Tick-Borne Disease Working Group
9:06 AM to 9:48 AM

> John Aucott: We are getting ready to convene the second meeting of the working group. We're going to begin by roll call of attendants, and answer if you're here. Vanila M. Singh, Absent. Richard Horowitz?

> Richard Horowitz: Present.

> John Aucott: Ben Beard?

> Ben Beard: Here.

> John Aucott: Karen Vanderhoof-Forschner

> Karen Vanderhoof: Here.

> John Aucott: Okay. Estella Jones, absent. Scott Cooper?

> Scott Cooper: Here.

> John Aucott: Wendy Adams?

> Wendy Adams: Here.

> John Aucott: Allen Richards, absent. Lise?

> Lise E. Nigrovic: Here.

> John Aucott: Dennis Dixon

> Dennis Dixon: Here.

> John Aucott: And Patricia Smith.

> Patricia Smith: Here.

> John Aucott: And Kristen Honey?

> Kristen Honey: Here.

> John Aucott: All right. We have a quorum and we'll begin the meeting.

We're going to start off with a little bit of welcome and review of meeting one. I think the feedback on meeting one has been excellent.

And as a working group we're really pleased with the ability to bring so many diverse group of stakeholders and patients and representatives and health professionals into one room to discuss and listen, mostly, yesterday about the topic of tick-borne diseases and Lyme disease. And so, we thought it was a great success.

We heard from a lot of patients and stakeholders, and the message was really one of open-mindedness, civility and respect, and an aspect of appreciating everyone's individual views.

We heard from Gregg Skall and Lorraine Johnson, and from many individuals. And what they focused on were the gaps that the patients and groups perceive, and experience, in the care of tick-borne diseases and Lyme disease. So, we heard about the gaps, we heard about individual stories of delayed and misdiagnosis. And we learned about the lack of awareness of the chronic illnesses that the patients had experienced, and so, their options and their histories of their troubles and struggles with their illness came out through the discussions that we had yesterday. So, it was really a good time to listen to those, and it was a good day.

>> Kristen Honey: Sure. And just a couple highlights from yesterday is that we are looking forward, we're hitting a new reset and a new chapter in tick-borne illness. And the division of the past, we can't change that, but we can bring those different voices and perspective together to move forward. The analogy of everyone having a different piece of this elephant, I think, goes a long way with tick-borne illness, Lyme disease, and all the Lyme co-infections. And the common denominator is putting patients first, and how do we have the patient perspective on better health outcomes.

So, with this working group, we had talked about really having all perspectives valued and equal whether you're an MD, a Ph.D., 40 years of research experience, or 40 years of experience in your own body, or the loved one of someone's who's sick with a tick-borne illness. So, this is a place where all perspectives are valued and will be incorporated into the solutions going forward. We kind of dubbed it a tick-borne tribe, and we talked about better health through better partnerships, and thank you all for being a part of that co-creating solutions together.

>> John Aucott: So, our goals today, we'll continue with the first part of the day will be more listening. We have groups of key stakeholders and more public comments that we'll be going through. I want to kind of compliment everyone yesterday that presented and kept to the time course, and we'll be sticking strictly, again, to the time course so that everyone gets a chance to have, and give their presentations. We love that people treated each other with respect and civility yesterday, and we're going to obviously keep in that theme of respect and civility, and holding each other, you know, as an individual in their views.

So, with that, we're going to transition now to our stakeholder presentations. And Kristen will introduce the speakers that we have here today, starting with Sam Shor.

>> Kristen Honey: Great. Thank you all. And Sam, feel free to come up here.

Dr. Sam Shor is with the International Lyme and Associated Diseases Society, ILADS. ILADS is a non-profit, international, multi-disciplinary medical society dedicated to the appropriate

diagnosis and treatment of Lyme and associated diseases. ILADS promotes understanding of Lyme and associated diseases through research, education, and policy. They strongly support physicians, scientists, researchers and other healthcare professionals dedicated to advancing the standard of care for Lyme and associated diseases. Let's give a round of applause for Sam.

>> Sam Shor: Thank you, Chair Aucott, and the organizing committee for allowing me to speak on behalf of ILADS as Kristen had just mentioned.

The goals that we have are, what I believe, has been verbalized already by Dr. Aucott, improvements in prevention, detection, and outcomes. And I hope that that theme will be -- resonates with the talk that I'm giving today.

And the perspective that I'd like to give is in relation to three areas of hot debate that need to be raised directly. The first is going to be the diagnostic two-tiered system, concept of chronic Lyme disease, and the use of longer-term antibiotics, and the concept of guidelines versus dogma. Guidelines are used to advise individuals in a certain topic. Dogma is a fixed belief that is expected for people to believe without question.

In this arena, we believe that there are many who held -- hold the two-tiered diagnostic system as the dogma of the diagnosis, and we would argue that there are alternative interpretations of the literature that suggests that that highly sensitive, quote, unquote, two-tiered system is, at best, 50 percent sensitive. That it -- an extension of that concept is when an individual may be told that their test is negative, and Lyme disease has been ruled out. Well, as a member of the Virginia Governor Task Force for Lyme disease, one of the position statements we had was that there was no test at that time, and I would argue at this stage of the game, as well, that can absolutely rule out this condition.

The next concept is chronic Lyme disease. For purposes of this discussion, I'm describing this as a multi-system illness that is the result of an ongoing infection by any of several pathogenic members of the Borrelia burgdorferi sensu lato complex. According to those who, unfortunately, have the tendency to restrict care, quote, there is no convincing biologic evidence for the existence of symptomatic chronic Borrelia burgdorferi infection among patients after receipt of recommended treatment regimens for Lyme disease, and many use this concept as an extension that chronic Lyme disease does not exist.

Well, alternatively, I would argue that not only does post-treatment Lyme disease not -- does exist, but that there are many who fall into the category of non-diagnostics, and that, unfortunately, concept of chronic Lyme does not exist, overlaps into a large category of individuals who are ill, but just haven't been diagnosed.

The literature, both animal, and human literature supports the persistence of this organism in the setting of directed antimicrobial management that's been recommended. Twenty-five to 71 percent of patients in the series identified here shows that short-term antibiotics fail in patients with late-stage disease.

Then in terms of folks who are untreated and undiagnosed, there's a plethora of literature to

indicate the clinical manifestations that have the potential to occur in individuals who are not treated, whether it be chronic fatigue, arthritis, it's particularly neurotropic so that many neurologic manifestations have been identified.

And there are a number of contributing factors to the large cohort of individuals who are undiagnosed or have delays in diagnosis. There's a growing tick exposure risk, the incidence of Lyme disease has been identified as being larger than historically identified in 2015, increasing the incidence CDC from 30,000 to 300,000 per year of new cases. And many believe that that is underdiagnosing the true nature of the condition.

The other major contributing factors include that this is a very small vector, that the nymph which is the far second to the -- far right, is the most common that's transmitting the -- this infection. And many people, and arguably, some series, the majority of people don't remember having had a tick bite. The range of developing everything but erythema migrans is from 30 to 70 percent in the literature. So, many people don't remember a tick bite, don't develop the rash. They present with common symptoms, chronic fatigue, headache, joint pain, who doesn't have that at some time or another. And this is in the setting of being also considered by Pachner as the new great imitator, confused with conditions such as multiple sclerosis, brain tumor, and psychiatric derangement.

Co-infections to which others have eluded have the potential of increasing the severity and duration of a particular individuals' illness, so there's a synergy that can occur in this condition with tick-borne illnesses, and this is the setting of the diagnostics that are, unfortunately, insensitive in the political environment where those within a position to promote such guidelines are saying, in fact, it is highly sensitive.

So, to give an example of the statement that's on the CDC.gov, many doctors may not consider tick-borne diseases in diagnosing your illness unless you report being bitten by a tick. But, I've already eluded to the fact that the majority of individuals in some series don't remember being bitten by a tick. So, you're excluding a large proportion of individuals at the outset with your history taking if that is a criteria that one uses, that's promoted by the CDC.

And then the tendency to restrict care, there is no benefit for long-term antibiotics of Lyme disease. In fact, that was based upon the four NIH sponsored studies, two of which had subcohort analysis that did show clinical benefits to prolonged use of antimicrobials and the other two NIH protocols were failed to be profoundly flawed and not generalizable. There also were four non-NIH studies that showed benefit of longer-term treatment.

So, in summary, I'm hoping that there is no place for dogma, particularly in a field for which there remains so many questions. That we need this working group to maintain an open balance interpretation of the literature. This can then drive more appropriate education to clinicians, the public, and governmental agencies, and thus supporting the goals to improve prevention, detection, and outcomes.

Thank you.

>> Kristen Honey: Thank you, Sam. And some people may know him as Dr. Shor, but we've decided with this group, for now, to go on a first name basis because we want all perspectives to be equal. So, I am Kristen, not Dr. Honey, and that was a great presentation by Sam and ILAD.

So, thank you all, and you'll see the same thing on the agenda where we drop the titles, and that's in an effort to focus on the mission and problem-solving.

Next up we have Elizabeth Maloney who will be virtually joining us with a PowerPoint that will talk to us, I'm told.

She's with the Partnership for Tick-Borne Diseases Education. Elizabeth Maloney, or Betty Maloney, is President of Partnership for Tick-Borne Diseases Education, a 501(c)(3) organization that provides evidenced-based education on tick-borne diseases to a wide range of users, including accredited CME courses for physicians.

>> Elizabeth Maloney: Hello. Thank you for this opportunity to present my thoughts on your very important task. My comments will focus on gaps in our knowledge base. While I recognize that your charge extends to all tick-borne diseases, due to time constraints, I'll primarily address Lyme disease.

Prevention involves limiting exposure, using protective measures, and managing known bites. Is it possible and feasible to produce a sustained reduction in tick populations and/or halt range expansion?

What are the motivators and barriers to practicing prevention? What's known about the relative effectiveness of various personal prevention strategies? If we can't get people to take all steps, which ones do we prioritize? We need a highly effective strategy for managing high-risk bites and neither single dose doxycyclines, nor topical aztihtromycin, are it. Although earlier studies of multi-day regimens fail to demonstrate efficacy, Zeidner's findings suggest that strategy deserves further study. Might herbal preparations work, thereby avoiding antibiotics altogether.

The pathogeneses of Lyme disease requires additional study. It would be useful to know how species and strain variations in these areas play out in infected individuals. Clinicians might be better able to tailor antibiotic regimes based on the identified strains pathogenicity, and antibiotic susceptibility.

With regard to host-pathogen interactions, is there something to be learned by studying healthy seropositive individuals? What explains variations in clinical presentations? Is it due to differences between B. burgdorferi strains, differences between hosts, or a combination of these elements? Consider the EM rash, if it represents an immune response to the bacteria as they migrate through the skin, what does its absence imply? Does it reflect an impaired immune response, or simply infection with a strain that doesn't elicit that specific response?

Disease latency is known to occur, but how and why this happens is unknown. Similarly, triggers for B. burgdorferi reactivation have yet to be identified. The clinical relevance of morphologic variance and persister cell populations needs to be formally investigated. In-vitro

studies demonstrated that morphologic variance and persisters do not respond to commonly prescribed, single agent regimes. Clinicians who treat long-standing cases of Lyme disease report that many patients respond to combination therapy. And they also note that successful combinations are remarkably similar to the effective combinations identified in Feng studies.

Both Dressler and Bacon demonstrated that serology is more sensitive for identifying Lyme arthritis than neurologic presentations. What accounts for those findings? Embers demonstrated that the C6 antibody response in prolonged, untreated disease wanes despite ongoing infection. Why does this occur? Is there a point where the immune response shifts from eradication to localized containment?

Given the frequency of post-treatment manifestations and the controversy surrounding the topic, this requires a biased free investigation. There's ample evidence demonstrating that B. burgdorferi can persist following antibiotic therapy. Therefore, we must leave that debate behind and turn our attention to investigating how B. burgdorferi survival mechanisms might be overcome.

It should also be determined whether or not the immune response can become uncoupled from the pathogen such that it churns on despite the absence of B. burgdorferi. And, if this can occur, how might it be stopped or prevented?

Available serologic tests are unreliable and newer, shinier sero assays are not the answer. Clinicians and researchers need clinically validated methodology that can directly identify Borrelia burgdorferi.

The trial evidence to date is inadequate and many findings cannot be taken at face value. Thus, the optimum therapeutic approaches for all disease stages remain unknown. Lyme disease is a complex illness that does not lend itself to being studied with conventional, randomized controlled trials. Pooled information from multi-centered observational studies in clinician reports might be a more efficient way to gather clinically useful information. Yet conducting trials without a better understanding of the pathogenesis, and without tests that reliably determine infection status strikes me as putting the cart ahead of the horse.

Because patients need treatment in the here and now, you may be encouraged to provide therapeutic advice. Recall that was does or doesn't work for average --

[inaudible]

-- patients. Looking at this diagram, we can consider what happens when therapeutic efficacy is defined as any response to the right of a preselected cut off value. When the cut off is A, the drug is efficacious. Shifting the cutoff to B makes it ineffective for the group at large, despite remaining beneficial for some. As Kravitz points out, rigidly applying trial findings is counterproductive to patient care.

Many of the physicians who treat complex and long-standing cases of Lyme disease report that their patients had more than one tick-borne infection. Unfortunately, this patient population

hasn't been studied. That's a glaring hole, especially when evidence suggests the potential for pathogen synergy that may have clinical ramifications. For example, Zeidner's mouse studies demonstrated that the prophylactic efficacy of single dose oral doxycycline dropped from 47 percent when the animals were exposed to B. burgdorferi alone, to 20 percent when they were simultaneous exposed to both B. burgdorferi and Anaplasma phagocytophilum.

Not all federal activities are helpful. Prevention campaigns are too limited. Some CDC and NIH generated information contain biases or distort the evidence. This is especially true in the discussions of persistent Borrelia burgdorferi infections in the clinical utility of two-tier testing. The NIH Xenodiagnostic paper claimed a different primary endpoint than that reported on Clinicaltrials.gov, and appears to discredit its own positive finding of persistent Borrelia burgdorferi DNA in a patient who remains symptomatic more than 400 days post-treatment.

So, how do we get the biggest bang for our buck? In the immediate future focus on educational activities such as prevention campaigns and meaningful physician education. Although the trial evidence is weak, there's enough there to prompt a change in current practices, especially with regard to managing known tick bites, and patients with EM lesions. Appropriate therapeutic risk stratification in these groups should reduce the number of patients whose infections progress to an antibiotic recalcitrant state.

Encourage the CDC and NIH to clean up their websites.

[inaudible]

Looking further ahead understanding the pathogenesis of all tick-borne diseases is critical. Clinicians and researchers need reliable, direct tests of B. burgdorferi infection. The public needs a vaccine that covers multiple tick-borne diseases and provides safe, effective and durable protection. Clinicians and patients need generalizable, patient-centered, therapeutic trials.

My thanks to panel members. You've taken on a truly monumental task. It looks like you're at base camp. Best wishes for your successful climb.

[applause]

>> Kristen Honey: And next up we have Dr. Paul Auwaerter from Infectious Disease Society of America. Paul, please come on up.

Paul is a Sherrilyn and Ken Fisher Professor of Medicine at the Johns Hopkins University School of Medicine serving as a clinical director for the Division of Infectious Disease and Director of the Sherrilyn and Ken Fisher Center for Environmental Infectious Diseases. Paul's research and clinical interests include improving the diagnostics and care for patients with Lyme disease, and this year he is serving as the President of the Infectious Disease Society of America, IDSA, the largest professional society worldwide related to infectious diseases.

>> Paul Auwaerter: Thank you, Kristen, and also Chairman John and the working group for the opportunity to present today.

I give you perspective, and at least speaking on behalf an 11,000-member organization as well as over 20-year experience in providing consultative care for patients who have come to be evaluated for Lyme disease.

As mentioned, I think, what IDSA is committed to hues very closely to what I believe are the goals of this working group, including surveillance, prevention, diagnostics, and an ability to really provide the best care as evidence does inform in terms of treating Lyme disease.

So, to proceed through a couple of key areas, the first I would say in terms of a recommendation would be surveillance. I'm sure everyone is aware that there's been geographic spread of Borreliella if you want to use a more updated taxonomy, into states that 20 years ago had not been at all involved such as to -- to such a degree such as Pennsylvania. So, there are a number of neighboring states where the incidents will be increasing, and I think surveillance in those areas would be of great benefit to people, as well as monitoring for other tick-borne co-infections which has been articulated so far.

So, another aspect is on prevention. Prior CDC trials have tried to use acaricides and impact tick prevention strategies that have not really had impact on clinical outcomes, so if there is a strategy to help with Lyme disease on the tick population, those studies should be designed so that they are large enough to try to decide if such environmental interventions may benefit human health as well.

And as I -- has already been articulated this morning, for me, as a Lyme disease researcher, the greatest impact, I think, would be advancing an efficacious Lyme disease vaccine. Of course, there had been one, now almost 20 years ago that had been marketed and approved by the Food and Drug Administration, but the uptake was not great and then was withdrawn from the market after some unsubstantiated allegations such that the market share dropped. I would say that there is hope because there are over five groups of researchers working on new Lyme disease vaccines.

And I do want to take a moment discussing Lyme disease vaccines because I think this is something that if you were to try to design, you would like to make sure that the vaccine covers all types of Borrelia, that it would provide protection, have at least an 80 percent efficacy and -- I'm sorry my glasses are so far away, I have to turn my head. The vaccine should be made standard for active children and adults in states that Lyme disease endemic. As an outdoorsman and Boy Scout, myself, I think this is a vaccine that I would have great interest in.

The economics are pretty easy. I think for anyone that studies vaccines, given the acknowledged cost in human disease, the suffering, the healthcare economics, a vaccine is always cost effective if it works well, and I don't think this is something that would be put out through all 50 states, but would be targeted. So, I think the working group should take a strong look at potential vaccine candidates, really emphasize are we doing enough research and development? And, consider, in fact, even whether you may recommend to Congress and your regulatory agencies, incentives to spur vaccine development.

Now, as already been mentioned, I believe, I firmly believe that an accurate diagnosis best informs treatment. And so, when you look at diagnostics, it's important to know that at least for the moment the only well validated, clinical diagnostic tools include serology. Now, working as infectious disease physicians, serology has its inherent limitations. It does depend on the immune system, that immune response can be variable. And, indeed, people who have just been infected with Lyme disease may not have a positive blood test, so we have to depend on the rash, everything with migraines. So, there is indeed a handicap, especially early in the diagnosis of Lyme disease where we do have a gap and that gap has been important, I think, to try to tackle.

Current serology, I think, does perform well as immune response responds.

We are -- there is some good progress because the federal agencies have developed a serum repository of well-characterized patients who have Lyme disease and allowing for testing of new diagnostics against benchmark standards. So, I think this is a good first -- a good step, I should say, towards allowing researchers and manufacturers in terms of developing the next generation of diagnostic tests with direct detection, I think, being important.

So, in terms of needs, without a doubt, there's still often confusion about how to interpret tests, and also lessen false positives and negatives, so there is much work to be done there just in our current clinical standards. Direct detection tests would allow for, I believe, earlier detection of tests. Unfortunately, our current diagnostics that are available such as PCR and so on, don't really rise to that challenge. The tests, also, could be developed to help correlate with microbial cure. So, because we're not really dealing with an easily culturable organism, I think this is another avenue that would be important when trying to emphasize testing.

Education has already been discussed, and I agree that education about using diagnostic tests both in areas where there is lots of Lyme disease, and also in areas where there's not Lyme disease is important because what we call the predictive value of tests is very dependent on how often the disease and infection might occur.

And just like with the vaccine with diagnostic tests, this is a low margin industry for business, people don't make a lot of money, at least companies tell me this. So, for companies that are investing in new diagnostics, incentives would be another avenue that might -- the working group may wish to consider to spur this along.

In terms of treatment and therapy, I would tell you that there's really been no evidence yet that longer therapy of early Lyme disease has any benefit than some of the treatment regimens you have here today. Certainly, everyone doesn't respond, and that is an important point which has been made. But additional and longer treatment for early Lyme disease has not yet been shown to be efficacious, or we would adopt that particular approach.

Additionally, for patients that certainly do not improve after antibiotic therapy which I see, and are, indeed, a struggle that I have in the office every day. Well performed, randomized control trials have not shown that giving antibiotics have really yielded durable benefit -- sufficient, or durable benefit. And I think two other important points are to be made here. These trials look for whether infections were viable and still present in these patients, they were not found. And

also, in these randomized placebo-controlled trials, the placebo response rate was in the 30 percent range. So, I think, when you're trying to analyze if someone has fatigue or pain which is really terrible and devastating for their health and family, are we really doing better than that placebo response rate with their interventions, so that is very important.

On the flip side, I think many of you know that we are dealing with problems all over, not just in tick-borne diseases with excessive antibiotic use, there are downsides, clostridium difficile infection, public health and drivers of antimicrobial resistance, and indeed patients who don't appear to have Lyme disease but had received long-term therapy, have had complications including death and intensive care unit stays.

Lastly, certainly, I do believe, looking at Lyme disease, that Lyme disease can serve as a model for understanding why fatigue, pain, sleep disturbance, does not improve after antimicrobial treatment. Not unique to Lyme disease, it occurs after infectious mononucleosis, Q fever, but it is a model to try to help understand this. And I think that this kind of mechanistic understanding can help and inform both diagnostics and/or effective clinical therapies.

So, in conclusion, the Infectious Disease Society of America will certainly stand by high-quality evidence that helps inform both diagnosis and treatment. We've made some prevention recommendations which I think ultimately is probably the most important to try to help decrease the growing numbers of patients with Lyme disease and help maintain not only individual health but improve our public health.

Thank you.

>> Kristen Honey: All right, let's give Paul another round of applause there.

So, I have to say it is great to see ILADS and IDSA coming together on the same stage, sharing their facts, their data, so we can put everything in one place and move together forward beginning now. So, thank you, again, to our speakers.

Now, to close out this round, last but not least we have a four-stakeholder talk, then we'll take a short break and resume some other stakeholder perspectives.

I'd like to welcome Dr. Oscar Alleyne, National Association of City and County Health Officials. Dr. Oscar Alleyne is a senior advisor for public health programs for the National Association of City and Health County Officials, NACHO, in Washington, D.C. NACHO comprises of 3,000 local health departments across the United States. Together they form an organization focused on being a leader, a partner, a catalyst and a voice for change from local health departments across the nation. Welcome.

>> Oscar Alleyne: Good morning.

I thank you for the opportunity to be in front of you today. I must say a few editorial things, its NACHO, not NACO or Nacho, a lot of people like to say, nacho, especially the Texans.

Additionally, National Organization of County, City Health Officials, essentially as was mentioned represents those county and city health departments who are on the front lines with respect to public health. Often, when we get into this conversation about tick-borne diseases, it has focus, of course, on the patient side of the coin, and on the federal, I guess agency perspective. And there isn't a lot of that integration where you find the states and locals who are knee deep in many of these interactions as far as hearing their voice as part of this particular struggle.

So, I come before you in this opportunity to share some of these perspectives. And more specifically, though I'm now the Senior Advisor for Infectious Diseases Informatics and Emergency Preparedness at NACHO, I've spent 16 years of my life as the Director of Epidemiology and Public Health Planning for Rockland County, New York which is, for those who don't know, one of the endemic counties as Lyme disease and other tick bornes.

In fact, I can tell you that from Powassan to Ehrlichiosis, Babesia and Lyme disease, I've probably gone through hundreds, if not thousands, I would say, per year, of these cases and having to sit in this juncture with being the provider of those essential public health services, the ability to track, report these information, and also communicate with the community, the residents, and those who are concerned about the impacts of tick-borne diseases on their lives. And that's, essentially, the point of my presentation and talk today.

The role of the essential public health services by local health departments has been one to ensure that not only is surveillance to be of paramount importance where those of you who or may not know, there are over 70 diseases that are required to be reported and monitored daily. When physicians diagnose or suspect, a case of Lyme or other tick-borne diseases, they have a public health authority, or responsibility, of reporting that to the local health departments. So, often times when you hear of the data and statistics, that's information that is gathered by the men and women on the fields of public health at the county and city level.

So, the ability to have effective surveillance, to have the ability to not only move from the old ways of paper-based reporting to electronic reporting to enhance those opportunities found with electronic health records, to have a quicker, I guess, response to identifying illnesses in the community and responding to those illnesses, and developing not only that, but I would say the educational modules and the prevention steps to engage the community residents to empower them to help to be stewards of change with respect to fighting this particular illness.

So, that's the been the role of local health, and quite remarkably, as I said. And our previous colleagues have mentioned, we've seen this change where we have gone from endemic in some of our jurisdictions like where I hailed from to emergent threats such as the Northeast and Midwest -- further Northeast and Midwest, where we've seen these tick-borne elements have really passed on with some degree of fervor.

So, the role of the technical expertise, and how to translate theory into practice, has been another significant strength. So, the ability to take the data and the research that have been mentioned before and integrate it into effective practices that are not only evidenced-based but what I also would normally tell folks, that are practice based evidence.

Local health departments have been very systemically involved in the community collaborative process. When I was in my local county health department, as well as other colleagues across the country who were impacted by Lyme, we engaged our communities to ensure that there were collaboratives around tick-borne diseases. Being able to essentially translate the most recent data, and also hear the voices and understand the commitments from the communities' perspective as to what can be really effective strategies, priorities for not only intervention but also prevention in some way, shape or form, to address the impact of tick illnesses.

So, we can't go around talking about that without discussing the impacts of vector control. Vector control, those of you who may or may not know, is actually practiced at the local level. Whether or not it's the county health department, or the municipalities and jurisdictions that are sub-county, the role of the vector control data and the processes need to really be overhauled, or I should say, supported in our particular country.

So, one of the biggest pleas as far the next steps that we can say and imagine is how well can we integrate true partnership and stakeholder engagement? We have prioritization that we've seen from our colleagues in CDC, we've seen the role of the Commission, we've seen the role of the community activists, and the community concern groups, so how can we help be that -- part of the that bridge to ensure that as we move forward and not only develop a new and better effective diagnosis, new treatments, but also new education elements to really move it from that of being a didactic process to one that brings the data to life?

Thank you.

>> Kristen Honey: Let's give one more round of applause to Oscar and all those on the local front lines.

Thanks to all our speakers. We are going to take about a 15-minute break, we will convene at -- what time?

>> Male Speaker: Ten o'clock.

>> Kristen Honey: Ten o'clock. We'll convene at 10:00 and then we'll hear some more perspectives. Thank you all.

>> Male Speaker: U.S. Department of Health and Human Services. Produced at taxpayer expense.

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