

# Anaplasmosis in Maine

[Announcer] This program is presented by the Centers for Disease Control and Prevention.

[Sarah Gregory] Hi, I'm Sarah Gregory, and today I'm talking with Dr. Susan Elias, a staff scientist in the Lyme and Vector-borne Disease Laboratory at the Maine Medical Center Research Institute in Scarborough, Maine. We'll be discussing an increase in cases of the tickborne disease anaplasmosis in Maine.

Welcome Dr. Elias!

[Susan Elias] Well, thank you very much, Sarah!

[Sarah Gregory] Okay, while we're in the midst of this COVID-19 outbreak, it's important for people to remember that there are many, many other dangerous pathogens out there, right?

[Susan Elias] The coronavirus outbreak is really serious and it deserves our attention and focus. But I think that people, especially in Maine, are able to hold in mind that there are many other medical issues of concern. And a good example would be the opioid crisis, which is not an infectious disease, but poses a serious burden to the people of Maine. So, just trying to put it in a larger context, I think that people remain very well aware of other infectious diseases of concern. We still have seasonal flu underway and we have Lyme disease, for example, and now we have anaplasmosis taking center stage in the state. And given that the snow cover is mostly gone in southern Maine, we're having an early start to the tick season. So, it's really in our face, especially if you're a dog walker. We find that people who have dogs and take them out for walks are the first to know that tick season has started.

[Sarah Gregory] Okay. Well, then let's start by you telling us what anaplasmosis is.

[Susan Elias] So anaplasmosis, fully and formally, is called "human granulocytic anaplasmosis." And I bring that up because I kind of like to understand what words mean, and a granulocyte is a type of white blood cell. So, the organism that causes anaplasmosis is *Anaplasma phagocytophilum*, and it's like a cell-eater. So, it's a bacteria, and it's a bacterial infection that targets the white blood cells. So, it causes fever, it causes weakness and aches, and it can lower, actually, lower white blood cell counts and platelet counts.

[Sarah Gregory] And how does this differ from other tickborne diseases?

[Susan Elias] Well, so compared to Lyme disease, for example, anaplasmosis has a faster onset. There's no rash. Many people are familiar with the classic bull's-eye rash of Lyme disease, that doesn't happen with anaplasmosis. Your body mounts a quick antibody response, and it can actually...it can actually be life threatening in the elderly or the immunocompromised, that is, people with weakened immune systems. And that's not quite the case with Lyme disease. Babesiosis also can affect those vulnerable populations, again, those being the elderly and the immunocompromised.

[Sarah Gregory] Okay, so you just mentioned a couple others, but what are the other prevalent tickborne diseases in Maine?

[Susan Elias] So, the number one tickborne disease in Maine, as well as in the United States, is Lyme disease. In Maine, the number two tickborne disease is anaplasmosis, and number three is babesiosis. So, those are the three prevalent tickborne diseases in Maine: Lyme disease, anaplasmosis, and babesiosis.

[Sarah Gregory] Okay, and is anaplasmosis a greater concern than the others? I guess it would be, because you said it was more life threatening than Lyme.

[Susan Elias] Yes, so anaplasmosis, similar to babesiosis, can make certain people, certain individuals, severely ill and requiring intensive care unit support, and it can lead to death in some instances. So, again, it can be life threatening in the elderly or immunocompromised. And, you know, that population where you have a weakened immune system, that can be, because perhaps you are undergoing chemotherapy or maybe you have just, for some reason, a weakened immune system congenitally, or it could be due to having had another illness. So, there's a number of reasons—you know, HIV—that a person could have a weakened immune system. So, the important thing is to be aware that there are more vulnerable populations.

[Sarah Gregory] And why did you do this study? What were you looking for?

[Susan Elias] Well, so this surge in anaplasmosis received a good amount of media attention. We have a lot of media interest and general public interest in tickborne disease in the state of Maine. And so, in 2017, there was a jump in anaplasmosis cases that essentially doubled from 2016, and actually it increased by about 600% from 2013. So, there was this jump, and we were very interested in why this jump was; it represents about a 600% increase in cases. So, with a surge in anaplasmosis cases, we wanted to know if it had to do with increased transmission, and by that I mean more tick bites, or more transmission of the agent of anaplasmosis from those ticks, or could it be a manifestation of increasing testing efforts. So, we were trying to tease out whether the advent of DNA testing, otherwise known as “tick panels,” if that testing for anaplasmosis might be driving the increase in cases being reported to the state.

[Sarah Gregory] How did you conduct the study?

[Susan Elias] Well, so this was actually a lot of fun and just very interesting to try to take down the data and try to get at the relationships between the cases and the spread of ticks, the spread of the agent of anaplasmosis, and then testing efforts. So, the first task was to get the...oh, sort of organize the data on anaplasmosis itself, and the second thing to do was try and get testing data. So, we sort of had two arms of the study. One was basically the illness data, and the other was the testing.

So, for the illness, we...we...we got the case data from the Maine CDC, and this came to us by year and by county. So, of course, we tabulated it, and our period of interest was really 2013 through 2017, but we did have case data going all the way back to 2008. So, we tabulated this and we converted cases to incidence, which is the number of cases divided by the population of each county. Also, we did it at a statewide level for the tabulation, and we do incidence so that we can adjust for population. In the state of Maine, most people live in the southern half of the state—you have 1.3 million people, with the concentration in the southern part of the state. The counties have different populations, so we wanted to make sure that we were adjusting for population.

So, now we have anaplasmosis incidence. And then, one of our coauthors, Jessica Bonthius, thought it would be more robust if we also looked at hospitalization data. So, Jessica is with the Maine CDC and University of Southern Maine, and I think that was an astute observation of hers. So, we were able to pair the incidence data from the state with hospitalization data. And we tabulated the incidence, we tabulated also the hospitalization rate, again adjusting hospitalizations for population, and then we mapped it. And we wanted to map it because we

wanted to see, if we compared 2013 to 2017 side by side, would we see that...that jump in anaplasmosis happening in most of the counties, not just sort of a statewide number, but what does it look like if you break it down by Maine's 16 counties.

So, when you look at the anaplasmosis, it does jump in most counties. You see that this increase is almost statewide, less so in the northern tier of the state where there are still fewer ticks. And if you plot the hospitalization data, you see the very same pattern: you see that hospitalizations for anaplasmosis jumped between 2013 and 2017. So, we had this sort of five year window that we were looking at. And another pattern that we've seen before was very clear in these maps, which is that the incidence of anaplasmosis and the hospitalization rate of anaplasmosis are higher in the midcoast region of the state than in other areas of the state.

So, this is a little bit interesting, not the main focus of the study, but we see the same pattern with Lyme disease incidence, which is that there's this sort of hot spot on the midcoast of the state, these midcoastal counties have higher Lyme incidence than surrounding counties, even the ones to the south. And the reason that's curious is that the deer tick invaded from the south. And so, the way it works is the deer tick is an invader and it emerges, it has emerged in southern Maine, and it has spread northward and westward. And so, as it becomes established in the southern tier of the state, it is still emergent in the northern tier of the state, and we know this because we have two-and-a-half or three decades of surveillance data. And that helped us to map out the range expansion of the deer tick over time. So, it's very clear that the deer tick is moving from south to north; so, why is it that we have this kind of hot spot in Lyme incidence and anaplasmosis incidence in the midcoast? And that's a question that remains to be answered. It's very intriguing.

[Sarah Gregory] Um, yes...

[Susan Elias] Yes, so we'll need to look at the hospitalization side of that, as well as the testing side of that.

But, so, not to stray too far afield, but what tends to happen is, first you get the vector invading, and then you get the pathogens that it carries invading. So, first we get the tick, then we get the bacteria that causes Lyme disease, and now, following that, we're getting the bacteria that causes anaplasmosis. So, it seems to be ramping up following the wave of Lyme disease. And we think...we think, too, we're seeing babesiosis following the wave of anaplasmosis. So, it's the way that these pathogens are cycling, I think, back and forth between the tick and the host that the tick feeds on for a blood meal. But that's sort of the ecology and, just setting that aside for the moment, we then wanted to look at the testing data.

So, who does the testing? So, there's a number of commercial labs around the company that test people for vectorborne illnesses. So, Lyme disease testing is kind of an entity to itself, but currently, the way you would test for anaplasmosis is through a PCR test, which is polymerase chain reaction, so PCR, which targets the DNA that would be present for anaplasmosis. If it's circulating in a person's bloodstream, then the PCR test would be able to detect that. And if you have a tick panel, what you're really talking about is a PCR test that has multiple—it's a multiple test, it's a panel test—so depending on the lab, you might be able to simultaneously test for, not just for anaplasmosis, but also babesiosis, ehrlichiosis, and some other tickborne illnesses.

[Sarah Gregory] How accurate are these tests for these tickborne diseases?

[Susan Elias] Right. So, well it's interesting because, before even the advent of PCR testing for anaplasmosis, the best you could do was a blood smear or an antibody test and they had very low

accuracy. However, and this shows in the paper, the labs did some testing and their sensitivity and specificity is 1—like, its 100%, very accurate. Which means you're going to find your true positive and your true negative. So, we have a very high degree of confidence in these PCR tests for anaplasmosis with these labs.

So...so, what we wanted to understand, though, was how common were these tests even five years ago. So, we tabulated the number of PCR, you know, tick panels that were ordered from 2013 through 2017, we looked at that on a year by year basis, and we saw the steady increase in the number of these panels that was being ordered. So, you figure clinicians are becoming more aware of these tests, patients are becoming more aware of tickborne illness, and so, it's just becoming easier and more convenient to send out for these panel tests. And so, you can see that, where we've had about a 700% increase between 2013 and 2017 in anaplasmosis incidence, we've had over a 1,000% increase in the number of these panels ordered.

And these tick panel data came from two big labs. They came from the Mayo Medical Laboratories—and this is the data I'm talking about—the data came from Mayo Medical Laboratories, as well as NorDx. And so, NorDx is, you know, a Maine-based lab, and those two labs, even though there are a lot of commercial testing labs, those two labs were responsible for over 70% of all the lab-based case reports to the Maine CDC. So, we feel like we have a pretty good handle, you know, on the trend and the number of panels being ordered over time. So, yes, so you asked me, you know, how did we go about conducting the study? So, it was a really big deal to be able to obtain these data from these testing labs, and it was because we had some prior collaborations with clinicians who are part of these laboratories, and so we were able to get the data thanks to their help.

[Sarah Gregory] Okay. So, could you sort of capsule that and tell us what you found and how does anaplasmosis compare with Lyme disease in incidence now?

[Susan Elias] Um-hum. So, what we found was, not surprisingly, you know, big evidence through the mapping, that anaplasmosis is going through a range expansion, you know, moving from kind of the south-coastal area of the state on up northwestward, you know, sort of mimicking the range expansion of the deer tick and what we would expect for amplification of anaplasmosis in nature over time. So...

[Sarah Gregory] I'm sorry, let me interrupt you here, too—so this is all the same tick? They're not different ticks, bree...doing different diseases...they're all spread by the same tick, is that right?

[Susan Elias] Right. That's right. So, when we're talking about Lyme disease and anaplasmosis and babesiosis, I'm referring to diseases that are transmitted by the deer tick. This is, you know, our current situation in Maine and we've been, for the past two or three decades really concerned about the deer tick, or the black legged tick, if you will, exclusively, although we are rather concerned that we will soon be experiencing the arrival of the lone star tick. But, for the time being, when we're talking about anaplasmosis, we are talking about transmission from the deer tick, yes.

[Sarah Gregory] Okay.

[Susan Elias] So, we do see evidence, the mapping suggests that we are experiencing increased transmission from the tick, the deer tick. However, the testing data also strongly suggests that we're undergoing increased disease discovery. So, the surge in anaplasmosis also could be

attributed, in part at least, to the increased testing effort, so the advent of these PCR panels, these tick panels.

So, one thing that we were able to find in our study is that, where we had almost no pediatric cases prior to the advent of the tick panels, now we're seeing more pediatric cases. And earlier I said that one of the vulnerable populations is the elderly, so the elderly are more susceptible to severe cases of anaplasmosis. Whereas in children, they're typically, if they're infected, they're subclinical—they don't have symptoms; they might feel a little bad for a while, but they don't really come down with what could be obviously differentiated as anaplasmosis. But now that we have the panel testing, if a clinician sends out for a panel, you're going to be picking up those subclinical cases. And that's why we think that in the data we tabulated we see this appearance, after 2013, of pediatric cases, whereas before that we only saw one case.

[Sarah Gregory] Ah, I see. Okay. So, how do you explain the huge rise in hospitalizations for this...for anaplasmosis?

[Susan Elias] So, there is an increase in hospitalizations—I think we said that there was a 200% increase in hospitalizations—and...I'm just checking the data here...looks like a...for “All Ages” we had a 231% increase in hospitalizations from 2013 to 2017, compared to the 700% increase in incidence. But it's all up by orders of magnitude. And then we saw the 1,000% increase in testing.

But, to address the hospitalizations, again, we think it's a combination of increased transmission. So, maybe not necessarily more tick bites, but maybe those ticks have a higher infection prevalence with *Anaplasma phagocytophilum*, which is the agent of anaplasmosis. So that, that bacterial infection in that tick, we're thinking that it could just becoming more prevalent in the ticks. So, that's reason number one.

But reason number two could be the testing and the reporting. And what we're finding—I've done another analysis looking at Lyme disease case reporting in Maine—and just taking a look at some of the coastal towns, you can see that most town's case reports come through labs first. But some towns have the case reporting coming directly from clinicians. And, the thing about that is, more and more clinicians...the first report will not come from the clinician because, for one thing, clinicians are overwhelmed by the sheer volume of tickborne illness and they don't necessarily have time to do the reporting. And if they send out for a test, the lab has to do the reporting—that's mandated. So, somehow that case is going to get reported, but if it comes as a clinician report, it might indicate more reporting effort. And so, if you look at different towns, you might have a different ratio or balance of lab versus clinician reports. And that, too, could be muddying the waters.

So, the question then is...is that sort of hot spot of higher anaplasmosis incidence and higher anaplasmosis hospitalizations more about the transmission changing, or is it more about reporting differences? And I think we could get at that if we could drill down to a finer granularity with the testing data; if we could go to the county level, we might be able to understand more.

[Sarah Gregory] Okay, so what are your conclusions from this study?

[Susan Elias] Right. So, the conclusions are that the surge in anaplasmosis cases is probably due both to an increase in transmission of *Anaplasma* from infected ticks to humans, but also to an increase in this PCR tick panel testing. So, the thing we can't do, we can't conclude, you know,

the relative ratios of each of those yet. All we could do is really shine a light on the fact that this is kind of going on at the same time.

[Sarah Gregory] So, are there next steps or ways to further this study?

[Susan Elias] Yes, so I think if we could get the testing data from labs, possibly at the county level, we might be able to get a better handle on how...how the reporting has changed over time at a county level, right? What we know now is that...I should say that the testing has increased 1,000% between '13 and '17, right? In that five year period it's increased hugely, but that's on a statewide basis. What would it look like if we could see these panel tests broken down to the county level? That might tell us a lot.

I also think—and that would be on the testing side or the clinical side—I also think that we could step up efforts on the entomological side. It would be so helpful if we could collect ticks and test them more intensively for infection prevalence with *Anaplasma phagocytophilum*, that's the agent of anaplasmosis. If we could get an idea how that infection prevalence might be increasing over time or how it might be focal in some areas, and I also think if we could even get data on their blood meal hosts, we could look at the presence of *Anaplasma* in white-footed mice, red squirrels, chipmunks, and other animals like that, so we could figure out what's going on entomologically in these areas. So, we could really...if we could really focus in and get more detailed data, both on the entomological side and on the testing side, they would really illuminate it.

[Sarah Gregory] Whether there are hospitalizations or incidence or more testing or whatever, these numbers seem pretty bad to me. Are there ways people can protect themselves from getting these diseases, any of them?

[Susan Elias] There are many, many ways. And you're asking me about, I think, personal protection measures?

[Sarah Gregory] Right.

[Susan Elias] Right. So...and tick bite prevention basically breaks down into two large arms. One would be landscape, landscape measures that you can take to reduce your likelihood of encountering a tick. But if you want to focus on personal protection measures, that is a critical topic to cover. So, we have a beautiful state. We don't want people to stay inside, and we want people to get out, and people are very outdoorsy in Maine anyway. So, one thing that people need to keep in mind is that more cases of tickborne illness are acquired peridomestically, that is, around the home, than in any other circumstances. So, you might think, well, outdoor workers are more likely to be infected—we have a lot of outdoor workers in the state—or maybe outdoor recreators are more likely to be infected. And it's not that they're at low risk, but it really is the case that the highest likelihood of infection comes from just around your house. And we are a suburban and rural state, mainly rural, very ex-urban. And so, you know, people are going out to garden—gardening is huge—people are going out to their wood pile to get some firewood, they're letting the dog out, you know, everybody is outside playing—whatever you are doing, we are at risk of tick bite in our own yards. And so, I think, first and foremost, we need just to be aware of that.

So, if you think about my lab, that has been in existence for over 30 years, we've had dozens of staff, and we've spent so much time chasing ticks in the environment. And we've only had one case of Lyme disease in all this time, and part of it is an awareness. And so, I just urge people to

be...educate themselves, you know, understand when tick season is, understand where ticks like to be, and they like to be in your yard, for one thing.

And then in terms of “What do you wear?” “What do you put on yourself?” So, you've got clothing as a barrier and you've got insect repellent as a barrier. So, for clothing, the standard outfit would consist of long pants, light colored, a long-sleeve shirt, light colored, shirt tucked into pants, pants tucked into socks, and...so that's the standard outfit. Not everybody likes to go around that way, especially in summertime, so some do and some don't. Its ability to protect is somewhat murky. I think it's protective if you're really going to go out and chase ticks and crash around in the brush, you really should dress that way. Another piece of clothing that's very helpful is the “tick gaiter.” These are sold by many outdoor outfitters. They are soaked, impregnated with permethrin, and permethrin is a very good tick repellent. And you can put those gaiters on your boots and around your ankles. So, you know, that, that...the tick is looking sort of for the “Holland Tunnel,” being your pant leg; so you don't want to give them that opportunity to climb up your pant leg. So, that's the tucking in into your socks, as well as the tick gaiter. Some people like to wear long boots out, that's a good idea, you know—you could just wear boots up to your knees.

But it's always good to have the repellent to back up the clothing, especially if you're not wearing that specific clothing. I don't always wear that clothing when I go out; I like to wear shorts in the summer sometimes. But the permethrin is the repellent that you can apply to clothing. You don't want to put it on your skin, because the oils in your skin neutralize the permethrin.

[Sarah Gregory] Oh...

[Susan Elias] Right, so that's not for skin. Permethrin is for clothing. But we have a number of options to put on the skin. One is DEET...so, people don't care for DEET. I slathered my kids when they were growing up with picaridin, which comes as Avon Skin So Soft, but you can just buy a bottle of picaridin in any box store, some grocery stores, the hardware store, the drugstore, you can find a bottle of picaridin—that was my repellent of choice. And of course it repels mosquitos, too, so that's a bonus, and black flies, which don't vector anything, but nevertheless they are bothersome. Another...so, there's a number of, sort of, natural...natural products. One that I think has had some actual testing done as far as its efficiency for repelling ticks is lemon oil with eucalyptus. It smells really good. It's kind of a heavy oil, you have to apply it, reapply it. So, it really comes down to personal preference. But I think it's a really good idea for people to think about, parents especially.

So then, that's all good, but, at the end of the day it really comes down to the tick check. That is the most effective, and actually the most common, protective behavior exercised by people in high Lyme-incidence states. And so, the tick check is when you check yourself when you come inside after you've been outdoors: you check yourself right away, and then it's really good practice to check yourself before bed. And most people find their ticks in the shower. So, it's not that the shower is risky, it's just that there you are and this tends to be when people find ticks crawling on themselves or perhaps biting. So, really the tick check is the number one thing. If there's one thing you're going to do, it's got to be the tick check.

[Sarah Gregory] Okay.

[Susan Elias] Yup, and if you find a tick biting, first you really want to save that tick. You want to remove the tick and you want to save the tick. People are grossed out, they want to flush it

down the toilet, or worse. But it's a good idea to keep that tick because sometimes a clinician is going to want to have a better understanding of what happened to you, and if you have that tick, that's one more piece of evidence, right? That you've been bitten. And also, you can tell from the size, the degree of engorgement of the tick, how long it's been attached. And it's not easy to see macroscopically, just with the naked eye or even through glasses. But if someone can look at that tick through a microscope, that's one more piece of helpful information that can guide what you want to do next for treatment.

And as far as that tick removal, there's a number of ways to do it; tweezers are recommended, there's a number of different types of tick spoons that are out. The key is to get under that tick and pull gently but firmly. You want to try not to leave any of the mouth parts behind in your skin. If something does break off, that's okay. Your body is just going to push it out the way it would a splinter. But if you have that tick, save it. Put it in a...like a little pill jar or moisten a paper towel and put the tick on a moist paper towel—alcohol is even a little bit better, just rubbing alcohol, and then you can fold that up and put it into a plastic bag. And that's a good way to hang on to your tick.

A number of states have tick identification programs. Maine has one, it's no longer with us at the Maine Medical Center, but it's now at the University of Maine Cooperative Extension Service. And so, for free, they will identify your tick, it's just a matter of mailing it in. And sometimes they can do it if you take a picture and it's a good picture of the tick, they can do it that way. So, that's what you should do, and if you have any questions, go to a walk-in clinic, call your doctor, seek medical advice.

[Sarah Gregory] And if you do have one of these infections, is there reliable treatment?

[Susan Elias] Right. So, in the case of tickborne illness, early diagnosis and treatment is the key. With anaplasmosis, doxycycline is very effective; that's a very effective treatment. So, it's an antibiotic treatment. Of course, you would get treated by your clinician who understands, you know, your profile of...are you allergic to this or that. But yes, doxycycline is the starting point, and the same is true for Lyme disease.

Early treatment is key, it works better that way. My son had early Lyme disease, and he had a two-week course of antibiotics and he's fine. There is a small proportion, maybe 10% of the population, who goes on to have symptoms post-treatment. So, that's a different circumstance, but by and large, early treatment with antibiotics is very effective. So, that's why we want people to be vigilant, to remove the tick, to seek medical advice and to get as much information as they can from credible sources.

[Sarah Gregory] Okay so, as we're summing up here, tell us about your job.

[Susan Elias] Oh, my job is an interesting job! I wear a lot of hats. I actually have a Bachelors and Masters in wildlife science and a PhD in earth and climate science.

[Sarah Gregory] Oh!

[Susan Elias] But I think what that says is that there are many, many pathways to work in vector ecology. You almost have to be a multidisciplinarian to work in vector ecology. So...I, I do all kinds of things. So, with my staff, I go out in the woods in the summer with a corduroy flag chasing ticks. And in the wintertime, we've gone out to red maple swamps to try and suck mosquitoes out of their cold water crypts. And, so that's...there's a big field component work. I actually spend more time probably inside. I've conducted...well, I've been the research



coordinator in conducting several serosurveys, so there's a clinical aspect to my work. We're interested in serosurveys of Maine people to see, you know, where, where tickborne illness is located and how it might be moving through time. But I do spend a lot of time with data on the computer—we have large, cumbersome data sets. I love to analyze data! I do a lot of paper writing, and we're involved in writing grant applications, of course. Research compliance is a big part of the mix. We keep track of our budgets. And I think I could speak on the behalf of all our staff in saying that we enjoy mentoring quite a number of students. We have undergraduates who are interested in infectious diseases and tick- and mosquito-borne diseases, and we have also had research doctors who come through as research fellows who are interested in diving into a specific aspect of vectorborne disease. So, we've got a lot going on.

We have a vectorborne disease working group in the state, and most of us involved in vectorborne disease work in any capacity, meet. We meet every other month to try to push forward consolidated messaging on how to avoid tick bites, how to protect against mosquito bites, and so forth. And I also serve on the Maine Climate Council, which was convened in 2020. The Maine Climate Council is charged with developing a plan to reduce greenhouse gas emissions and also to adapt to inevitable impact of climate change. So, I'm serving, you know, in my capacity as a vectorborne disease ecologist to contribute to that work.

[Sarah Gregory] Wow! Well, I was going to ask you what you do for fun in Maine, but I'm not sure you have any time left over to do anything fun...

[Susan Elias] Oh, no. Work hard, play hard! Let's see...so, yeah like a typical Mainer, I love outdoor activities—backpacking, canoeing, hiking, swimming, you know, all which put you in or near the Maine woods. I like to suggest to people, you know, just as it's better to be “germ aware” than “germ phobic,” let's be “tick aware” and not “tick phobic.” I think that it's very important, you know, that we think about nature deficit disorder and we don't want to leave people inside. We want them to get outside because of the health benefits, physical and mental, of being outside. So, it's better to be educated and prepared.

So, yeah, I also...I ski—I'm a Nordic skier—and I play hockey, and that doesn't really entail high risk of tick encounter. But to be honest, we're experiencing warmer and shorter winters here in Maine. We have less snow, less snow deaths, we have earlier ice-out, and what that means is ticks can start questing earlier in the spring. We can see it in the data, it's very clear. So again, the key thing is for people to just be aware if there's no snow on the ground between you and the ticks, then, you know, there's an opportunity for ticks to quest and find you.

[Sarah Gregory] Well thank you so much Dr. Elias for taking the time to talk with me today.

[Susan Elias] Well Sarah, it's been a real pleasure! Thank you very much. I appreciate the opportunity.

[Sarah Gregory] And listeners can read the February 2020 article, Surge in Anaplasmosis Cases in Maine, USA, 2013-2017, online at [cdc.gov/eid](https://www.cdc.gov/eid).

I'm Sarah Gregory for *Emerging Infectious Diseases*.

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