Science Magazine Podcast

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Promo

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Music

Interviewer – Sarah Crespi

Finally today we have David Grimm, online news editor of *Science*. He's here to give us a rundown of some of the recent stories from our online daily news site. I'm Sarah Crespi. So David, the first story we have today has made its circuit of the Internet. It's about the effect of semen on ovulation, which sounds kind of mundane until you get into the details.

Interviewee – David Grimm

Right. Well, believe it or not, we actually don't know – or until this study – we really didn't know what the role of the fluid was in semen. Semen is primarily composed of sperm and the fluid that the sperm live in. And for a long time, scientists thought the fluid was basically just there to sort of keep the sperm happy and was sort of just a transport vehicle. But almost 30 years ago, actually, scientists began to wonder if there was some sort of factor in the sperm that induces ovulation. Now that's not a concern for human women because human women are what's called "spontaneous ovulators". They ovulate on a regular cycle; they don't need to be induced to ovulate. But there are a lot of animals that are called induced ovulators. Animals like camels and rabbits actually have to or, at least, scientists thought they had to have sex to sort of induce them to start ovulating and then basically have sex again.

Interviewer – Sarah Crespi

And how do they think that induced ovulation?

Interviewee – David Grimm

They thought that maybe just the physical stimulation of sex induced ovulation. But as I said, you know, as long as 30 years ago, scientists began to think, "Well maybe there's actually something in the semen itself that's inducing the ovulation; it's not just the physical act of sex, but maybe when the male copulates with the female, he's actually transferring something to the female that's causing her to start ovulating." This was a very controversial idea at the time and really hasn't found support until now.

Interviewer – Sarah Crespi

Yeah, it's really surprising that no one has gone through molecule by molecule and figured out what's in semen.

Interviewee – David Grimm
Exactly. And that's exactly what the researchers did in this new study. They took llama and bull semen, and they spun it down just to get rid of the sperm and just to look at the fluid itself. And they did a lot of complex analysis to sort of try to separate it out molecule by molecule, and they actually injected some of these molecules into animals to see if they would induce ovulation. And after a lot of trial and error, they came up with a molecule called neural growth factor, or NGF.

Interviewer – Sarah Crespi
That sounds like something that we maybe have come across before.

Interviewee – David Grimm
Right. And that was…the scientists were a little disappointed. They thought they would find this mysterious new molecule that nobody knew about, but NGF is actually pretty well known. It's actually already been linked to the development and survival of sensory neurons. So what the scientists found is not a new molecule but a new use for an old molecule.

Interviewer – Sarah Crespi
And so, you said this probably doesn't have much use…this information probably doesn't apply to humans, but it's possible that it could have an effect.

Interviewee – David Grimm
In other experiments with cows, which are spontaneous ovulators like humans, the researchers found that NGF actually changed the timing and the development of egg-bearing follicles. It also promoted the development and function of the corpus luteum, which is a temporary structure crucial to sustaining pregnancy. So even though NGF doesn't appear to spark ovulation in humans, it may actually have other pregnancy boosting effects.

Interviewer – Sarah Crespi
But do the researchers know whether or not it's actually present in human sperm?

Interviewee – David Grimm
Yeah. They actually have found it in human sperm, which suggested it it may be playing a function in our species as well. And that function may be to somehow promote pregnancy. And that could be really important for couples that are having trouble conceiving. Perhaps NGF could be a potential therapy.

Interviewer – Sarah Crespi
…or a test.

Interviewee – David Grimm
Exactly.

Interviewer – Sarah Crespi

So this next story we have is about another problem that maybe surfacing from the overuse of antibiotics.

Interviewee – David Grimm
Right. Well, Sarah, antibiotics obviously are a "wonder drug", and they've protected us from a lot of really nasty diseases. Farmers also use antibiotics to make cows, pigs, and turkeys gain weight faster. When these animals are on antibiotics, they tend to get a lot bigger, and that's good for farmers because there's more meat and more they can sell. This new study tackles the question, "If we gave antibiotics to people, would the same thing happen?" And that gets back to your original question, "Is there sort of a problem with us taking too many antibiotics?"

Interviewer – Sarah Crespi
Right. So how did they look at whether or not people were getting fat from the antibiotics?

Interviewee – David Grimm
Well what they did first was they actually looked at mice, and they added antibiotics to the drinking water of mice that had just been weaned. After seven weeks, the mice on antibiotics had significantly higher fat mass – they're fatter basically – then a control group that was drinking just water. What they also looked at was the bacteria in the guts of these animals. Now, a lot of animals, including humans, have billions of microbial cells living in our guts, and they actually form these microbial communities, which we think are really important – or in the past few years have actually shown to be really important – for a variety of things: that they may help us break down nutrients, that they may be important for protecting us against certain diseases. This bacterial community is actually known as the microbiome. And one of the potential links between antibiotics and weight gain has been this idea that maybe antibiotics somehow muck around with these bugs in our gut, maybe they kill important bugs that would help us maybe digest nutrients more efficiently, or other processes that would be involved in metabolism, and by disrupting this you're causing animals to gain weight. And indeed what they saw that in the mice that had gained weight, they still had the same number of microbes in their gut, but there was a difference in the composition of these microbes.

Interviewer – Sarah Crespi
So that's mice. What about people? How can we test this in them?

Interviewee – David Grimm
Well, there was another study that actually also just came out which suggests that the link may hold in people as well. And this study looked at data from 11,000 children born in the U.K. in 1991 and 1992. And some of those children had been treated with antibiotics in the first six months of their lives and some of them hadn't. And those who had been treated with antibiotics had a higher chance of being overweight at 10, 20, and 38 months of age. So this again suggests this correlation between the use of antibiotics and weight gain and this time in humans.

Interviewer – Sarah Crespi
But there could be other explanations for this excessive weight in these children.

Interviewee – David Grimm
Exactly. This is just a correlation. Also, these changes in weight were really small. By the time these children reached six months and even seven years, there was no difference in weight between them and the children who didn't get antibiotics. So this is a really controversial study. It's a very intriguing idea, and both of these studies seem to give way to this idea that antibiotics can cause weight gain. And again, getting back to your original point, there's a real overuse of antibiotics in the U.S. and in other countries, and this could be a potential side effect. But a lot of experts are saying these two studies are just way too preliminary; the data is not strong enough yet to firmly make a conclusion that antibiotic use leads to weight gain, at least in people.

Interviewer – Sarah Crespi
Gotta keep our eye out for that randomized study.

Interviewee – David Grimm
Right.

Interviewer – Sarah Crespi
Our last story is a new way to track deadly outbreaks.

Interviewee – David Grimm
Right. Sarah, this story has to do with a mysterious outbreak that happened at the National Institutes of Health in Bethesda, Maryland. In June of last year, a 43-year-old woman was admitted to the hospital, and she had a lung disease. Doctors knew she was carrying a highly resistant form of a deadly bacterium known as *Klebsiella*. But it didn't make her sick, and they placed her in isolation, and they discharged her a little while later. No one else in the hospital seemed to have gotten infected with whatever she had. But a few weeks later, a bunch of other patients also came down with *Klebsiella* infections, and over the next three months 12 more patients contracted it, and six ended up dying as a result of these infections. And so there was this outbreak, and the doctors really weren't sure what was going on because this woman didn't have contact with any of these other people. But doctors really weren't sure how this was spreading. This woman had no contact with these other patients that came down with it.

Interviewer – Sarah Crespi
We're talking about a new way to track outbreaks. What did they do in this case?

Interviewee – David Grimm
Well what the researchers did was something that's been called "genomic epidemiology". And what that essentially means is they took a look at the genome of this *Klebsiella* bacterium. And what's interesting about the genomes of bacteria is that when bacteria divide they accumulate mutations. And that means that when bacteria move from patient to patient or from person to person, they're not exactly the same bacteria. There have

been small changes in the genetic code, which can help you distinguish one from the other. And that's really useful for scientists because they can say, "Okay, this is the bacteria that was present in patient A, and these are the bacteria that are present in patient B."

Interviewer – Sarah Crespi
So it's like a puzzle where this patient has this set of changes, this other patient has those and more, and so you know who came after.

Interviewee – David Grimm
Exactly. And they can use that to sort of piece together the puzzle of how the bacteria moved from patient to patient. And when they did that, they found out that the female patient that was originally admitted to the hospital seemed to be the one that initiated this *Klebsiella* outbreak. But that the other three patients, they acquired her strain of the *Klebsiella* independently from each other, which is really weird. It wasn't like she was…she passed it to one person, that person passed it to somebody else, and that person passed it to somebody else. Three other patients somehow got it from this woman even though they had no direct contact with her, and they all got it directly from the woman, they didn't get it from each other.

Interviewer – Sarah Crespi
How did this bacteria jump from her to these other people without passing through anyone else?

Interviewee – David Grimm
Unfortunately, the doctors really aren't sure how it got transmitted. What they do know is they had really strict hygiene regimens in place meaning that it should have been extremely unlikely for a person to pass the *Klebsiella* to another person or from this patient to pass it to a doctor who would have passed it onto another person. So what they think may have happened is *Klebsiella* is actually somehow living on the medical equipment that was being used with this patient, and that medical equipment got reused with these other patients. And that's really surprising because *Klebsiella* wasn't really thought to be able to survive in the environment; it was thought to be very sensitive and die very quickly. And so this research is not just telling us new things about how to track outbreaks but it's telling us new things about this really dangerous bacterium, that it's much heartier in the environment than we thought, and that could lead to new ways to combat it.

Interviewer – Sarah Crespi
And so this is a pretty new technology to, you know, sequence the whole genome of a bacteria and compare it with others. Is that a result of new technologies in sequencing?

Interviewee – David Grimm
Exactly. You know, sequencing is getting cheaper and cheaper. But even for this study, the scientists paid about $2000 per genome they sequenced. So this is a very expensive thing. It also took a long time. So if you've got a hospital that's in the middle of an

outbreak, this sort of genomic CSI may sound like a good idea, but it's going to be really expensive and take a really long time.

Interviewer – Sarah Crespi
All right. So what else do you have on the site week, Dave?

Interviewee – David Grimm
Well, Sarah, we've got a story about cell phone use and driving and why taking cell phones away from drivers may not prevent crashes. Also a story about singing apes on helium. So you just have to check out the site to read more about that.

Interviewer – Sarah Crespi
No audio?

Interviewee – David Grimm
No audio right now. And finally, for *Science*Insider, we've got a story about NIH cracking down on grant millionaires. Also a story about NASA's plans to probe the interior of Mars. 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 online news editor for *Science*. You can check out the latest news and the policy blog, *Science*Insider, at news.sciencemag.org.