Tracey Peake ([00:54](https://www.rev.com/transcript-editor/shared/VUNksVEhk7By7Xdjy3jslhyuxGGfKozAuGKXBcY2xQB4ucoLPZxohqSr_hR67qSUB6wTm0qCA0a7ss-uxDQfipiUBYM?loadFrom=DocumentDeeplink&ts=54.9)):

Hello and welcome to NC State's Audio Abstract. I'm your host Tracey Peake. Our guts aren't one size fits all, and they don't work in a vacuum. The microbial communities inside mammalian guts are as varied as we are, and they have enormous impacts on our overall health. Erin McKenney is an assistant professor of Applied Ecology here at NC State, and she is an expert on all things gut. Welcome, Erin.

Erin McKenn ([01:23](https://www.rev.com/transcript-editor/shared/x6UBCuOQ_jJLTdVvObQ8NVcZHHcVVSvwoZRm7F1PUJph8Z2Cj7ytngBi-Qm4m9eFuGIFdUfpQYQQgl6j3GrQKVsIzug?loadFrom=DocumentDeeplink&ts=83.7)):

Hey, Tracey. Thanks for having me.

Tracey Peake ([01:25](https://www.rev.com/transcript-editor/shared/UzcjjoHIF3pFzLtyapRfy8nd0dROh6aoKrhfW9c-OBZ-KLuuCmy_-OTCD_9-57xAzWMp9XUF7aEZwocHtIU628ZZwpk?loadFrom=DocumentDeeplink&ts=85.53)):

I'm glad you could be here. This is kind of a random one, but your work is really interesting and varied. And actually we spoke before during the pandemic on sourdough because of the microbial goings on in those communities. So now we're moving, we're pivoting, as it were to the gut. Why are we studying guts?

Erin McKenn ([01:47](https://www.rev.com/transcript-editor/shared/Rh0H8HbGIPDUnZKxlIroCyGpaOY4tQElEC9zcM5FKSbiZ3poTdQniWe2AG9oZW9ZRbciUpwdFS_3duCvGdf_evEnAf8?loadFrom=DocumentDeeplink&ts=107.49)):

Well, so we all have guts and actually different species have guts that are different shapes. So there's the anatomy inside you is kind of a record keeping of your evolutionary history. Different species have different shaped guts, different lengths of guts that we've evolved over time to digest specific different diets. So if I see a gut and it looks very long and very capacious, if it's a palatial gut, especially if there's a cecum in it, which to me is the wonder pouch, that's what I call a cecum. It's the wonder pouch between the small intestine and the large intestine. If I see a long, roomy gut, especially with a cecum, I know this is an animal that eats a lot of fibrous, difficult to digest, plant matter, and depends a lot on microbes to digest those food components. If I see a very simple gut, I know, oh, it's easy to digest.

([02:52](https://www.rev.com/transcript-editor/shared/ajY_rhlLg1gGgqAcP7NqDPZ_7LrrAVyynde_mHIiWZ0Ri5HUi60XvmKUaQTThwZjD1pPKdGwDEMIiWxoauvi8iPuBnI?loadFrom=DocumentDeeplink&ts=172.02)):

So the gut itself is kind of a record keeper of the evolutionary history and the feeding strategies that animal uses. And then the microbes tell me a story of variation. How much variability there is between animals within the same species. Tells me a story about regulation. How important is it that very specific members of the microbial community are present for their digestive abilities or for the compounds that they produce that can really impact that animal's health?

So that story of variation and membership can tell us a lot about how important, how specific the microbiome is to help the particular animals or individuals digest their food.

Tracey Peake ([04:15](https://www.rev.com/transcript-editor/shared/fczj_viLDeYpCJWIpCRAEpdeDy07wYRiGDLGZoSkbDLJHJ5Lx2ysqUPch-W28L3MrMTa7Szz2VhXMQ8boJpUP42pCm0?loadFrom=DocumentDeeplink&ts=255.9)):

Okay. And so I like the palatial gut thing. I enjoy that very much.

Erin McKenn ([04:20](https://www.rev.com/transcript-editor/shared/57mIeAF_M7TKtrCwKfXUkarCDJnGahLW1GBfa1cyMQ_fauyIYvAVKQ-W3NK9hcjah0cswH6pPuevDVclmNfB5eDNh9I?loadFrom=DocumentDeeplink&ts=260.13)):

Mind palace, gut palace.

Tracey Peake ([04:21](https://www.rev.com/transcript-editor/shared/MVy9mVG_VJqLLPPN1n4sv9Npmb_2V3D4dOCK8WrzqVyzYm1Cm846nE4HfkEX688ERIu14vgKaks-LRgI0t38heNCtwk?loadFrom=DocumentDeeplink&ts=261.63)):

Gut palace. Well, and it's interesting that you bring up mind too, because the gut has been referred to as sort of the second brain of the body, and we know that it's a lot more important to our health than we thought before.

Erin McKenn ([04:34](https://www.rev.com/transcript-editor/shared/D1zG77yQsgCBTklDSjTpDexZQpfK2GJjHiwPuvY6JygA1tIMwHbk8YiiFyi0ukWuJJkIcc9R3OOIDd40-JlLtyO258Q?loadFrom=DocumentDeeplink&ts=274.41)):

It's our primary interface with the world.

Tracey Peake ([04:37](https://www.rev.com/transcript-editor/shared/pR0YXqV9euLFLuozOkvH2qIVxJqDBbxXe0gjgIdr9c1vxZZuHwNNwn0FqKJoS7Sm2jWxvNbjv3_GyC0izJn6Ejw8Kxo?loadFrom=DocumentDeeplink&ts=277.32)):

Okay.

Erin McKenn ([04:37](https://www.rev.com/transcript-editor/shared/7KdHjogaU2_WWINYt3bb9FfJ12k9zYdMTNE0Pw7ziJIEgwQbLJhcNrlotqPxwzdn5rBzqDpgxdwl8xUTYOxL2ifgcwk?loadFrom=DocumentDeeplink&ts=277.59)):

We think about your skin, like I'm touching everything. Yeah, okay but my gut is lined with immune cells every time I put something in my mouth. And for toddlers, that's much more varied than adults, but every time you put something in your mouth, you're sampling the world around you. So your gut is lined with immune cells in part because your body, your immune system is trying to learn about the world around you in ways that your skin cannot tell you. Your skin is a barrier. It's a membrane. It keeps you from dehydrating. We have cornified skin cells on the surface. It is tough. Your gut is not tough. And so it's your primary interface with the nutritional landscape, what foods are available, but also with microbes and pollen and everything that makes the world, the world.

Tracey Peake ([05:35](https://www.rev.com/transcript-editor/shared/B4NLhlNzSXb4AxefqQxGLXucMh6xLQrZTlN7X_SUFfswZVL5-UCIF8L-d1bDFZbzNN1aW1Rkf-7-heXMo6z8C7NfrKY?loadFrom=DocumentDeeplink&ts=335.22)):

Wow. I've never thought of it that way. I'm very glad to know that. That makes me feel good. It also makes me feel kind of depressed about my subpar breakfast this morning. I'm not sampling the world in the way that I should be doing it.

Erin McKenn ([05:46](https://www.rev.com/transcript-editor/shared/I21_a9CAh8VQOqSnDETPDt3awJuSUAmGlVylzjG1orcqo20V1S1TmHJHQ4htsnaZfgQGlYPGFMWeyaedhMh9U3JZiYM?loadFrom=DocumentDeeplink&ts=346.41)):

It's knowledge for potential future empowerment.

Tracey Peake ([05:49](https://www.rev.com/transcript-editor/shared/kVI7XQWfsRWIOv--O90PVY5wqus-cu7jFCqW4JvjTXL5DHdm-tMuV3_HL6ao00ofeRbNCVjYSSzEp8vA6dr0V7ecdaM?loadFrom=DocumentDeeplink&ts=349.23)):

There we go. I will be empowered in the future when I choose my breakfast. But you've worked with a lot of different species of animals. You've done work with gorilla guts and bear guts and rhino guts and all the microbiomes going on. Have you found any common threads among these species? Because you're talking about how it's very diet specific, diet driven, and is there anything about the animal microbiomes that you're studying that could be relevant to human health as well, or humans?

Erin McKenn ([06:23](https://www.rev.com/transcript-editor/shared/YQ3NLCZC9ftHAl-k51SVkFzz9gEdbgE4nn2dmpq3Uaz98qQCEsyHayMPHrqvg_rCMEGAe3l64Q5QLs5gFWiLcW8TLi4?loadFrom=DocumentDeeplink&ts=383.4)):

Absolutely. So some common themes, I would say, are the microbiome gives us some insights to how these animals are navigating the world and their evolutionary history, and also the resources that they need and how they utilize those resources. The microbes can also tell us about consequences of changing resources. So for wildlife, this becomes a big question or a potential for informing conservation management and managing wild populations, whether they are facing endangerment or not. All of those animals in the wild, as are we humans, we're all living in a changing world and increasingly changing world. So how is a black bear guts gut microbiome setting it up to succeed or to struggle in the future as resources change, as climate changes? For southern white rhinoceros or for gorillas, similarly, how are their gut microbiomes finely tuned and adapted to their specific current feeding strategies and what does that mean for them in the future? If you are an herbivore, then you have a specialized gut microbiome. So you might have less wiggle room or less adaptive flexibility compared to an American black bear that has a short garden hose gut.

Tracey Peake ([07:57](https://www.rev.com/transcript-editor/shared/87gWDWeUSllXUa4eO5YrcOEvK7PRI8Weqp60enKIFtpk9vA5HqHZykwZFSIXiciQNKywqaDzjDnvaVJGB2GiYh1ieyQ?loadFrom=DocumentDeeplink&ts=477.33)):

Say that three times fast, right?

Erin McKenn ([07:58](https://www.rev.com/transcript-editor/shared/Iq1GF9LTwwWUsqDHqf38SJfSsOaZd8v1uykXDeX-9zgU4eHeM1tYSP1vQVH5WyyhM23qYgMNO8gHAS4jOu__IJoszME?loadFrom=DocumentDeeplink&ts=478.8)):

Yeah, I know. Tongue twister, gut twister, but not a gut twister because it's so short and simple. So there's a ton of variability and they're eating highly diverse foods. So with all of that variety, they may have better odds at being able to adapt to pivot in a world of changing nutritional landscapes.

Tracey Peake ([08:21](https://www.rev.com/transcript-editor/shared/6VQOF2C8cBiONswlsB6iQ4Bf995N5bdSOPdTGA6EEr6rwDSLZuKP3kUJUkyXrI7ChQyDyoRMDWqdT5yo2sSbV1vAxN4?loadFrom=DocumentDeeplink&ts=501.96)):

How will the black bear survive?

Erin McKenn ([08:23](https://www.rev.com/transcript-editor/shared/vG_2qXE0RFySA36BbXUHeYnAq4-N5RwR9D6PA0ndQGSuixM5VY7MSElexERGyG_1VVX6Ss8Aw8O8qdNIaJ9Pjq5lCKQ?loadFrom=DocumentDeeplink&ts=503.85)):

Right. Well, especially if they're dumpster diving or if they live in a state where hunters are allowed to bait with more or less processed foods. What does it mean when a black bear eats a Hostess snack cake or a block of cheese or a handful of Skittles and sardines or salting crackers? These are all bait items that are used in some states and that are banned in other states. So what does that mean? So it's not only for those problematic human wildlife interactions, those host behaviors, it also has repercussions and ramifications for the gut microbiome and for the bear's future abilities to pivot and take advantage of different food items.

Tracey Peake ([09:42](https://www.rev.com/transcript-editor/shared/WAPZMz1OuGYQytxxUfJLR_J_8EIQpKzSYFrpCqQnIgIWVqi8H0V-r2I3weGI6vI4QoQx_yaBEM-t2HI8UaOnNyIWxqU?loadFrom=DocumentDeeplink&ts=582.15)):

But all of this is really fascinating, and it would also be helpful to people who are doing preservation work because they know they need to include specific elements for these animals' diets. Are these animals adaptable? So if you had a white rhino, for example, which is an endangered species and we're trying to preserve and conserve and bring it back, do you have to always have that very specific diet that they would have in the wild, or can you wean them off of that, change it for them so that if we did get sufficient population to send them back into the wild, they'd be able to survive on what's there now.

Erin McKenn ([10:46](https://www.rev.com/transcript-editor/shared/XVG62So9WR5NSMzBDIUFVXo-6IWKsfVzbu_JT8c4PBpO9Lqz-6fRGQrKHlqXjU5UubNujsY4braL4lRldLsS3xNfpAY?loadFrom=DocumentDeeplink&ts=646.02)):

That's a great question, and that is a concept that's related to a lot of populations under human management, under human care, like at zoos. So because at zoos, if you go to see rhinos in Asheboro, North Carolina, they're obviously not rhinos in Africa, right? They are not a wild population. And in North Carolina, we are very fortunate to have a warm climate, warm enough that we can grow a lot of browse items, a lot of natural plants, and the North Carolina Zoo, just as a brief tangent, biggest zoo in the world. So you actually have the acreage for these animals to be interacting with a natural environment and to be truly exhibiting some of those natural behaviors. However, the plants that we have in Asheboro North Carolina on exhibit are not the same species, nor do they have the exact same nutritional composition or produce some of the same plant compounds as the species that rhinos have evolved to consume in their wild ranges.

If we are trying to keep these animals under human management, what foods can we feed them? And ideally we want to feed them foods that are commercially available so that they will be available in a plentiful supply. You don't want to get them accustomed to one species of plant and then have to change them again because they're out of stock or out of season or supply chain issues. So we're already playing those calculated translational games. What do I feed a rhino in captivity to keep them healthy? How much romaine lettuce do they need to satisfy certain requirements? Do I then give them some kale? Can I get ahold of some other perhaps non-agricultural crop?

([13:06](https://www.rev.com/transcript-editor/shared/dkwwL9QFhvQa3DCdlTNPJWndeRnKwijHuXsADPps21dbWvRpMSBpC5VSE8hW97i3irSlQeNf8WGgtP03PkbqVKWoVJQ?loadFrom=DocumentDeeplink&ts=786.24)):

Are there other plants? Are there trees that we can harvest leaves from? And what would those be that will provide surely the fiber, but also vitamin content. Also, those secondary plant compounds. So depending what compounds are present in the plants, it can prevent health issues or it might actually cause health issues because it would change sort of the microbial. Not just the microbial processes, but it also changes what nutrients are available. And either tannins in plants actually bind proteins and a lot of trace minerals. The plant doesn't want to be eaten.

([13:55](https://www.rev.com/transcript-editor/shared/oQG_ma4W4zhUMYAgla4Ow5Hqwxz2tzMU9TZ39T_ovn824MXvW5-RE3RDOhwmweDD9yxINyek9bj4WNHq0pUHS97afx8?loadFrom=DocumentDeeplink&ts=835.2)):

But if you can't prevent herbivory in the current generation, you can bind all those nutrients and kind of starve out the next generation of herbivores. Right. So this-

Tracey Peake ([14:05](https://www.rev.com/transcript-editor/shared/1Q-oKxk0cryj3jeYVWM3ZxnhwLhhJ24fWp3Q3omOFr39kK-cM15TgZqzTIyAEZyjWNfq3MeMO8aCzwKTmAQEgHbNxJg?loadFrom=DocumentDeeplink&ts=845.52)):

Plants are mean.

Erin McKenn ([14:07](https://www.rev.com/transcript-editor/shared/AHLHXwKbRbUT0mVUaFqE-75XTmm7lcZ0GkwUv4Y995SoVIgbCS7ndB918GPUAvtDyzzrIVQqfpdE76KBbPL-1KdAADw?loadFrom=DocumentDeeplink&ts=847.23)):

Plants are strategic, and I don't want to be eaten either. I get it.

Tracey Peake ([14:11](https://www.rev.com/transcript-editor/shared/lHkTF65knj-8FrDPgkRS0aIYIz4xxdQReTgtFt1XFTaN_7Y1Kh2owbQfkrFiNvlFvxcDP7RiQUNnIUDoPrwtmRG5iNI?loadFrom=DocumentDeeplink&ts=851.25)):

I get it.

Erin McKenn ([14:11](https://www.rev.com/transcript-editor/shared/cWPp7J_NH3-LMhLMIRe-Zlvr_Ku8NRp2Ly7EsfWc4wNT1cNplfOve7dcvB-HSjHik_CuZlgPiG4erbXlz0m6a3WxajA?loadFrom=DocumentDeeplink&ts=851.7)):

Plants are mean.

Tracey Peake ([14:12](https://www.rev.com/transcript-editor/shared/W3hmw2GvpxPmTGnR4hiJHdcfFgRMziga0QSYepw0ULNnudh3Var_HpUAG2_ShABVxrPsDOuSdL-IOMUGxtd6BpQIqJw?loadFrom=DocumentDeeplink&ts=852.81)):

Mean plants can't kill off the rhinos plant. That's mean.

Erin McKenn ([14:16](https://www.rev.com/transcript-editor/shared/73I0pTjIA_j8n-3w3pMBhnkdHtkwcNc8gHAl2_D1YfAofbNR_E_ctM_rdC7LAfKO_l3LD2r53Og2lsvfaiG4jVQ5qXQ?loadFrom=DocumentDeeplink&ts=856.17)):

So all that to say, zoos are already acclimating populations of exotic species to a variety of different plants and different food items. So I think it is possible for the wild populations to adapt as long as the change doesn't occur so quickly that all of the current food dies out before the next plant can take over.

([14:50](https://www.rev.com/transcript-editor/shared/pXNIRvsr3GQoKoeCCI0-wZBfcm25fy6ksdxjKpdi_KqhhqD2LrMtBkXzY_tt0jjbLvtluvzMvLFozdhVbEYZb1eZGX4?loadFrom=DocumentDeeplink&ts=890.34)):

When change progresses at a faster rate than animal and plant species can evolve and adapt, that's when we all run into trouble. That's when we have mass extinctions.

Tracey Peake ([15:00](https://www.rev.com/transcript-editor/shared/7TCqZafcpWIjR33DmXWqXpCTrxv9nz5Trccg1LyWuutLjUcbjFfqEu-E0aN65O03Y8JhixyTKU7mrIEDFv_qp8p_qHw?loadFrom=DocumentDeeplink&ts=900.96)):

Yes, absolutely. Well, what are you hopeful that other researchers can take away from the work you're doing?

Erin McKenn ([15:25](https://www.rev.com/transcript-editor/shared/wgurZAs-3khAfdgevguNkesxyNQcNMtHdr0aDEAjCH-r_1ZXL_yu7v0iQxUVeTs5hDI8kHCa9XML7VhXG6iPQIwNtb8?loadFrom=DocumentDeeplink&ts=925.62)):

I think for wildlife populations, we could help inform management agents, folks in departments of natural resources across the country if they are working with specific populations. And using the black bear example here in North Carolina, the Asheville population of black bears is in a unique context compared to the Eastern North Carolina Black Bears of Hyde and Terrell counties. There are differences in what agricultural crops are grown nearby. There are differences in what natural resources that are not provided by humans or nearby. If we compare North Carolina to Michigan or other states with different hunting policies, what types of foods, how processed can those foods be that we use for baits? What is the impact of a Hostess snack cake versus trail mix on the gut microbiome?

We noted a dramatic and statistically significant decrease in microbial diversity in bears consuming more processed foods, particularly more corn." What does that mean in a world where corn is everywhere.

Tracey Peake ([17:03](https://www.rev.com/transcript-editor/shared/MGlirhAapUg9pZ15vxPxzR5FhgJuC3ImDU4MlE9UIgAGSrW7RFBbfNRGyGncTg-qwLz9PSMXDqKrczoTDorE53Nq0sA?loadFrom=DocumentDeeplink&ts=1023.51)):

Corn is everywhere, plants are mean, and corn is everywhere.

Erin McKenn ([17:08](https://www.rev.com/transcript-editor/shared/U-EWsi-0LvWPm4J4LIx15ONpijy5DPwJs3B_NmjEN6U-gUlYMzD3E3vO7t7ZAsVfuHun7v-0KxVREGvi9v7cpT6Xfyc?loadFrom=DocumentDeeplink&ts=1028.52)):

The taglines take place. Things you didn't know you would learn from the gut microbiome. So there are opportunities for reflection on our own health, the consequences of our own navigating the nutritional landscape, especially in a world of complex and very processed foods. So I think there are opportunities to kind of look in the mirror, and think "Oh."

Erin McKenn ([17:42](https://www.rev.com/transcript-editor/shared/FP86D_UFbZHhzu3tPNqm-P-gczRJqVjAzU5eWsv0FLlpyvrdaN_ueN9SC_1EpNVp2XSNv7GsjsR0PTu_RTu1KoZqIXc?loadFrom=DocumentDeeplink&ts=1062.48)):

And something that I've really loved about studying carnivores in general is that we found so many surprising things in some of the first studies. And in working with students, I bring a lot of this research into the classroom so that I can teach my students how to analyze data, which is scary for them. But I love using or bringing in carnivore microbiome data sets for the students to study because there is so much variation. What does that mean about bare gut microbiomes? It means there's so much variation that we don't get a clear cut significant or strong signal of diet differences or of sex differences or of gut site. What does that mean?

([19:47](https://www.rev.com/transcript-editor/shared/TBl_imYVDqNGe2sYo0LKQxsU6xc4uHffRFB86IoYrUOyyQn0qZozGCv-hLq-0yKfw0lXd20ff9ZyQerWOaqlbcTHMh8?loadFrom=DocumentDeeplink&ts=1187.61)):

To me, that is so cool because most of the research that we know from herbivores and omnivores is that gut sites are very different from one another and physiologically, because we digest different foods and different nutrients at those different gut sites. So naturally, the microbiomes associated with those different gut sites have adapted to those unique physiological conditions. So we expect to see significant differences between the stomach, the small intestine, the large intestine, when you don't see any difference, what does that mean about bears? There's just so much variation that even though you're digesting different macronutrients there, it's in and out so quickly. The body has no time to regulate. The microbiome has no time to adjust or adapt or specialize to those specific environmental conditions. It's in and out.

Tracey Peake ([20:44](https://www.rev.com/transcript-editor/shared/olcEypbdjl3OKQ6By0cwCWYi4l7icPBtL_f3eVRiRyauti3bHuI0SURRujs8hmtmlaXMXw8DYDdD3HUsdRGK3zn9Q8Y?loadFrom=DocumentDeeplink&ts=1244.37)):

So does that mean that bears are just going to survive forever?

Erin McKenn ([20:47](https://www.rev.com/transcript-editor/shared/lMAgov4CWcj2ce2sAhzyN10Up8mbIFNLMgfP-gYT3SgaCi-QTFTxoYKcJmZ72KUFcAMY1NlwRqvjBsEsQ0xQG6zzwYs?loadFrom=DocumentDeeplink&ts=1247.61)):

I hope so.

Erin McKenn ([21:00](https://www.rev.com/transcript-editor/shared/kLz5JVRL86rLuG6GXryRJq3GzzP4S4Lpd3h_6ZiQXC0Jyb2u8Lt67GnNxxDBPd4Kavawq4iXplhx2g1fXv8q2Kum-QM?loadFrom=DocumentDeeplink&ts=1260.99)):

Leaf eating lemurs, Sifakas have such long guts that if you feed them fruit, if they get ahold of a piece of fruit, it will ferment and rot inside them and it could kill them.

Tracey Peake ([21:12](https://www.rev.com/transcript-editor/shared/PAyC63ak9sqhyt3FwkdIp6k_TSEAHpOLEAL25EJY99lxaM2bSewcZ-29cSTLHMNeqmcU4tEm34Oezqygp9bJbrL4VPI?loadFrom=DocumentDeeplink&ts=1272.06)):

Oh, wow.

Erin McKenn ([21:12](https://www.rev.com/transcript-editor/shared/vq-wbf0bubtyWYPBoGoEtsMQplGuf2yjKS0SSsrugbq_Eq0XAEHFYaPmyGHqYWJScLuPVn59S4P69Ph-YE0x13xCFX8?loadFrom=DocumentDeeplink&ts=1272.81)):

Right. So in some cases, exploring new dietary potential new feeding strategies could be detrimental. It could be deadly. So that helps us to think about which species are most at risk in a world of changing resources.

Tracey Peake ([21:32](https://www.rev.com/transcript-editor/shared/vRylfVGdgjHJybsjZxcsiRL6jGB9i05iH6KqyBGWWE7jS79hz1Hb-tlWZMVqT1dvDdAj905XA-YoEL9KW_dn-U-KNek?loadFrom=DocumentDeeplink&ts=1292.22)):

Wow. Well, and that kind of leads me into sort of my final question that I always ask everybody, which is, what is the one coolest factoid or the coolest thing that you did? It could be a thing that you found, it could be an experience you had while doing this research. It's a hard question.

Erin McKenn ([21:51](https://www.rev.com/transcript-editor/shared/DlzeNx0rBuN4xgilQ3_CELRHNyByx3i_AlA3CJCl0AfvOU5mZ2cwIYc0T113mSbQeg67ZIefs3ilfTCV5p7TabXEnZs?loadFrom=DocumentDeeplink&ts=1311.75)):

That is tough.

Tracey Peake ([21:53](https://www.rev.com/transcript-editor/shared/fjfXI2-ovG0QrSPWYdNFR9vdIO2ttUqzkX7qPtJsHq-Pjbdmrtq2cTt3tIEfR7hvJTiLcmnqjmWRXhCzsUWiJvRmqQ8?loadFrom=DocumentDeeplink&ts=1313.61)):

It's a hard question.

Erin McKenn ([21:54](https://www.rev.com/transcript-editor/shared/RKr16FfJQlGgYiVW9HabiuxjX_ssHHqwCfGabDbpbMvp4OSglHEWnHp6L2oq7DVg2eTivQge8G7kzjlVyVPH-IALqjc?loadFrom=DocumentDeeplink&ts=1314.12)):

I know. I should have studied up for this.

Erin McKenn ([22:02](https://www.rev.com/transcript-editor/shared/MypfzTXkW8AzL7XEMBtgmU-BVg3xcO755NIRM3FfdFopzIgfoAVTKuVxnFvDtKG2CHP7clBocV-Ahmbr6K6CH4uE0FA?loadFrom=DocumentDeeplink&ts=1322.55)):

So I'm actually going to shift from the gut microbiomes, because to me, the poop and guts always amazing, and I always love studying the gut microbiomes in these microbial communities. There are so many opportunities to say, "Wow, check your hubris at the door. It was never about us and what we thought we could control. It's about the microbes. Duh." They don't care about us. They care about what they can digest. But stepping outside of that microbial focus, I did get an amazing opportunity in 2017 and 2018 to measure the guts of 45 human cadavers at the Duke Anatomy Labs. They were part of the anatomical gifts program. So these people had donated their bodies to science.

Tracey Peake ([22:58](https://www.rev.com/transcript-editor/shared/_wqSZc-mzJi34n4Us4vw8NrpDJ6nhzfTNKZ-2fRmnccqG2osqPdYmkcs8gP4efjqJ6nj5bDN1sG18Q72vYLX58GnbL0?loadFrom=DocumentDeeplink&ts=1378.11)):

Right. I'm just curious, not about how people donate their bodies to science. I read, was it Stiff?

Erin McKenn ([23:04](https://www.rev.com/transcript-editor/shared/imsSiBdlPf8bephsT3O4HkpB_ltXOsW-DiEPNmyQ2BXN86zDba5bWIteGZqpJRN8_UKAvGNmWkhk2rwRS0NwWNQCiyc?loadFrom=DocumentDeeplink&ts=1384.59)):

Oh yeah, yeah.

Tracey Peake ([23:05](https://www.rev.com/transcript-editor/shared/3-XWyknfZ43J36jvl_iJglJZyH_Vs2SK3UCZcHPLIplqoAxE50AEUzcrQtjq6WYVnCg_fci_O8DWUgAGFkQBHrIyB_E?loadFrom=DocumentDeeplink&ts=1385.37)):

Okay, but no, I'm just curious as to how an opportunity to measure guts comes up.

Erin McKenn ([23:12](https://www.rev.com/transcript-editor/shared/PH0LTp9ubyMhf5_qx04A2VcPPqWrqBfm14ZwWrYzLgDgQcB2pGuLjgfJZfvBJA4ln0slEtCvzVq-7ifv0s0rHzYO9fo?loadFrom=DocumentDeeplink&ts=1392.9)):

Yeah, this is kind of a perfect example of networking and how things just fall into place if you're open to talking to a lot of different people. And if you know good people, fun people. So let's see...

Tracey Peake ([23:32](https://www.rev.com/transcript-editor/shared/z445FGvQpzHOowWb3RKS8w0gPu9fLeWrYHGYDY7yii_3XHTyAYgxwWJ0j0UlCeFwjUslGILgacJDJUEykHSIbiZE8h8?loadFrom=DocumentDeeplink&ts=1412.82)):

Good people.

Erin McKenn ([23:33](https://www.rev.com/transcript-editor/shared/mKw1Sob2pxQI_4qWID23zG8hO3yUZRluqicb2JJLCGKTwl4qM1xjPFchHeruAXaOxlH5qPF-UHsbFX81G8C_XYPi7ko?loadFrom=DocumentDeeplink&ts=1413.9)):

So after I got my doctorate studying lemur, gut microbiomes at Duke University where I met Roxanne Larsen. Roxy is awesome in her own right. And we had of course kept up because I have trouble leaving people behind. So after my doctoral dissertation defense, I was moving on to a postdoc working with Rob Dunn at NC State in Applied Ecology. And he had worked with Amanda Hale, who is a doctoral candidate in biology.

So she's figuring out how or why people might've died, or how does variation in our skeleton correspond to different traits or different life experiences? So Rob and Amanda had worked together to figure out this we don't think about guts being different. How much diversity is there in guts? They're inside us, and yet we all have a gut. So how could we even measure that?

So Amanda worked with Colleen Grant in the biology department to revamp their dissection labs and come up with a protocol. "Hey, students, as you are dissecting this cat or rat or pigeon or frog or whatever, don't just find the landmarks because that's a little boring. Where are the kidneys? Where's the esophagus? Where's the gallbladder? How about you also measure the size of it?" So that's awesome. We have this comparative animal aspect. But the dream that was not yet realized when I entered Rob's lab was the human component, because who has access to humans? Well, so I had defended my dissertation. I'm having a cider with Roxy celebrating my successful defense.

And Roxy mentions that she's on the education design team for the Duke Anatomy labs, and I'm like "Wait, like human corpses." And she's like, "Yeah, you seem very excited right now." I said, "Well, could we come measure the guts of those cadavers after your students are done dissecting? And she said, "Yeah, let's talk." And it happened. So we were able to go measure the guts of 45 different people.

Tracey Peake ([27:17](https://www.rev.com/transcript-editor/shared/p8j99bz25lP6u_RgLSgvrIfBR-j9sH2lBPMPjHLdjkqHMDzcEvqRnHFyUrT4GaBNp4Ph6LrSxn0Gfa7T-86XCx2xhjE?loadFrom=DocumentDeeplink&ts=1637.37)):

And are they standard?

Erin McKenn ([27:19](https://www.rev.com/transcript-editor/shared/ftkuYv8dlDXpcJvy6XFkRL76_eAI4mSy7Y20WlJnKn7zfyWoqHK8HQlbnxZX0ivYHaYZW2h35p_NJSZ2jb2RiXsA78U?loadFrom=DocumentDeeplink&ts=1639.89)):

It is just completely different. Based on what we found the three of us in this room probably have different guts, and that has huge ramifications. When we think about the gut, it's a representative diagram usually drawn from a textbook. The placement, not just the positioning might be very different, but also the size, the length of these different parts. I almost missed one guy's appendix completely because it was growing off the back of the cecum, not off the front. Somebody else we found a 10 centimeter long appendix. That's really long for a human, we think according to the standardized diagrams.

So another, a woman had just a huge cecum. I was very envious of her cecum. So the standard would be the little coin purse, two inches across maybe. This woman's was a clutch bag, which of course, now there needs to be a sideline of purses that are actually modeled after guts of different species, just saying, school of design I'm coming for you. Future projects. But this woman had this truly a palatial cecum. And I'm like, "You had so many different microbes there, and they were so happy in that little oxbow lake, and they had so much time to do the fermentation." Amazing. Amazing.

Tracey Peake ([28:52](https://www.rev.com/transcript-editor/shared/znJON6qKJFUamAVLos7cgBha8fpjRzBHDLWYR2y5QglK-PH7o5_dc8U9uw4XPaVNlczTItczQRvieOukzeZf7AoyRzU?loadFrom=DocumentDeeplink&ts=1732.92)):

Wow. And I know you don't have this data, but was there anything to lead you to think that maybe the difference in cecum size or gut size correlated to the diets they ate? I'm sure when you donate your body to science, you don't also give them like a nutritional history, and it's too late to look at the contents of the gut to figure out if the microbes are different.

Erin McKenn ([29:18](https://www.rev.com/transcript-editor/shared/TfxJhvaTrrC3X_czv09CvLwF5MZaBtfXtpFPjMQ6H4x3WTJsaLnOQ3mgNESD1J0_wOLR09Oln8O1u9-8LJQQb1bN-zE?loadFrom=DocumentDeeplink&ts=1758.06)):

Yeah. So we do know from other previous studies that fiber is fermented by microbes to produce short chain fatty acids, acetate, propionate and butyrate. Butyrate in particular, not only is it very important for anti-inflammatory properties, so it can actually prevent the development of cancer, very exciting. But also butyrate early in life stimulates the development of the gut. So butyrate, based on what we know about butyrate as being very important for triggering the development of the gut and making it more complex, I would speculate, I might hypothesize that people with really glorious palatial guts, especially if we took a look at those villi and micro villi, the surface area, that those more complex guts might be associated with more fiber consumption, perhaps.

Tracey Peake ([31:13](https://www.rev.com/transcript-editor/shared/lYbya1BiTjuxz4E-2WFkreOW9bWeIogWWNqUu2UTxEWl8Ktlj8UkIraxuu27DY3-InfyMyCXnhKCqnldX_2i4e-nSPo?loadFrom=DocumentDeeplink&ts=1873.23)):

Okay. Well, that's fascinating to know. Also, eat your fiber.

Erin McKenn ([31:16](https://www.rev.com/transcript-editor/shared/3WuaEv4KPUH1uWhAhdoS9YK4EMrGQ6i9dhDvkk-ytLViEBlU6qda9l3iiqRGgRAXfxwKAU7CSK54GCrCELZVFRGhMc0?loadFrom=DocumentDeeplink&ts=1876.05)):

Yes.

Tracey Peake ([31:16](https://www.rev.com/transcript-editor/shared/1iuLZiWSWRlEmMkVNo5U48eFyPf8cD-UwGbHckR-RE7m3egb3aI6a_5VA5ZZVKbj8Q6qxyHvdZqvKTvlEsCvTXSmIdQ?loadFrom=DocumentDeeplink&ts=1876.53)):

Yes.

Erin McKenn ([31:18](https://www.rev.com/transcript-editor/shared/QBlMgQOcoVwoY3x1XOKzrRPBDt7futwxO-mcWcr-hqBbGDyj7i1PSpWQmoRaSMgi1-PwL7tXTrhUz3jLJni_tbl_KCM?loadFrom=DocumentDeeplink&ts=1878.69)):

What they've been saying is true all along.

Tracey Peake ([31:20](https://www.rev.com/transcript-editor/shared/6UYedrfyZwoUKRRjbvOcYMAXV33n_uzHXHCyt6cA8cUx14W64AGt6Jxk6Hqib5NHhlc-4egM4-N5qge38pnn19NT4ms?loadFrom=DocumentDeeplink&ts=1880.52)):

It's been true forever.

Erin McKenn ([31:22](https://www.rev.com/transcript-editor/shared/jEC__EClFuH2V2azocp244ziJFPkKldf4XK1uXyFCdPcdJXFyjb3gFbIdxjO_dmQNXX-ctBHnhYx7k4t09mIfxQUopg?loadFrom=DocumentDeeplink&ts=1882.02)):

Just maybe more deeply than we could have imagined.

Tracey Peake ([31:24](https://www.rev.com/transcript-editor/shared/SwEEzGsj1cLOc25cG0DHHf_gW48zZDLBavR72bNWzOeQluPA5N77kN8tcOwJ8xeFft-BpHpeHOjbsiwikiK86d7MHes?loadFrom=DocumentDeeplink&ts=1884.45)):

Okay. Well, thank you so much for being here today, Erin. This has been very fascinating. I have learned a lot more about guts and bears, and people had six degrees of academic separation from cadavers than I thought I would. But yeah, thank you so much. It's been great.

Erin McKenn ([31:44](https://www.rev.com/transcript-editor/shared/OxYNT_Yt5F_UxjPv5NkLMIK7RgB4baURX0-ilLSXZkYSoU0wONuNY3FLt66as-cKndBSCMsckICfBz5KTFc-laChghY?loadFrom=DocumentDeeplink&ts=1904.37)):

Absolutely. Thanks for having me.

Tracey Peake ([31:46](https://www.rev.com/transcript-editor/shared/8XQsY7nePRzxlRhUf0TNJWYVVWws_fMW6_CPxMxp-BVLrpUOSYNo0IKFxwWC4pqeI_9EfVAn9NsauFPLemJWggcGcQQ?loadFrom=DocumentDeeplink&ts=1906.68)):

We have been speaking today with Erin McKenney, an assistant professor of Applied Ecology here at NC State. This has been audio abstract. I'm your host, Tracey Peak. Thank you so much for listening.