



Science Magazine Podcast Transcript, 24 May 2013

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Promo

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Music

Interviewer – Kerry Klein

Finally today, I’m Kerry Klein, and I’m here with online news editor, David Grimm, who’s going to give us a rundown of some of the recent stories from our online daily news site. So Dave, in our first story, we’re talking about friendly viruses. As we learn more about our microbiome, we learn that bacteria can be both friends and foes, and now a new study tells us that the same might be true for viruses.

Interviewee – David Grimm

Right, Kerry. This microbiome is the population of bacteria that we have on our body. Recent studies have shown this bacteria can actually be very helpful. For example, one recent study showed that the bacteria on our face can actually help prevent acne. And researchers have shown that bacteria in our guts can actually help us potentially even lose weight. But nobody’s really looked at the viruses that live on us, and there are actually a lot of viruses that live on us as well. Viruses tend to inhabit mucus, and mucus is, of course, the slimy substance. It coats the inside of our mouths, our nose, eyelids, and our digestive tract. It’s got bacteria in it, and this new study reveals that it actually has a lot of phages in it too. And phages are basically viruses that invade and kill bacteria.

Interviewer – Kerry Klein

So what are these phages in this mucus doing?

Interviewee – David Grimm

Well, that’s what the researchers set out to figure out, and what they found was they grew human lung tissue in the lab. And lungs are one of the body’s surfaces that are protected by mucus in humans, and the researchers had *E. coli*, which can be a very dangerous bacterium, invade this lung tissue. And what they found was that the lung tissue that didn’t have a protective coating of mucus that also contained phages in it fared a lot worse than the lung tissue that had mucus but did have phages in it, which suggests that the phages are critical for fighting off these harmful bacteria.

Interviewer – Kerry Klein

So the mucus itself may not actually be as protective as the phages that it carries.

Interviewee – David Grimm

Right, exactly. The mucus probably has a protective aspect, but it’s really these phages that are inside the mucus that are helping to defend us. And what’s really interesting is

we're obviously not the only animal that has mucus. There's a lot of creatures on Earth that have mucus – worms and corals, for example. And the researchers found when they looked at the mucus of a lot of these species, they were finding phages in them, which suggests that phages actually may play an important part in a, sort of, immune system for a lot of species on Earth.

Interviewer – Kerry Klein

So it sounds like this could really provide a lot of insight into diseases that affect mucosal membranes, like the lungs, the bowels, things like that.

Interviewee – David Grimm

Exactly. And actually one of the diseases mentioned in this article is inflammatory bowel disease. And we know we have this ecosystem of hundreds of bacterial species in our gut, but patients with IBD have a disrupted ecosystem with different dominant species. It's possible that the phages are actually playing a role in this – that viruses are attacking certain bacteria and not attacking others. And one way to combat IBD may not be to focus on the bacteria but actually to focus on some of the viruses that live in our guts.

Interviewer – Kerry Klein

And in our next story, we're talking about how Neandertal mothers cared for their young. Ancient teeth from our ancestors have been extremely useful in learning about how they lived, and now we're even learning about how baby Neandertals may have been fed.

Interviewee – David Grimm

That's right, Kerry. Teeth can actually tell us a lot of stuff. The simple morphology of teeth can reveal what species they came from, what kind of diets they had. But nobody's really looked out how teeth can actually shed light on breastfeeding behavior. And the reason teeth can even shed light on this in the first place is because you can sort of think of teeth as tree rings, in a sense. Every day they lay down layers of dentine and enamel. And this dentine and enamel actually contains traces of a chemical called barium, which is an element similar to calcium. And it's present in water sources and main types of soil. It's also present in high levels in breast milk, so you can imagine when a baby is breastfeeding, there's going to be a lot of layers containing high levels of barium in those very early rings of the teeth because the baby is drinking a lot of breast milk. But when the baby is weaned off the breast milk, you're going to have less barium because there's going to be less barium in their diet. We know that's the case for humans, and the question in this study is how can we take that knowledge and apply it to other animals, and even potentially Neandertals, to figure out how other species practice their weaning behavior.

Interviewer – Kerry Klein

Can breast milk be distinguished from other kinds of milk and other sources of calcium in our diet?

Interviewee – David Grimm

Well, the interesting thing with humans is actually a lot of human babies after they are weaned off breast milk actually go to infant formula, which actually has higher levels of barium, which also can reveal some interesting information. If you see all of a sudden this spike in barium, you might assume, okay, well this baby maybe had breast milk for six months and then maybe for the next six months had formula. And then maybe you'll see this big drop in barium and you'll say, okay, well now it looks like the baby's being weaned off breast milk and infant formula altogether and is eating more of a normal diet which has a lot less barium in it.

Interviewer – Kerry Klein

Okay, so you said that these analyses have been pretty accurate on human babies. So what did we find with Neandertal teeth?

Interviewee – David Grimm

Well, the researchers actually only looked at one Neandertal tooth, and this was from a child that lived about 100,000 years ago. This was a molar found in a cave in Belgium. And the researchers did some laser scanning of the tooth, which allowed them to look at all these different layers of the tooth. And what they found was that the barium levels started off pretty high right after birth, and they continued to be elevated for seven months. And this suggests that this baby was exclusively breast feeding for seven months. Then the barium levels fell to intermediate levels for another seven months, and this suggests that the mother's milk was being supplemented by other food sources so the baby was still getting breast milk but possibly also eating other food as well. And then after about 1.2 years, the barium levels really dropped off, and this suggests that the child wasn't drinking any breast milk anymore and potentially was actually very abruptly weaned from the breast milk and really just sort of forced to eat more normal foods.

Interviewer – Kerry Klein

Okay, so in this particular example, this baby started to be weaned around seven months, and then a little over a year, it appeared to be fully weaned. Is this earlier or later than we expected from Neandertals?

Interviewee – David Grimm

It's pretty early, and it's also a lot earlier than is seen in modern humans, especially those humans that live in non-industrial societies where weaning doesn't actually take place until 30 months. And this analysis of this Neandertal tooth suggests that Neandertals were weaned very early in life, which also suggests that they might have developed a lot faster than we did, which is actually a going hypothesis. Experts caution you don't want to make sweeping conclusions just based on one tooth found in one cave, but it is really sort of a nice affirmation of this technique, which shows just how much information is available simply by looking for this one element in the sort of tree rings of teeth.

Interviewer – Kerry Klein

And our last story is about penguins and why they don't fly. We know of a lot of flightless birds out there. There are emus and ostriches and also penguins. But I don't know that we necessarily know why they don't fly.

Interviewee – David Grimm

We don't really. We know that penguins are very good swimmers, and there's been this suspicion that perhaps in order to become very good swimmers, they had to give up flight to make themselves much more effective in the water. This new study lends a lot of support to that idea. It's a study of a type of bird called the murre, which is a penguin-like sea bird. What's different about these birds versus penguins is they can still fly and they swim, but they are not great at either, especially flying. They actually pretty bad fliers. And the researchers said, well, we can look at this bird who's, sort of, almost maybe in this transition stage – not really a great swimmer, not really a great flier but can do both. Maybe that will provide some clues into why penguins have given up flight.

Interviewer – Kerry Klein

So, did they answer that question?

Interviewee – David Grimm

They think they did. What they did was they looked at a group of murrelets that nest on cliffs in Alaska, Canada, and other northerly sites. And studying these murrelets wasn't easy, especially in northern Canada. The researchers actually had to carry shotguns loaded with rubber bullets to ward off the local polar bears. They lived in a cabin surrounded by an electric bear fence. Don't let anybody ever tell you that science can't be dangerous work. When they actually were able to get the murrelets, they outfitted them with sensors so they could get a sense of how deep they dove, how much time they spent in the air. And what they found was these animals expended a lot of energy when they flew – more than any other bird. In fact, on the wing, murrelets burn energy at 31 times the rate they do at rest – the highest known ratio of any bird. When other vertebrates work very hard, they're burning energy only at 25 times the resting rate, so these birds are really working hard just to be bad fliers.

Interviewer – Kerry Klein

And what about how they swim?

Interviewee – David Grimm

And they swim okay. They were more efficient than many other birds that swim, but they are still not great swimmers. The researchers found that compared with penguins of the same size, murrelets expended far more energy while diving.

Interviewer – Kerry Klein

And so what does this mean for penguins who can only do one?

Interviewee – David Grimm

Well, what the researchers hypothesized is if the murrelets wing became a bit more like the penguins' stubby flipper, they would be a lot better swimmers, but their ability to fly would almost be impossible. And what it suggests is that penguins may have reached a very similar point in their evolutionary history where they were able to fly a bit, able to swim a bit, but weren't able to do both very well. And for some reason decided, you

know what? Life's going to be a lot easier if I just swim, but I'm a much more successful swimmer. Maybe there's a lot more food in the water, especially if I'm diving down. And so from an evolutionary perspective, it made sense for them to evolve into a place where they just became these awesome swimmers, and it was worth it to give up flight. And murrens really are shedding light on this really, sort of, transitional point in evolution. Animals obviously are not consciously making this decision but where this decision is made over evolutionary history.

Interviewer – Kerry Klein

Alright. And what else have we had on the site this week?

Interviewee – David Grimm

Well, Kerry, for *ScienceNOW*, we've got a fascinating physics story that deals with the phenomenon of entanglement. This is the idea that if you observe a photon in one place, it will actually affect the behavior of a photon in another place, potentially another place that's light years away. It's this really bizarre property that Einstein called spooky action at a distance. Now researchers have shown that if you observe a photon at one time, you can actually affect another photon at a different time. So entanglement may not just work across space but also across time. For *ScienceInsider*, we continue to explore the impact of the sequester. This week, the impact on biomedical research labs. Also a story about whether journals should abandon the impact factor. Finally for *ScienceLive*, our weekly chat on the hottest topics in science, this week's *ScienceLive* is about the DSM-5, the latest what's called the Bible of psychiatry, whether it's still valuable or should be ditched. Next week's *ScienceLive* is about the ethics of studying chimpanzees in captivity. Should we abandon captivity for chimps and just study them in the wild. So be sure to check out all these stories on the site.

Interviewer – Kerry Klein

Great. Thanks, Dave.

Interviewee – David Grimm

Thanks, Kerry.

Interviewer – Kerry Klein

David Grimm is the online news editor of *Science*. You can check out all of our news at news.sciencemag.org, including daily stories from *ScienceNOW*, science policy from *ScienceInsider*, and *ScienceLive*, live chats on the hottest science topics every Thursday at 3 p.m. U.S. Eastern time.