Science Magazine Podcast

Transcript, 1 November 2013

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Promo

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Music

Interviewer – Sarah Crespi

Finally today, David Grimm, editor for our daily news site, *Science*NOW, is here to talk about some recent stories. I'm Sarah Crespi. First up we have a story on snakes on the brain. So this new finding raises a really interesting question. How much time did our primate ancestors spend thinking about snakes? But let's start with a more basic question. How long have snakes and mammals coexisted?

Interviewee – David Grimm

Well, the first snakes slithered through the forest of the supercontinent Gondwana about 100 million years ago, and they weren't very friendly to our tiny rodent-sized mammalian ancestors. At first they squeezed the life out of them, and then about 40 million years later they started injecting them with venom. So snakes were really one of the first and most persistent threats to our ancestors.

Interviewer – Sarah Crespi

The idea here is that these persistent predators actually shaped important parts of our ancestors. What did they do to us and is there any evidence for it from an evolutionary perspective?

Interviewee – David Grimm

Well, the idea is that we had to evolve to somehow avoid these snakes, otherwise, you know, our ancestors were going to extinct. And one of the things that at least this one researcher believes happened is that we evolved more forward-facing eyes to give us better vision, and also we enlarged these visual centers that are deep within our brains that are specialized for picking out specific features in the world around us. Obviously you'd want to detect that snake so it didn't bite you. And so her idea, which she calls the snake detection theory and she first proposed it in 2006, is basically that these early interactions with snakes actually shaped who we are today.

Interviewer – Sarah Crespi

So how can you show that the snakes were the key to, say, our eyes or to these enlarged visual centers?

Interviewee – David Grimm

Well, some of the evidence before this new study was that there are some rare primates who have never encountered venomous snakes and they seem to have poorer vision than other primates.

Interviewer – Sarah Crespi
In the new study, they bring in the neuroscientists.

Interviewee – David Grimm
Right.

Interviewer – Sarah Crespi
What were they able to find about this?

Interviewee – David Grimm
Well, the neuroscientists focused on this region of the brain, which is called the pulvinar, which is this cluster of neurons in an evolutionarily very ancient part of the brain called the thalamus. And these neurons, these pulvinar neurons, are believed to help direct our attention using our eyes to recognize a specific threat. And, interestingly, primates have much bigger pulvinars than other animals, and certain parts of the pulvinar are even specific to primates. So you would imagine that if there is this part of our brain that was very specific to detecting snakes, this might be it.

Interviewer – Sarah Crespi
They now have a structure to look at. When they took a look at the neurons in this structure, were they snake-responsive?

Interviewee – David Grimm
Well, they looked at a couple of captive-born macaque monkeys that had never encountered snakes before. And they inserted electrodes into their pulvinars, and then they showed them a series of pictures – some pictures of snakes, some pictures of other macaques looking at them in a very threatening way, and some just sort of neutral expressions or macaque hands in various positions, pictures basically that didn't look very frightening. And what they found was that the images of snakes had a particularly strong and fast-acting effect on the pulvinar neurons. Of the 91 neurons that became active at some point in the experiment, 40% seemed to be very snake-specific. They reacted very quickly and very strongly when these animals saw images of snakes.

Interviewer – Sarah Crespi
So that's in macaques, which are a distant, distant relative to humans. Is there any evidence that this crosses over to people?

Interviewee – David Grimm
No, there's not evidence right now that this actually holds true for people. And one of the experts who chimed in on this new story says that her own work has shown that humans are actually better at detecting cars and guns than they are snakes, and because we really haven't had cars and guns for that long, especially compared to the millions of

years with which we've confronted snakes, it suggests that snakes may not be as primal a concern to our modern brains, at least as they used to be.

Interviewer – Sarah Crespi
Next up we have a story on how allergies may be getting a bad rap. The primary response by the immune system to unfriendly microbes in the body like bacteria and viruses is to destroy the intruders, but we also have a second string of defense, the so-called type 2 response that comes out as allergies. But what we don't know is what exactly this reaction is good for.

Interviewee – David Grimm
Right. Is all that sneezing, coughing, and even sometimes diarrhea good for you? And this new study suggests that it actually is. It has to do with bee stings. And the question was when people get stung, especially people that are allergic, is that sting somehow protective? Why would we have evolved this response to a bee sting if it's so annoying, basically? And is the idea that perhaps when we get stung once with a bee, it protects us from a potentially lethal sting further down the line?

Interviewer – Sarah Crespi
So how do the researchers actually test whether or not an allergic response might be protective?

Interviewee – David Grimm
Well, what the researchers did is they took a bunch of mice and they gave them an injection of bee venom, not enough to hurt them but enough to stimulate an allergic response, and then a few weeks later they injected the mice with a potentially lethal dose of this bee venom. And what they found is that the mice that didn't get that initial sting were not protected and a lot of them died, but that the mice that did get that initial injection of venom were much more protected and most of them – in fact, the vast majority of them – survived.

Interviewer – Sarah Crespi
And that was if they had an allergic response to the first?

Interviewee – David Grimm
Exactly.

Interviewer – Sarah Crespi
Mice exposed to venom once and then again, and if they had an allergic response, they were protected from a lethal dose. So what does this say about how allergies work in modern times, say, in people? I mean, peanuts have never been lethal as far as I know.

Interviewee – David Grimm
Right. So that's a good question. And what's up with our peanut allergies and some of the other allergies. Well, all of these are also type 2, so it suggests that maybe it's a side effect of this evolutionarily protective effect of this type of allergy. But, again, you

know, this research was only done in mice, it wasn't done in humans, so it's a little unclear about whether this actually holds true for us. So, in other words, just because you get that initial bee sting and you're allergic to bees doesn't mean you should stick your hand in a hive anytime soon.

Interviewer – Sarah Crespi
Finally, we have a story on bats as vectors for SARS. After the SARS outbreak in 2002, researchers deduced that the virus passed from bats to civets to humans, but new evidence suggesting that civets may no longer be needed. So, Dave, can we start back in 2002? Why were civets implicated in this outbreak?

Interviewee – David Grimm
Well, when researchers first started looking for a culprit for the SARS outbreak, they identified a coronavirus in bats which was very similar to the virus that seemed to be causing SARS in humans. But the bat virus had some important differences with the human virus. Meanwhile, when they looked in civets, they found that the civet SARS virus was much more similar to the virus seen in humans. So their idea was that maybe the bats were biting the civets, and then the civets were transmitting the disease to humans, and therefore the civets were sort of this necessary intermediary between bats and humans.

Interviewer – Sarah Crespi
But this new study suggests that bats may be able to transmit the coronavirus. What kind of evidence did they find?

Interviewee – David Grimm
Well, in the new study the researchers were looking at bats, and they found two new strains of this coronavirus that were actually much more similar to the human strain that had been seen in the bats about a decade ago. And when they looked more closely at these strains, they found that a spike protein that they encode was actually very similar to the protein that was seen in the virus that directly infects humans. And, indeed, when they took these new coronaviruses and they introduced them to cells in the lab, they found that they could directly infect our epithelial cells, which are cells that line our lungs.

Interviewer – Sarah Crespi
Should we be worried about a new SARS outbreak transmitted by bats?

Interviewee – David Grimm
Experts don't think so, at least not based on this evidence alone, because these are just cells in culture. It's not clear that this virus can actually infect human beings. But it is a big concern because even though a lot of people got SARS – hundreds of people died about a decade ago from SARS – the idea was that if it had to go from bats to civets to people, there were a lot of roadblocks the virus had to clear to get to people. But now that there's this idea that it could be transmitted directly from bats to people, and in places like China especially, where people are hunting and eating bats, they have this

direct connection with bats. And if bats were able to directly transmit the virus to people, that could be a huge problem that could potentially spark another pandemic. So the researchers really need to figure out now whether what they're seeing in the lab actually holds true in the real world.

Interviewer – Sarah Crespi
Okay. So what else is on the site this week, Dave?

Interviewee – David Grimm
Well, Sarah, for *Science*NOW we've got a story about some new insights into the nature of dark matter. Also, tied to Halloween, some very cool pictures of animals that have their own Halloween costumes and wear them year-around. For *Science*Live, we've got another Halloween-themed story. Our *Science*Live this week is on the science of fear. Why do we like to get scared? Next week's *Science*Live is on dark matter – speaking of dark matter. And finally, for *Science*Insider, our policy blog, we've got a story about super storm Sandy one year later. What impact is it still having on researchers in the U.S. East Coast? Also a story about researchers sparring over tests for breast cancer risk. So be sure to check out all of these stories on the site.

Interviewer – Sarah Crespi
Thanks, Dave.

Interviewee – David Grimm
Thanks, Sarah.

Interviewer – Sarah Crespi
David Grimm is the editor for our online daily news site, *Science*NOW. I'm Sarah Crespi. You can check out the latest news, our upcoming live chats, and the policy blog, *Science*Insider, at news.sciencemag.org.