Transcription results:

S1 00:18 [music] We're pleased to have our next speaker here from Hunter College who is actually pushing new theories about metabolism, and he's going to share those with you that are actually pretty groundbreaking. And so please join me in welcoming Dr. Herman Pontzer to the stage. [applause]

S2 00:33 Hey. Howdy.

S? 00:36 Howdy.

S2 00:37 It works. Okay. Let's get going. I'm an anthropologist. I study how humans evolve, and here's a picture of me back in my graduate school days. I'm interested in how the human body evolved and how evolution has shaped the way it works. And I look at this picture, and you might see someone full of hope and with a full head of hair, and it's a joyful thing, but that's a heartbreaking picture to me because what I didn't know is just about two inches beneath the surface was this skull. I wasn't lucky enough to be the first who uncovered it. It was somebody who came along after me, but this is at a site I was working at graduate school called Dmanisi. It's in the Republic of Georgia in the Caucasus Mountains. And the reason I was there, and that the team of folks who were working at Dmanisi were so excited to be there was that it captured a really critical point in our evolution. If we look at human evolution over the last six or seven million years or so, we split from chimps and bonobos about six or seven million years ago, and our early ancestors were mostly in Africa-- entirely in Africa, I should say. But about two million years ago, around the time that we see sites like Dmanisi crop up, we have a new kind of hominem evolving, and we see the beginning of the hunter-gatherer lifestyle evolving. Bigger brains, stone tools, some meat in the diet. All right? And Dmanisi captures one of the earliest sites of this ecologically flexible, big-brained, clever ancestor that we are all descendants from. And, in fact, our species, homo sapiens, is just the most recent branch off of that homo family tree. And so we get started in Africa about two or three hundred thousand years ago and branch out all over the place, and so one of the things this tells us, and one of the reasons we're so excited to work in a place like Dmanisi is that that hunter-gatherer lifestyle, with its origins about two million years ago is the heritage that we're all part of, we're all a piece of. Humans evolved as hunter-gatherers and, in fact, our species, homo sapiens, is just again the most recent sort of twig on this bushy part of the human tree.

S2 02:49 And so what's interesting then is to think about what's happening these days in places like College Station, and the rest of the US and Europe, and other developed countries, is that this urbanization, modernization, mechanization of our daily life is actually incredibly recent, and potentially at odds, a sort of mismatch, with our hunter-gatherer past. So that raises the question - this is a question that I've been interested in the last few years, and a sort of growing field has been interested in this question - is this modernization making us sick? This mismatch between the hunter-gatherer lifestyle in which we evolved and that shaped our bodies, and this very recent strange phenomenon of cities and cars and supermarkets. Is that mismatch making us sick? Specifically, one thing I'll focus on today-- some work that I've done recently is sort of focused on this question, is it making us fat? We know that the grim statistics on levels of obesity in the US and Europe, and one of the general questions that people have come back to again and again or ideas about why obesity is such an issue is that perhaps we're just not burning enough calories now in our modernized lives to sort of burn off the calories that have accumulated as fat in Westernized societies.

S2 04:04 So it's a neat idea, right? And it's one I've become really fascinated by. But the fossil record is a hard place to answer that question. If we want, as human evolution researchers to answer this question, we need different tools and different approaches. And so one of the things I've been doing in the last few years is taking a different tack. And so I've been working with a couple of different populations across the globe with lots of collaborators, looking at populations like the Shwar, and the [Chumani?] in the Amazon, the Hadza in northern Tanzania. And these are traditional populations who all maintain in their culture and their lifestyle important elements of that hunter-gatherer lifestyle that we've all come from, right? So these are populations that are getting a lot of their food from the wild. They're very physically active. They don't have modern medicine. They don't have vehicles, or domesticated animals, or tools, or anything like that. And so humans are incredibly homogeneous genetically. Our species, like I showed you, is a very recent branch off the big family tree. And so because we're so homogeneous, these populations are like natural experiments. We get to ask, "If I grew up in Hadza land, or if I grew up amongst the Shwar or the [Chumani?], what would my body be like?" That's the kind of things we can ask when we go in to work with these populations.

S2 05:25 So I want to focus on one of the populations we've worked with extensively over the last few years called the Hadza - this is work I've done with Dave Raichlen and Brian Wood - and the Hadza are this amazing population of folks in northern Tanzania. They're still hunting and gathering. There's a couple of Hadza houses and Hadza family. They go out, and women collect plant foods from the landscape. Men are still hunting wild game. Very physically active, all right? No modern medicine. They hunt with bow and arrow. No modern vehicles, or mechanization, or anything like that. So, again, they retain really important aspects of our lifestyle, of the hunting and gathering lifestyle, that's been the environment that shaped us over the last two million years. And they've become, again, this really important touchstone for understanding what our bodies are like in these hunting and gathering contexts and the ways in which we've evolved.

S2 06:18 So, for example, we know that they're incredibly healthy in a lot of important ways. First of all, they're very, very active. This is minutes a day of moderate, vigorous physical activity. They get about three hours a day and we get, if we're lucky, maybe 10 or 20 minutes. They're incredibly physically active. They don't get heart disease, okay? They don't become overweight and obese. And so they're this model of public health and this model of what our bodies are like in this hunting and gathering context. And so one of the things we've wanted to test over the last couple of years is are these health effects due to the fact that they're burning more calories than you and me? So is this active lifestyle burning more calories? It seems like an obvious question, right? We know that they're incredibly physically active, and we're told all the time that the more active we are, the more calories we'll burn, and that will have really important health benefits for us, including keeping us thin, all right? So is it true?

S2 07:14 Well, we use this technique called the doubly labeled water method, which is the gold standard for measuring calories a day outside the laboratory. And we did this with a bunch of Hadza men and women, as well as we had data for a lot of US men and women, as well as other modernized populations like Europe and other modernized groups. And here's what the data looked like. So here's fat-free mass, that's body size along the bottom, against how many calories you burn per day, and here's our comparative sample. So we expect the Hadza to be elevated above this but, in fact, when we get those data back what we found, much to our surprise, was that the Hadza looked like everybody else. So even though they're incredibly active, they are

not burning any more calories every day than you and I are. So you can look at this however you want. Statistically, it doesn't matter. They're burning the same number of calories as you and me.

S2 08:02 So what's going on? And this has actually spurred a lot of really fun and interesting science over the last couple of years. And what we've come to realize is that the story we've been taught about how that your body burns calories is not complete and not really accurate. Instead, what seems to be happening is that the body is constrained in how many calories it wants to burn, and it tries to keep that in check. So here's an example of that. You take somebody, this is a famous study in the 1990s, you take a group of people who are sedentary. You train them up to run a half marathon, and so they're sedentary in the beginning. About two months in, they're running 20 minutes a day, four times a week. Their energy expenditures go up. Great. That's exactly what we expect. And we expect then that they'd keep on going up as we get more, and more, and more training, right? Wrong. What actually happens is energy expenditures flatline. Calories a day plateaus. Their bodies are working to keep energy expenditure in check.

S2 08:54 What happens when we look across a big population of people and ask, "Are more active people burning more calories?" And the answer there again, surprisingly, is no. The body adapts to increased activity to keep energy expenditures in check. And, in fact, there seems to be about a 600 calorie a day cushion that the body can use to adapt and keep energy expenditures more or less the same. All right? It's not just humans. We've done a lot of work with other primates and, for example, if we look at-- this is a big study we did a few years ago looking at primates, different species of monkeys, and apes, and lemurs. If you look at population in zoos versus populations in the wild, guess what? Same calories per day. So sedentary apes hanging out in the zoo versus very active apes out in the wild. Same calories a day, okay? Lifestyle does not determine how many calories you burn every day. It's a real shock and something that's emerged out of this science. Interestingly, though, primates do show these really low energy expenditures. About 50% fewer calories a day than other animals, suggesting that evolution can push our energy expenditures around. So energy expenditure isn't something that your lifestyle dictates but it's something that your evolutionary history dictates, which brings us right back to the beginning, right? And raises the obvious question, "How has our evolutionary history shift the way that our bodies burn energy?"

S2 10:08 And so we sort of narrowed our focus and looked at humans versus the other apes. And what we find is that in our evolutionary lineage, we've increased our metabolic rates. So humans have evolved this fast metabolic rate. We think that's a really critical piece that's allowed us to fund our really expensive brains. As you sit here, quietly, about 20% of the energy you burn is going just to your brain. That's how big and hungry the human brain is. So think about that. Every fifth breath you take is just the oxygen you need to feed your brain, right? And ramping up our metabolic rate over that last two million years of our hunter-gatherer evolution has been a really big piece of how we've been able to afford that increase in brain size.

S2 10:50 But it's come with a cost. You increase your energy expenditure, you put yourself at risk of starving to death. We've also evolved some countermeasures to keep our energy expenditures in check as well as to keep ourselves from running out of calories. And one of them is, we're incredibly fat, right? Humans are the fattest ape. Humans put on more fat in the course of daily life than a chimpanzee hanging out in a zoo. And if that's not depressing, I don't know what is. All right. So we've evolved these fast metabolisms. They've been a critical piece of this hunter-gatherer lifestyle that we've evolved over the last two million years, and that's come with a couple of

other pieces, too. So it's come with our big brains, it's come with our technological savvy, our ecological flexibility. But it's also come with a predisposition to put on fat, and it's had behavioral consequences, too. So humans are also the only apes that share, right? If we share food, we're less likely to starve. If I come home empty-handed, you'll share with me. If you come home empty-handed, I share with you. Right? We can share with our kids, and it changes the way the children grow up, right? So here's a Hadza woman with her grandson sharing food that she brought in. Of course, it's a nice chubby, happy, kid, right? Because humans are the fat ape, right? And of course their bodies are adapting, right? They're very, very active, but they aren't burning more calories than you and me because they have this old evolutionary trick that seems to be common among all mammals to keep energy expenditure in check, even though they have these really physically active lifestyles.

S2 12:17 So it's been really fun doing this work over the last few years and getting a sort of evolutionary insight into how our bodies work, and learning new things from these populations and other species. And I'll just leave you then with a couple of thoughts. One is that exercise is absolutely essential for our health. We are evolved to move. That last two million years of hunter-gather evolution, that's all high physical activity lifestyle. Being out walking, being active all day, every day. So if we can incorporate that activity, that daily activity into our lives, we're going to have great health benefits from that. And that's one thing we learned from the Hadza. That's why they don't have heart disease. That's why they don't have diabetes. It's because they're so darn active. And if we could incorporate that, we'd be better off for it. But it's not enough, okay? High activity levels aren't going to keep us thin because our bodies will adapt and keep our energy expenditures the same as they were when we are less active. So I guess that obesity is a diet issue, right? Unhealthy weight gain is essentially-- it always boils down to bringing more calories in than you burn off. And if the energy that we can burn off is kind of stuck, if it's a function of our evolution and not our environment, then we're going to be able to tip those scales much easier, and keep the weight off or lose the weight, if we worry about the calories in. That's a much more flexible piece of the system, okay? So you still have to exercise, but you also have to watch your diet. It's not diet and exercise-- sorry, it's not diet or exercise, it's diet and exercise.

S2 13:52 And, lastly, I would just say, we have a lot more to learn from these traditional populations, right? The reason we've been able to do this new fun science is that we've been working outside the box, right? We have been working outside the lab, in the field, with new populations, new species, and new techniques, and that's allowed us to learn new things. And so it's just a call to all of you out there thinking about a career in science, as well as people thinking about where we should direct our energies and research in this country. These fundamental basic research questions or these different populations of new ideas are going to be essential to solving the long-standing problems that have been plaguing us for years and decades. Thank you. [applause]

S1 14:41 Great talk, Dr. Pontzer.

S2 14:42 Thank you.

S1 14:42 It's been lighting the phone up over here. I think I've gotten about 15 [laughter] texts on this one. So let's start with this one from John Smith at Texas A&M San Antonio. "Any comparison on lifestyle and/or quality of life into elderly age between city and hunter-gatherer populations?"

S2 15:00 That's a great question. So with the Hadza, they don't have any modern medicine or anything like that, right? But they still commonly live into their 60s, 70s, 80 years old,

and they are out there walking around every day, getting after it, hale and hearty into their late ages. And so they're a great model for how to age well, I think, actually.

S1 15:21 So I'm going to ask you this question because I think probably most of us have this question. I know when I first started reading your paper several [laughter] years ago, I had this question. So this is from Sue B, here in College Station. "How can caloric expenditure not increase with more minutes of exercise per day? I'm confused."

S2 15:36 That is the question. And what we believe is happening is a combination of things. One is, we might be changing subtly the ways that our sort of non-exercise time is spent, resting sort of more soundly. It would be [inaudible] behavioral changes. The other thing that's happening, and I think this is really important, so I think it's shifting the way our bodies use energy. Most of the energy we spend every day is not on activity. Even the active among us, most of it is spent on all the background stuff. And some of that background stuff gets you in trouble. So inflammation levels, for example. Background levels of inflammation is not good for you. It is an immune system function that we could tamp down. And, actually, if you exercise, sometimes you do see inflammation go down. Overactive systems anywhere, reproductive systems, that kind of stuff, maybe if you are more and more physically active, you sort of draw energy away from those activities, and make room for that greater activity. That's the hypothesis that we're exploring right now. No answers yet.

S1 16:31 So we'll just keep watching literature, right?

S2 16:33 That's right. That's right.

S1 16:34 So this is from Mayla from Augusta University. "Do you think if the Hadza would gain more fat-- do you think the Hadza would gain more fat if they abruptly stopped exercising than if they had stayed sedentary?"

S2 16:46 If you sort of abruptly changed their lives? Perhaps. And so that's one of the things we're trying to figure out too is, "How much does the way that you grow up affect the way that your body works," right? So if you grow up in that Hadza environment and your body is used to that allocation of so much physical activity, and so much other stuff, if you change that abruptly in your adult years, does that have big effects? And that's one thing that we think probably it does, but we don't know yet. More work to keep checking on.

S1 17:17 Thank you.

S2 17:17 Thank you.

S1 17:18 And I want to thank you all that have been sending these questions because I got 18 questions on Dr. Pontzer's talk. So keep doing that. I'm sorry we can't get to all of them. Maybe you can send them to him later.

S2 17:26 Sure. Please.

S1 17:27 Anyway. So thank you--

S2 17:28 Thank you.

S1 17:28 --very much for the talk. [music]