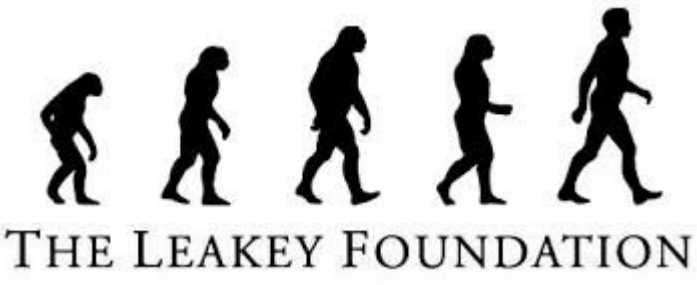

Origin Stories Episode 11: Face Mites

Meredith Johnson
0:00:07

This is Origin Stories, the Leakey Foundation podcast. I'm Meredith Johnson.

Female Speaker 1
All right are you ready?

Meredith Johnson
Yeah, I'm ready.

Female Speaker 1
Okay. Just scrape as hard as you can without hurting yourself.

Meredith Johnson
Okay.

Female Interviewer 1
And then do the other side. Does that hurt at all?

Meredith Johnson
No, I can feel it though.

Female Speaker 1
You might want to scrape a little harder (laughter)

Meredith Johnson
This is the sound of me doing something I never expected to be doing. I'm in a lab at the California Academy of Sciences having my face scraped with a little metal spatula for science.

Female Speaker 1
Okay. One more time on both sides. We just want to maximize our chance that we're going to get some DNA from you.

Meredith Johnson
What we're looking for is evidence of a little creature who's living on my face.

Michelle Trautwein
So, believe it or not, I think most people aren't aware of the fact that we actually have mites on our faces. Mites are arachnids and we actually have two species that live on us.

Meredith Johnson
This is Michelle Trautwein. She is an evolutionary biologist and entomologist and these mites she's talking about are tiny arachnids, commonly known as face mites. They're cousins to ticks and spiders. The one we're focusing on is called *Demodex folliculorum.*

Michelle Trautwein
And then we have another species called *Demodex brevis* which is its, kind of shorter, fatter cousin.

Meredith Johnson
How do you break it to somebody that they have mites?

Michelle Trautwein
(laughs) Brutal honesty. Just brutal, up front honesty.

Meredith Johnson
The brutally honest truth I'm about to tell you is that you're crawling with these critters, for sure. Trautwein has found that we all have face mites. They were first found in human ear wax in the 1800's. Since then, scientists thought that only about one in five of us hosted these tiny arachnids and when Trautwein first started trying to find them on people's faces her results were similar.

Michelle Trautwein
But then there's a lot of cadaver studies that find mites on one hundred percent of people and so there was this discrepancy.

Meredith Johnson
So Trautwein's lab started gathering the gunk off of people's faces— that's her word for it— and sequencing the DNA they'd gathered.

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Michelle Trautwein
And when we did that we found mites on a hundred percent of people— or we found mite DNA on a hundred percent of people which to us, indicated these mites are on everybody. They're just hard to find.

Female Speaker 1
But then do you find that a lot of people are freaked out when they find out that?

Michelle Trautwein
Yeah. I mean, I'm freaked out (laughs) I think that's a fair response to be — it's just a bizarre reality that this whole parallel universe exists on our skin.

Meredith Johnson
And there's no way to get rid of them. Fortunately, they're seemingly harmless.

Michelle Trautwein
There's some potential link between mites and rosacea. On the vast majority people, they're living a completely benign existence with us.

Meredith Johnson
Our faces are like a little planet where they live together with the rest of our skin's natural microbiome with all the other bacteria and microorganisms that exist on our skin. And it might be best for our own peace of mind to start to consider these little mites as our close personal friends and start to get to know them a little better. Let's start with what they look like.

Michelle Trautwein
They are kind of long tubes. They're kind of ringed a little bit if you could see their texture and they just have very short stubby legs and kind of flattened front part (laughter) they're actually kind of challenging to describe. Long, skinny tubes with tiny legs.

Female Speaker 1
Do they have a face?

Michelle Trautwein
They do have a face, yes. Yes, they do. (laughs) Their face is mite-esque. You wouldn't think it was a lovely face. It's kind of the face only a mother could love— a mother might could love probably. It's very arthropod-ish.

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Misha Leong
I mean the way you described it of them being like a segmented tube with these chubby little legs is—

Meredith Johnson
This is Misha Leong. She is a postdoctoral researcher in entomology who works with Trautwein.

Misha Leong
When you would try to describe arthropods sometimes it's easy to talk about lobsters because people know those kind of arthropods, but it's like if a lobster had a really, really long tail and no antennae (laughter) I don't know, maybe that's not a good one. We don't even know what color these mites are, really.

Meredith Johnson
And these hard to describe, tube-like mites with eight stubby legs live mostly on our faces, but also in our ear canals, on our nipples and our genitals.

Michelle Trautwein
Right, so I always say that, you know, we call them face mites, but they can be called nipple mites or genital mites, but it's just not as generally appealing perhaps, so.

Meredith Johnson
Face mites live for a little over two weeks. They make their homes in our pores and they come out onto our faces to reproduce.

Michelle Trautwein
They can reproduce both sexually and asexually and beyond that, they eat— some people think they eat the sebum in your hair follicles. Beyond that I don't know if we know very much.

Meredith Johnson
Which is strange considering that they're so close to us.

Michelle Trautwein
Well in some senses it's really surprising that we don't know a lot about them because they actually live on our face, so you would think that would be a prime target for investigation, but at the same time— and I say this having studied them for the past couple years— they're actually very challenging to work with. They're microscopic. Once you do find a mite they're hard to handle you know? It's hard to get a tiny microscopic thing into the vial that you want to get it into or on the slide or whatever else. So they can just be a challenging research subject. They

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don't live off of our body so you can't kind of put them in a box and watch them for a week. They need to be on a human face, so there's a lot of challenges with looking more into their lifestyles.

Meredith Johnson
Since we still know so little there are lots of questions about face mite lifestyles. Here's Misha Leong again.

Misha Leong
We have no idea how much the mites are really moving across the body. We say that mites are on your face and on your genitals, but how much contact are those mites really having? Like, how long does it take for a mite that's on your face like (laughs) in its two week lifetime would actually ever get down to your genitals? Unlikely. Is it like a monarch migration where it takes generations to get there? Who knows?

Meredith Johnson
But, this is an anthropology podcast, not an entomology podcast, so let's focus on people because this is where things get even more interesting. Finding an arachnid that lives on every single human being is pretty freaky for most people, but it's pretty exciting for an evolutionary biologist like Michelle Trautwein.

Michelle Trautwein
There's a few things that makes them really great, in fact, better than a lot of other organisms that have already been looked at and so that's exciting. They have a lot of potential. One is that they're very closely tied to our bodies. They really are a part of us and so because of that they're going to be good markers for the change that happens on us over time.

Meredith Johnson
Another exciting thing about them is the way we get them in the first place. They seem to be passed down from parent to child.

Michelle Trautwein
They are vertically transmitted which means they are passed from parent to offspring and so just like your DNA is passed from parent to offspring so are these mites and so that allows them to be another indicator.

Meredith Johnson
It's possible that we're colonized with these little critters starting at our mother's breast.

Michelle Trautwein

That seems like a good way, a good strategy for a mite to pass on to the next generation is to live in a nipple and jump on to the next infant that comes around.

Meredith Johnson
They seem to pass from mother to child and between spouses and close family members building a sort of creepy-crawly microscopic family tree. Because we keep them in the family, they don't hop from one face to another randomly.

Michelle Trautwein
I don't think they were sharing them, you know, when we kiss cheeks or other kind of casual social rituals. I think that with those stubby little legs it might take quite a bit for them to get from one face to another.

Meredith Johnson
These two things together; the way they're only passed by really close contact and the astonishing fact that we all have them means that face mites can be really good models to look at to learn more about human evolution. Scientists typically study human evolution using fossil evidence and molecular data like DNA and isotope studies, but it turns out that the little passengers we humans have carried with us through time can add valuable information to the story of how our species evolved.

Michelle Trautwein
Looking to parasites to understand more about our own evolution is not new, but for me it's always been super captivating especially as an entomologist. There's another group of studies done on lice which are a parasite that we're all pretty familiar with trying to avoid and those studies have just shown incredible things about human evolution.

Meredith Johnson
Studies of lice have given clues to some of the big mysteries of our past. In 2011, researchers look to lice to try to figure out when humans started to wear clothes. When they sequenced the lice DNA they found that head lice and body lice split from each other between eighty-three to one hundred and seventy thousand years ago. They use that data to show that humans were likely wearing clothes at least one hundred and seventy thousand years ago.

Michelle Trautwein
It makes me love lice in a whole different way, you know? I have small children so I also hate lice, but at the same time from the storytelling perspective lice are incredible and so the ability of these kind of pesky arthropods to tell us more about our own history I think is really powerful.

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They reveal things that our own DNA, our own kind of human fossil evidence wouldn't be able to retell us.

Meredith Johnson
So Trautwein and her colleagues started trying to find out whether face mites could also tell stories about our evolution.

Michelle Trautwein
So basically we started sampling people for mite DNA and we started sampling a diversity of people with really diverse geographic ancestry, so people who have Asian ancestry and African ancestry and South American ancestry. We wanted to know if we all hosted the same mite lineages or if there was a lot of genetic variation between mites from different hosts from around the world and basically we found just that different populations of people host different types of face mites.

Meredith Johnson
Just like they did with my face they scraped the gunk off of volunteers at Museum events in the US and when they analyzed the face mite DNA they found four distinct kinds or lineages of mites.

Michelle Trautwein
Three of those lineages were almost completely restricted to Africans and Asians and people from South America and those lineages were very, very divergent from what I consider the more common European lineage that we found.

Meredith Johnson
The results suggest that your geographic ancestry seems to dictate the kind of mites that can live on your face.

Michelle Trautwein
Someone of African or also perhaps Southeast Asian ancestry we find have the ability to host these, what we see as very ancient particular lineages of mites. Now interestingly enough they can also host this common European lineage. What's interesting is that Europeans can't seem to host the African and Southeast Asian lineage of mites.

Meredith Johnson
Trautwein's study found that people of recent African geographic ancestry still have the greatest diversity of face mites and she thinks these four kinds of mites they found so far are just a small sampling of the kinds that are out there.

Michelle Trautwein
Probably these four lineages I found are really just a small representative because those really long branch lineages that I think originated in Africa showed so much genetic diversity that I think that if we sampled people of African ancestry more broadly we would find many, many more lineages because just like human diversity, most human genetic diversity can be found in Africa and it's the same with human hosted mite genetic diversity. Most of that diversity can also be found on Africans.

Meredith Johnson
These mites are adding to the story of our dispersal out of Africa. What Trautwein and her colleagues found when they sequenced the mite DNA matches with the fossil evidence about humanity's African origins and the timeline of our spread to other places around the world.

Michelle Trautwein
They reflect human evolution and the picture of our out of Africa dispersal, but so far that's it. I think is a lot more potential to ask really explicit questions about human evolution, but right now we're just kind of painting this very basic foundational picture about how we have changed and evolved with our bugs over time.

Meredith Johnson
The last common ancestor of these mite lineages lived around three million years ago, well before modern humans. Trautwein's data suggests that face mites are rooted at the origins of our genus *Homo* and they've been with us ever since.

Michelle Trautwein
As humans moved out of Africa they took a subset of mite lineages with them. That subset of lineages then diverged into Asian populations and European populations. Another even cooler piece of evidence that we found is that on some Asian and on African-Americans we found that they can retain their ancestry-specific mite lineages over the course of decades or even generations. So for example in African-Americans who have been living in the United States for all of their known family history, up to three or to four generations they still host African mites.

Meredith Johnson
Finding that African-American volunteers whose families have been living in the US for generations still hosted mites unique to the African continent was a big surprise to the research team.

Michelle Trautwein

The fact that African-Americans host African mites was a big surprise to us and just super exciting and I think we assumed before we started that if we sampled Africans visiting from Africa that they would have unique mites, but I don't think we would've guessed that African-Americans who have been here for generations would still have African face mites, which is just delightful to think about.

Misha Leong
I think it's just so interesting that such proof of this vertical transmission of something that's on the surface of your skin, it's not a microbe that's passed on through the digestive system.

Meredith Johnson
That's Misha Leong again. That special quality of the face mites to stay in the family, their vertical transmission, is one of her favorite things about them.

Misha Leong
I really kind of latched onto the idea that their mites are being vertically transmitted at the same time in close intimate relationships like with married couples, there's transference of mites between them and so I'm Asian-American fourth-generation in California and so my mite family is all Asian-American.

Meredith Johnson
But her sister married a man who recently emigrated from China and Leong herself married a French man.

Misha Leong
And so I sampled our face mites over the holidays to see are my sisters' and my mites no longer that similar even though we grew up together? Are they more similar to our husbands who are from different continents and I'm really excited to see what comes out, but I don't know what the results are just yet. How similar are our mites to our parents still even though we've been in these long term relationships and I also sampled a bunch of other family friends anywhere from my husband and me who have been together for thirteen years, to a friend who just got together with his girlfriend and they've been together for about two years and my aunties and uncles who have been married for almost forty years and just how similar the populations are on their and their spouse's faces, I think is really going to be an interesting thing to find out.

Meredith Johnson
Leong and Trautwein are working on other projects with the face mites too, to see what other stories they can tell about us and our evolution. They're traveling to all seven continents studying the relationships between us and our arthropod friends.

Michelle Trautwein
My favorite part of the results we found is just this ability to recreate our history and to think about these mites as creatures that can tell us more about our own selves. So, just that very general finding is exciting to me. The questions that we can ask about these mites seem endless. It just seems like a really amazing system to study, so I'm hoping that with the first few papers that we're getting out that we get other people excited about mites and hopefully build up more of a community of scientists thinking about the types of questions we can answer with these incredible little arachnids.

Meredith Johnson
So when you're washing your face tonight take a minute to consider your invisible friends. Try not to think about how they're slurping up your face oils and reproducing right next to your nose, but instead maybe think about how they connect you to your grandmother and her grandmother all the way back. How they were with us while we were making stone tools and painting the caves at Lascaux. How they were with Lincoln when he gave the Gettysburg Address. How they've been to the moon with Neil Armstrong. Because they've always been with us they're part of us and we can't get rid of them.

Thanks for listening to Origin Stories. Thanks to Michelle Trautwein and Misha Leong for sharing their work. You can learn more about our face mite friends and see pictures, if you dare at leakeyfoundation.org. We'll have the link in the show notes.

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