Science Magazine Podcast

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Promo

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Music

Interviewer – Linda Poon

Finally today, I'm Linda Poon, and I'm speaking with David Grimm, online news editor for *Science,* about some of the recent stories from our online daily news site. So Dave, in our first story, how ultra-marathons may actually be easy on the body, science reveals that ultra-marathons can actually cause less damage than running shorter races. So first question, what makes a marathon an ultra-marathon?

Interviewee – David Grimm

Well Linda, if you really want to know what makes an ultra-marathon you'd probably want to look to the Tor des Géants in France, if I'm saying that right, and I may not be, my French isn't very great. This is a pretty extreme race. The participants walk and/or run for about 330 kilometers in the Italian Alps. They're dealing with an increase in altitude of 24,000 meters, a time limit of 150 hours, and no required stops, which means that people run this race often without sleeping, or sleeping very little. It's very extreme, very intense on the body. And the question with the study is: do the people that run these kinds of races actually do more damage to their bodies than people that run races that aren't so extreme? And the surprising answer is that they actually may be doing less damage to their body.

Interviewer – Linda Poon

So when they're looking at these runners, what are they looking for?

Interviewee – David Grimm

They're looking for things like how fatigued these people are after the race, they also look at blood samples, and they look for the presence of certain chemicals that can show stresses on the body, enzymes that are released in response to tissue damage, things like that.

Interviewer – Linda Poon

Alright. So you mentioned a sleep deprivation factor, so how do researchers account for that?

Interviewee – David Grimm

Well, what the researchers did is they actually looked at 15 runners that had run this race in 2011. And, you know, they wanted to know – because a lot of them don't sleep that well during the race – they actually compared them to a group of eight trained runners

who were limited to a similar amount of sleep, which could be as little as an hour and half by the mid-point of the race, and nine hours by the end of the race. So they had people running the race, people that weren't running the race but weren't sleeping very well, and they also compared this to people that had run races that were maybe about half of the length of the Tor des Géants just to see what the various impacts of these different routines were.

Interviewer – Linda Poon
So how do these runners compare to others when it comes to muscle fatigue?

Interviewee – David Grimm
What they found, which was really interesting, is that the runners that run this really long French race showed less muscle fatigue, they had lower levels of inflammation in their blood than the runners that had run a race that was about half as long. They also had lower levels of creatine kinase which is an enzyme released by muscles in response to tissue damage.

Interviewer – Linda Poon
And what does sleep deprivation actually force the competitors to do? Does it actually help them in this case then?

Interviewee – David Grimm
Well that was the interesting thing, the researchers were trying to figure out what is it about running this really extreme race that seems to have actually made people better off? And some of it appears to be the sleep deprivation. Actually going for long amounts of time without sleeping forced the runners to pace themselves more, it also forced them to move a lot slower especially when they're really tired. And that actually seemed to take a lesser toll on the body than people that slept longer during races or that ran shorter races.

Interviewer – Linda Poon
So does that mean we should make marathons longer to make them safer?

Interviewee – David Grimm
Well, I'm not going to be running this race any time soon, but it does suggest that the body finds ways to compensate for these very extreme events. And in some cases this compensation can actually protect the body.

Interviewer – Linda Poon
Interesting. Well in our next story, how gut bugs explain the link between obesity and cancer. So what do gut microbiota have to do with cancer?

Interviewee – David Grimm
That's a good question. It turns out that the microbes that live in our gut actually are responsible for a lot of diseases. Our gut microbes have been linked to inflammatory bowel disease, allergies, even heart disease. So perhaps no surprise that they may also be

linked to cancer. The question in this study is: do they help explain this link between obesity and cancer. We know that people that are more obese are more prone to certain types of cancer but scientists don't really understand the mechanism behind that.

Interviewer – Linda Poon
So what did they do to study this?

Interviewee – David Grimm
What they did was they actually studied this in mice. And they had mice that were lean and they grew up on a normal diet, and they had other mice that grew up on a very calorie rich diet, and they became fat. And they exposed both of these groups of rodents to a cancer-causing chemical shortly after birth. And what they found is similar to humans: only about 5% of the lean mice had developed cancer, but all of the obese mice developed cancer. And when they looked a little further they found that these mice actually had different compositions of microbes in their guts. The obese mice also had higher levels of a compound known as deoxycholic acid, or DCA, which is a byproduct leftover after certain microbes break down bile acids produced by the liver. It's known in humans that DCA can cause cancer by damaging DNA, so it's really interesting that they were finding these higher levels in the obese mice.

Interviewer – Linda Poon
So how does diet play a role in cancer development?

Interviewee – David Grimm
Well that was one of the questions the researchers had: is it diet based? But they found when they looked at another group of mice that were genetically engineered to become obese – regardless of the diet that they were fed – these mice also had higher levels of DCA, which suggests that it's the gut microbes themselves that are playing a role in the cancer rather than just the diet that these animals are eating.

Interviewer – Linda Poon
So what does this mean for the future of cancer prevention in humans?

Interviewee – David Grimm
Well it suggests that one way to go after cancer may be actually going after our gut microbes. And what was really interesting in this study is when they gave these obese mice an antibiotic, the animals showed a reduction in their cancer incidence. And also when they reduce their DCA levels, these mice also had a lower risk of cancer, which suggests that both of these are possible pathways for treating cancer in humans.

Interviewer – Linda Poon
Finally, we go back in time and look at the sequenced genome of a 700,000-year-old horse. So Dave, why is this a landmark study?

Interviewee – David Grimm

Well Linda, it's a landmark because this is the oldest organism that's ever been sequenced. Before this, there was a fossil that was about 130,000 years old – this was from a polar bear jaw bone that researchers were actually able to get DNA from. But this, obviously, is several hundred thousand years older, it's from a horse, it's from a bone that was found in Canada's Yukon Territory. Scientists were exploring a site that holds ice and volcanic ash that date back about 700,000 years. So they knew when they found this bone it was very old, but they didn't think they could DNA from it, just because it's been really hard to get any DNA from anything that old. And actually some studies suggest that DNA doesn't even hang around for more than a million years. So scientists always sort of assumed that if they found something that old, that the DNA would be long gone.

Interviewer – Linda Poon
So what does this DNA indicate?

Interviewee – David Grimm
Well there's been some controversy in the study of equine evolution – and equines include horses, donkeys, and zebras – about exactly when they evolved and how related they are to each other. And also there's been some mystery surrounding a horse known as the Przewalski's horse, which is considered the world's only remaining wild horse. There's been a source of controversy about this horse about whether it's actually been mixed a little bit with domestic horses, or about whether it is truly, completely wild. And what the DNA revealed is that this horse seemed to share a common ancestor with the rest of the *Equus* lineage – and that includes all donkeys, horses, and zebras. This common ancestor likely lived 4-4.5 million years ago, which really starts to shed some light about when all of these animals came into existence. But the DNA also suggests that Przewalski's horse is genetically distinct from all of these other animals, and it did not mix with the domestic horse, suggesting this is a very unique animal.

Interviewer – Linda Poon
So 700,000 years is a very long time. How is an ancient horse any different from today's modern ones?

Interviewee – David Grimm
Well the scientists say this horse – and he was a he based on the DNA – was large but not as tightly muscled as a modern horse, maybe looking a little similar to today's Arabian horse.

Interviewer – Linda Poon
And this technique is obviously very advanced, what other things can we learn from this new technique?

Interviewee – David Grimm
Well the great thing about this – the really cool thing – is that they were able to sequence something that old, which suggests that other fossils that are found that old, we could potentially recover the DNA from them as well. And that could shed light not just on

horse evolution, but potentially human evolution, and the evolution of a whole host of other animals.

Interviewer – Linda Poon
Well these are three very interesting stories. What else do we have on the site this week?

Interviewee – David Grimm
Well Linda, for *Science*NOW, we've got a story about why whale veins don't collapse in the very deep depths that whales dive. Also a story about the similarities between our brains and the brains of honeybees. For *Science*Insider – our policy blog – we've got a number of stories on the site this week, including a story about the first clinical trial with induced pluripotent stem cells and what implications that could have for human disease. For *Science*Live – our weekly chat on the hottest topics in science – this week our *Science*Live is about human cloning, the ethical and scientific issues related to that. And then we'll be taking a bit of a hiatus for a couple of months, and *Science*Live will return in September. So be sure to check out all of these stories on the site.

Interviewer – Linda Poon
Great. Thanks so much Dave.

Interviewee – David Grimm
Thanks Linda.

Interviewer – Linda Poon
David Grimm is the editor for *Science's* online daily news site. You can check out the latest news and the policy blog *Science*Insider at news.sciencemag.org, where you can also join a live chat – *Science*Live – on the hottest science topics every Thursday at 3 p.m. U.S. Eastern Time.