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Lyme: The First Epidemic of Climate Change

Ms. Murtaugh:
300,000. That's the estimated number of reported Lyme Disease cases a year nationwide, according to the CDC. And now that infected ticks are being discovered in areas never seen before across the world, many are scrambling to find the cause behind this troubling epidemic.

This is Clinician's Roundtable on ReachMD, and I'm Codyanne Murtaugh. Joining me today to discuss the global impact of Lyme Disease is Mary Beth Pfieffer, author of *Lyme: The First Epidemic of Climate Change.*

Mary Beth, welcome to the program.

Ms. Pfeiffer:
Thank you.

Ms. Murtaugh:
So Mary Beth, could you share with our audience a little about the history of ticks, where they originated from, and their evolution; how long have they been here?

Ms. Pfeiffer:
Ticks date back to prehistoric times. There actually was a tick found in Asia which has been dated back 100 million years. It was found in amber. There was also a tick found encased in amber, which is that yellowish type of substance that comes out of trees and hardens over time and really creates an environment for historical documents, if you will, to be appreciated many, many, many years later. And a piece of amber was found in the Dominican Republic, and a scientist from Oregon cut it apart and found a hard-bodied tick from 15 to 20 million years ago in that amber. And when that sample was put under a very powerful microscope, they actually found—or he found—encased within that tick, within the gut of that tick, was a coiled, single-cell organism that we now take for Borrelia, a Borrelia species, similar to, if not identical to, Borrelia burgdorferi, which, of course, is Lyme disease. So ticks have been around for many, many millions of years, and we have every reason to believe based on this discovery by this Oregon scientist that Borrelia has been as well.

So the takeaway from that discovery is that these 2 organisms have had many years to work out the kinks in their relationship to survive and thrive together, and they are way ahead of us in the evolutionary scale, and they cohabit very nicely together. One of the more interesting—fascinating, in fact—discoveries that I made in the scientific literature was that ticks that are infected with Borrelia burgdorferi, the cause of Lyme disease, actually are healthier. They have found that these tickslive longer. They have more body fat. They are fatter, which makes them able to survive under stressful conditions for longer periods of time, and, believe it or not, they are more fertile. They have more eggs, and more of their eggs survive to hatch more tick babies, so yeah, these are things we need to worry about because ticks are so adaptable, as is Borrelia burgdorferi.

Ms. Murtaugh:
They appear to the ability to adapt and evolve in order to survive and ultimately thrive when looking at the steady rise of reported cases. Should we be considering this a global threat?

Ms. Pfeiffer:
Well, first to address that global issue that you just brought up, tick borne disease is indeed spreading and prevalent around the globe. It is every bit as serious a problem in Western Europe as it is here in the United States, in many places of the United States. It is a serious problem in the Netherlands, in Germany, in France, in Scandinavia. It is a growing and prevalent problem in China. It's in Russia. It's in Australia where the pathogen has not yet been identified in ticks, but a disease very similar to Lyme disease with very

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serious consequences for many people is emerging and is evident.

So this is global, and the reason it's global brings in a lot of the factors that are driving the disease, and first on my list is climate change—as my title, the title of my book suggests. It's called *Lyme: The First Epidemic of Climate Change.*

Ms. Murtaugh:
I know the main focus of your book is climate change, but how does it play a role in the movement of ticks across country?

Ms. Pfeiffer:
Lyme disease is being driven by climate change because we see ticks moving around the planet and we see ticks, moreover, moving to places that are warmer. For example, we have archival data for Sweden and Norway in which we could see that 50 years ago or so, Lyme disease-carrying ticks could only live at a certain latitude. Now we see them climbing latitudes. They are 300 miles further north in Scandinavia than they were just about 50 years ago. We see them moving north also into Canada. Canada is a new frontier for tick borne disease and for ticks. Black-legged ticks are moving north. Mice, by the way, are also moving north. The white-footed mouse, that is the prime reservoir for the Lyme disease pathogen, namely the place where, when ticks hatch in their larval stage, they go for their first blood meal to mice. So we see these correlations between the movement of ticks and the warming of the planet. We also see, by the way, ticks moving up mountains. This is another fascinating study where a scientist climbed an alp in Bosnia in the late 1950s and wanted to see how far up that mountain ticks could survive, and he put it at about 800 meters. Now ticks are at about 1,200 meters, so they made significant advances, and we assume by virtue of these correlations that the climate change is driving this.

Ms. Murtaugh:
It's hard to think that a small town in Massachusetts was the first case where Lyme was initially reported, but now these infected ticks are spread across such vast distances. Beyond climate change, what other driving factors in our environment attribute to this global epidemic?

Ms. Pfeiffer:
But beyond climate change, as you mentioned, there are other changes in our environment that involve the forests, that involve animals. And basically what we have, what we live in today, is an adulterated world. Many of us, if not most of us, live in places in which forests have been cut up and housing developments have been placed and roads bisect forest fragments, and species have been lost along the way. We live in a world of less biodiversity, a world in which deer proliferate, mice proliferate, but there are few foxes, for example. So, back in the day, we had checks and balances over these various species in the environment. For example, foxes would keep the mouse population under control, and mice, as we know, are a place that the Lyme disease pathogen proliferates and lives happily and infects ticks. So what we have, really, is a perfect storm of factors that has combined to drive an epidemic of ticks and tick borne disease. It's not just the warming of the planet.

How do ticks get from the South in the US up to New York or into Canada? Well, it turns out migrating birds play a big role in moving ticks around the planet. We have what's called flyways in the US, migratory flyways for birds. There's one that runs along the Atlantic Coast called the Atlantic flyway; in the center of the country, the Mississippi flyway; the Pacific flyway and so on. And ticks can hitch rides aboard birds, because they feed on birds as well as mammals, and it will take a bird 3, 4, 5 days to reach its destination in migrating.

So this is happening all around the world. Ticks are moving on the wings of birds. They are also, of course, moving on deer. Deer travel about. Small mammals move them about as well. But I think it's safe to say that birds move them great distances, move them quickly, and that that is happening worldwide. It's something we need to pay attention to as the tick populations grow and change all around the world.

Ms. Murtaugh:
Before we close, Mary Beth is there anything other points you'd like to share with our audience?

Ms. Pfeiffer:
I just think that the image of Lyme disease is changing also in the media and in the public imagination. And I can't stress to you enough that anybody listening to this broadcast really should just take the initiative. When they see a story in the newspaper or hear it on radio and it's about Lyme disease or about ticks in the environment, respond to it. Give positive feedback. Say, "I'm really glad you're addressing this issue." Alternatively, if they are not doing it, contact them and ask them to cover this issue. I do see more national coverage. I'd like much more. I'd like more investigation of Lyme disease. But the stories that are now starting to come out are accepting the premise and the message of many, many Lyme advocacy organizations out there that we have gotten this epidemic wrong, that we need to go back to the drawing board and find out what's going on and why so many people remain sick.

Ms. Murtaugh:

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Thanks a great way to end the discussion for today. I'd like to thank my guest, Mary Beth Pfieffer, author of *Lyme: The First Epidemic of Climate Change. I'm Codyanne Murtaugh and this is ReachMD. Be Part of the Knowledge.*

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