Science Magazine Podcast

Transcript, 28 September 2012

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Promo

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Music

Interviewer – Edward Hurme

Finally today, I'm here with *Science* staff writer Carolyn Gramling, who's here to give us a rundown of some of the recent stories from our online daily news site. First up, we have a story on how to make bacteria smile.

Interviewee – Carolyn Gramling

Yes. Well so this story is actually, in a way, it's about wrinkles. We all, of course, want to know how wrinkles actually form as a first step to preventing them. But what these scientists were doing were actually looking at bacterial biofilms, so these slimy communities of bacteria that essentially glom together and then form this sort of scaffolding of proteins and other kinds of molecules, such as starches, and they create this kind of surface. And what scientists have noticed is that within the biofilm, sometimes the communities of bacteria form these ridges, which can be extremely tall ridges relative to the height of the biofilm itself. If the bacteria were as tall as humans, then the ridges could be just as tall as the Chrysler Building in New York.

Interviewer – Edward Hurme

Wow!

Interviewee – Carolyn Gramling

So what scientists have found is that these ridges can actually end up having a lot of dead bacteria underneath the fold. And what they were wondering, it became kind of a chicken or egg kind of a question. What came first? Did the dead bacteria come first, or did the ridge come first? And this is what they were looking at as a way of trying to understand exactly how these wrinkles can form. So in order to address this question, what they did was make a number of different genetic mutants of a certain kind of bacterium which is in soil, and they basically engineered all these bacteria to have different genes missing – each of the genes is somehow involved in making a biofilm – and they wanted to figure out how those genes were involved in creating the biofilm, essentially, and also they kept track of when the bacteria cells died.

Interviewer – Edward Hurme

What were their results? What did they find was causing these wrinkles?

Interviewee – Carolyn Gramling
So what they found was that a number of these cells would die in patches, and that where they died – where those patches were – was also where these wrinkles would occur. And what they think was going on was that there was overcrowding in the biofilm – that as the biofilm would grow, the cells would start to crowd together, and much like people being crammed onto a Tokyo subway train, that essentially oxygen would get depleted, that the cells would begin to die. And that as a result of that crowding, there was all this tension building up and the scaffolding would start to compress laterally. And so it was both the cell deaths that were causing this wrinkle, and also the compression of the scaffolding, this actual mechanical property as well. So it was both of these things that were working together.

Interviewer – Edward Hurme
So why did the researchers want to look at this in the first place? What's the biological or evolutionary importance of this behavior?

Interviewee – Carolyn Gramling
Well what they're really trying to get at here is how all of these different forces, both genetic and mechanical, act together to try to create these kinds of wrinkles. And basically it's sort of a first-order kind of an understanding of how this works – how these things develop – so that ultimately they might be able to better understand how it would develop in multicellular organisms such as plants and animals and perhaps even humans.

Interviewer – Edward Hurme
And are there any other potential applications other than the one that I eluded to in the beginning, that they actually were able to draw shapes with these bacterial films? They drew smiley faces.

Interviewee – Carolyn Gramling
Yes. By actually being able to engineer where those dead cell patches would occur, they were able to also, therefore, engineer where the wrinkles would happen. So you can make smiley faces out of them. For our *Science* Web site, they also created bacterial cells that spelled out "science."

Interviewer – Edward Hurme
So from learning how to spell "science" in slime, our next story looks at a particularly gross way of a certain species of mouse escaping its predators.

Interviewee – Carolyn Gramling
Yes. There are these interesting little mice that are native to Africa, and they're called African spiny mice. And a lot of people actually keep them as exotic pets. And what these people have found is that when they handle these mice and the mice feel kind of threatened, the mice will actually lose little patches of their skin. And so this is a very interesting property. They don't just lose their skin, they actually lose very deep patch that's not superficial; it actually goes all the way down to the muscle. And so the question is how do they survive this? And researchers who are interested in regeneration

properties were interested in these mice to see, you know, what could we actually learn about that? Do they grow the skin back? What happens to them? We know, of course, that there are lizards and salamanders that can regrow a limb.

Interviewer – Edward Hurme
And how is this different from that?

Interviewee – Carolyn Gramling
Well, in that case, you know, that's an entire limb. In this case, it's just these patches of skin that we're looking at.

Interviewer – Edward Hurme
Just how much skin are they actually losing when they lose their skin?

Interviewee – Carolyn Gramling
What they found when they studied these mice was that these mice can lose as much as 60% of the skin covering their backs. Like I said, it's the entire skin that goes all the way down to the muscle. And they can survive this. And what's even more amazing is that it does actually grow back.

Interviewer – Edward Hurme
So by grow back, do you mean there's scar tissue? Or what does it actually look like?

Interviewee – Carolyn Gramling
Well, it looks very much – I mean, there's a little bit of scar tissue, but it's almost as good as new. And it turns out that what happens in these mice is actually really similar to what happens in, for example, newts that will grow back a limb, in that the mice develop these embryonic-like cells in the patch of skin that's missing, and then those cells eventually develop into the actual skin cells. And that's similar to what happens in newts when they grow a limb back.

Interviewer – Edward Hurme
So what do the researchers think they can potentially learn from these mice?

Interviewee – Carolyn Gramling
Well, what they're hoping ultimately to be able to do is if you understand at a molecular level how this regeneration happens – and this is the first time they've seen it in any mammal – then they're hoping that they can ultimately be able to promote regeneration in other mammals, including humans.

Interviewer – Edward Hurme
From removing skin to live another day, our next story looks at how removing something else can actually help increase your lifespan.

Interviewee – Carolyn Gramling

Yes, that something else being testosterone, which is something that a lot of researchers have looked into. Of course, it's well known that women on average live longer than men, and testosterone is one of the potential reasons why. People have spent a lot of energy researching this and the effects of testosterone on longevity. And one way that researchers can actually try to understand this problem is to look at men who have been castrated and compare them with uncastrated men. The problem with that is that you often don't have a really large sample size. So studies have been done, but they had really mixed results in the past.

Interviewer – Edward Hurme
So how did the researchers go about finding these eunuchs?

Interviewee – Carolyn Gramling
Well, in this one case, it turns out that there is a century's long record of eunuchs, and this comes from a genealogical record from Korea. Korean rulers used to keep eunuchs to serve in the royal court. And there was actually a record of their births and their deaths that was kept from basically the 16th through the mid-19th centuries, and so there's actually this amazing document. It was about 385 men whose lives were detailed in this. So that's a sample set that, you know, no other researcher had had access to to make this kind of comparison.

Interviewer – Edward Hurme
And so how much longer were these eunuchs actually living?

Interviewee – Carolyn Gramling
They were only able to verify the lifespans of 81 of the men. But of those 81, it turns out that on average, they lived 14 to 19 years longer than men of similar social status at the time. And it also turns out there were three of them who lived to be a hundred years old out of 81, which when you think about the usual centenarian average, it's about one in 3,100 perhaps in Japan. It's a much better average if you're a eunuch.

Interviewer – Edward Hurme
Why might testosterone shorten a person's life? What's sort of the mechanism working there?

Interviewee – Carolyn Gramling
Well, this is something that they don't actually know. I mean, they don't really know why testosterone might have this effect. At this point they're just trying to establish that link. By establishing that, people are hoping that they're going to be able to move forward and actually figure out if there's some therapy that would not actually involve removing anything, but could help lengthen lives.

Interviewer – Edward Hurme
Yeah, let's hope they can find a less invasive way to go about increasing longevity. And what else have we had on the site this week?

Interviewee – Carolyn Gramling
Well, on *Science*NOW this week, you can learn about how monitoring more fisheries might pay off, and also what happens to all the gas and dust that is swirling around a black hole. And also on our policy blog, *Science*Insider, you can learn about a report that shows that funding cuts to public universities are actually very significant state-to-state and also recommendations to NASA for Mars exploration into the next decade and beyond. And, finally, next week on *Science*Live, you can chat with experts about how societies such as a New Guinea tribe that is known for warfare can actually move from war to peace. And you can check all of this out, and more, on our Web site, news.sciencemag.org.

Interviewer – Edward Hurme
Carolyn Gramling, thanks for talking with me.

Interviewee – Carolyn Gramling
You're very welcome. Thank you.

Interviewer – Edward Hurme
Carolyn Gramling is a staff writer for *Science*. You can check out all our news at news.sciencemag.org, including daily stories from *Science*NOW and science policy from *Science*Insider. While you're there, be sure to check out *Science*Live, a live chat on the hottest science topics every Thursday at 3 p.m. U.S. Eastern time.