated through a whole variety of habitats where they might or might not have had the opportunity to gather tubers.

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They might or might not have had the opportunity to gather nuts, especially peanuts. They would have varying access to fruit. They would have varying access to honey. I think we know enough about our ancestry, our ancestral diets now to say that a diet that is high in plant matter in terms of bulk but high in plant, sorry, high in animal sourced foods in terms of calories is the ancestral diet. Averaged over all those opportunities.

I think a very high carbohydrate diet is something that our ancestors would resort to when they had no choice. But the sweet spot human diet is a kind of omnivorous diet in terms of bulk with a great deal of focus on animal fats and very high quality nutrients like bone marrow, like brain. Only secondarily like fatty muscle.

We really don't have the dentition or even the stomach to get at really hard tough animal flesh. You can see that on the teeth. Basically, a very important point to make is we've been cooking our food especially our animal foods for something a million years. Some people think two or three million years but certainly a million years. No part of this is raw food. In fact, human guts are not good at digesting raw animal tissue.

Cooked organs, animal tissues, that's where the bulk of our high quality nutrients come from. But then, being derived from omnivorous primates over 20 or 30 million years. Okay, when we were eating literally fruits, lots of plant stuff, small animals, insects, insect grubs, nuts, honey. You can't go too far wrong with eating that spectrum of things whether or not your particular genotype, your particular genome is that good at high starchy food. That's going to be a question mark in my opinion.

Over the last eight years since I figured this all out to my satisfaction at least, I'd been advising middle aged people with chronic health problems to try very hardcore Paleo diet. I've seen spectacular results in those who indeed go hardcore with Paleo especially lower starchy foods. But lots of plant matter that isn't very starchy. That's my long-winded answer to your question.

Robb: No, that's great. A good friend of mine, brilliant guy in Australia, Marty Kendall. He's an engineer. His wife developed type one diabetes rather late in life, late 20s or late 30s. He was perplexed by how challenging it was to maintain good

blood glucose levels with her. He went after the blood glucose regulation in a type one diabetic with a pretty fresh set of eyes but a good ability to model and use math to look at a problem.

He arrived at this lower carb Paleo type diet. And then he started getting pretty excited about nutrient density. What you're putting forward here overlays with what he would argue would be our most nutrient dense way to eat that you could possibly do which also kind of aligns with the whole optimum foraging strategy notion as well. I mean, it's pretty fascinating stuff. At this point, it maybe shouldn't be surprising but it is interesting the amount of variability that we can have in that more tuber based approach to Paleo type diet versus very nutrient dense but low caloric load plant material with the bulk of the caloric load being made up from animal material. It's really interesting.

Michael: I'm going to say a relatively old school evolutionary biology thing right now. You can't really account for the evolution of our very costly brains. Costly, in terms of both calories and nutrient quality.

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Unless you're talking about an animal that has access to lots of high nutrient quality animal derived foods, the basic budget for nutrition and development doesn't make sense on any kind of vegetarian diet.

Robb: Dr. Rose, I want to be respectful of your time. I know we just have a few more minutes here. What are some parameters outside of diet that can beneficially influence that morbidity/mortality curve? Things like strength training, aerobic work, circadian entrainment. What else can we be doing to help bend that in the favorable direction?

Michael: Well, the obvious thing to say is we did not evolve to sit in chairs or lie in beds 23 and a half hours of the day. Exactly the same principle applies to our activity patterns as it applies to our diet and, likewise, our sleep patterns and most every other thing we do. While we are an animal of great behavioral flexibility, of course, the greatest on the planet, that doesn't mean we're well-adapted to being inert keyboard and pad manipulators and sedentary.

However, the data are the total amount of activity of a normally active adult even in an automobile based society like that of United States. It's not that different from a normal hunter-gatherer activity or metabolic profile. So, even with this very dramatic films that you can show people of hunter-gatherers on the hunt, that's not an on average how they lived.

One of the reasons I think for that, again, as a biologist, is our brains are tremendously consuming calories. That is to say, even sitting here having this interview with you, my brain is just sucking up an enormous amount of calories. If I am walking, if I were walking and talking to you, I would be using more calories but it's not as dramatically different as it would be for an animal like a snake or alligator.

We just metabolically shut down to a high degree if it's not moving. So, because we have this incredibly costly demanding brain we are in a sense metabolically quite active. However, demonstratively, reasonable levels of exercise are beneficial. In fact, I was reading a paper yesterday which shows that resistance training, other types of basic activity up to an hour a week lower all cause mortality. But once you get to very high levels of activity your all cause mortality rate actually then goes up.

The truth is, if you imagine a really spectacularly muscled and athletically proficient primate, you're thinking of a chimpanzee, not a human, are very substantially stronger than we are. They can do much more spectacularly athletic things than we can because their metabolism is not tilted towards the maintenance of a costly brain. We are the deadly and successful animals that we are because of our brains which are really just about after the cardiovascular system our number one metabolic priority.

I'm not an advocate of Ironman triathlons as a way to improve your health. In fact, I think you risk dying sooner for those things especially if you eat anything like modern industrial diet.

Robb: Amazing. It's funny because this minimum effective dose idea is a tough one to sell. It's tough to sell in folks that really have habituated themselves to doing nothing and it's also tough to sell to the folks that -- not to turn this into a psychology show but they're on the lam from something in their lives and they can't have a moment of downtime so they have a Spartan race one week, CrossFit game competitions the next week.

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They unwind with a hot yoga class after hiking to the studio six miles away. Those two polar extremes seem to be neither where we want to be but also very difficult to drag them into that notion of an hour a week of strength training and just generally being active is probably where the best result on investment wise.

Michael: That's what the latest data are saying.

Robb: I like that because I like both working out a little bit but I'm also fairly lazy. So, I don't want to spend my life doing it, so that's great.

Michael: Hunter gatherer populations are actually pretty lazy. When they have western anthropologists among them and the western anthropologist want to go out for a run, the hunter-gatherer just look at them like they're insane. If you're not hunting why are you doing that?

Robb: Right. That's fantastic. Well, Dr. Rose, again, I could literally go on for hours with you. I want to reiterate what a huge influence you have been on my thinking and cannot say enough thank you for coming on the show. I want to be respectful of your time. Where can folks find you on the interwebs or follow your work?

Michael: Sure. I have a website which is 55theses.org, the numerals 5-5 then T-H-E-S-E-S. There I've tried to reduce my 40 years of research to 55 sentences. Accompanying those sentences are little mini essays and little podcasts and all that stuff. I'm not the webmaster. Another person is the webmaster, Rob Patterson. He talked me into doing this.

I'm also on YouTube. I'm most easily found using Michael Rose aging. Of course, I have many, many print interviews which are available online. I've written popular book, doesn't include the diet stuff. It's called the Long Tomorrow. You can get it very cheaply used for like \$2 to \$5 from Amazon. Don't feel guilty about buying it used. No problem for me. I'm fine. Those would be three starting points.

Of course, you can also me on Google Scholar where I maintain my own page. It's Michael R. Rose. That will connect you to several hundred publications that I've come up with over the last 40 years.

Robb: Fantastic. Well, I honestly think I was one of the first people that ever put the 55theses into an RSS feed so that I could check back on that constantly. I cannot thank you again enough for your work and, hopefully, can rope you into coming back on the show in the future.

Michael: I would be happy to.

Robb: Fantastic. Dr. Rose, thank you so much and continued success in your work.

Michael: Thank you so much, Robb.

Robb: Bye.

Michael: Bye.

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