

Dengue Fever in the United States

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

[Ted Pestorius] Hello, I'm Ted Pestorius and today I'm talking with Dr. Amesh Adalja, an associate at the Center for Biosecurity and a clinical assistant professor at the University of Pittsburgh School of Medicine. Our conversation is based on his policy review of dengue outbreaks in the United States, which appears in CDC's journal, *Emerging Infectious Diseases*. Welcome, Dr. Adalja.

[Amesh Adalja] Hi. Thanks for having me.

[Ted Pestorius] You're very welcome. So let's start with the easy one: What is dengue?

[Amesh Adalja] Dengue is a viral disease that's widespread throughout the world, spread by mosquitoes.

[Ted Pestorius] How's dengue different from dengue hemorrhagic fever, which so many of us have heard about?

[Amesh Adalja] Well, dengue really causes a spectrum of illness. In some cases, some people might not even have any symptoms at all, and some people may have fever, rash, and body aches that last about a week, and that's typical dengue, and that's what people refer to when they're just talking about dengue. Dengue hemorrhagic fever is a type of what's called severe dengue in which, after the usual symptoms of ordinary dengue appear, symptoms of leaky blood vessels and destruction of platelets occur. So blood clotting abnormalities occur and the patients go into shock because of all of the fluid loss that occurs, and that shock can be fatal.

[Ted Pestorius] So is dengue a common problem in the continental United States? I think of it like malaria, something that people get outside of the US.

[Amesh Adalja] In the past, dengue was much more common in the US, but for the last several decades dengue is really a minor problem in the continental US and has really been found in three locales: Florida, the Texas-Mexico border, and Hawaii. However, it does occur in places like Puerto Rico and the US Virgin Islands. But the United States, in general, has the mosquitoes that spread the virus all over, so when travelers from areas that have dengue arrive in the US, they can be bit by those mosquitoes and then start local outbreaks.

[Ted Pestorius] Well, in your dengue outbreak policy review, you discuss three outbreaks since 2001. Can you tell us a little bit about those?

[Amesh Adalja] Sure. So the three outbreaks were Hawaii, Texas, and Florida. The Hawaii outbreak occurred in 2001, interestingly right around September 11, and was centered in a rural area on one of the islands. And there's two mosquitoes that primarily spread dengue, and this one was spread by the non-usual mosquito; it's the one that's not quite as good at spreading it and that may have helped stem the outbreak. But nevertheless, there was a major response from

health authorities on the island, and they really had to balance their concerns with the tourist bureaus, which I think was a very interesting thing, because Hawaii's economy is so dependent on tourism, and especially in the setting of September 11 when tourism was down, they really had to have a nuanced message that didn't take away from their tourism but, again, didn't put anybody at risk. In all, they had 122 cases identified on three of the Hawaiian islands.

The Texas outbreak occurred in 2005, and this is an interesting case because the first case was actually a woman who contracted dengue in Texas and then travelled from Brownsville, Texas to Mexico for medical treatment and then was subsequently diagnosed with dengue fever across the border in Mexico. And she actually had dengue hemorrhagic fever, which is one of the first indigenous cases of dengue hemorrhagic fever we've had in the United States in quite a while. But the Texas outbreak wasn't that unexpected because people had known for a while that this cross-border type of dengue could occur and Texas public health had really attuned people to the risk of dengue and had laid a lot of ground work for expecting dengue in the years prior. So, that was kind of the key interesting point of that outbreak.

The Florida outbreak was much more recent; it occurred in 2009 and 2010, and there are still some cases trickling in in the Florida area. And this began in Key West. Key West is a little different than other parts of the United States and they have something there that they call the Key West lifestyle, which involves being out in the open air, keeping your windows open without screens, and it really makes it ripe for dengue to occur once you get the right mosquitoes around that are infected. And what ended up happening is this outbreak got managed very aggressively because Key West is in Monroe County, and Monroe County has a very active vector control division and they were really all over this outbreak and really did some innovative stuff with getting the public involved and getting rid of some of the areas that the mosquitoes were breeding. But I think that since there's been more cases that have occurred in Florida since the end of this outbreak, in other areas, we're only probably seeing the tip of the iceberg of dengue in Florida. There's probably more undiagnosed cases occurring, and as I said before, some people with dengue fever are completely asymptomatic so you wouldn't pick it up. So I suspect that there's more cases occurring in Florida.

[Ted Pestorius] Now before these recent outbreaks, over this last decade, when was the last significant outbreak in the continental United States?

[Amesh Adalja] In the 1940s.

[Ted Pestorius] Really? So we had a gap from 1940 until approximately 2001?

[Amesh Adalja] Right.

[Ted Pestorius] Why the retriggering? Why, after 60 years of no disease, we're suddenly seeing it?

[Amesh Adalja] I think there's a few things that account for this increase, and I think one of it has to do with the return of the mosquito vector. I think there was a lot of aggressive control with

yellow fever and the malaria eradication campaign that have caused this mosquito to kind of disappear from the United States, but then it started to reappear. The other thing is...

[Ted Pistorius] I'm sorry, but, so there was a mosquito that we didn't have that's come back?

[Amesh Adalja] I think the *Aedes* species of mosquitoes...

[Ted Pistorius] Right.

[Amesh Adalja] ... Had really disappeared from lots of the continental United States because of the effects of yellow fever eradication and also the kind of a side effect of the malaria eradication program. When those things collapsed, the mosquito has kind of found its way back into the United States. Other things are that we have a lot more travelers, so we've got lots of people who travel to dengue-endemic regions, which include both Puerto Rico and the US Virgin Islands, and those people are coming back to places like Florida or going anywhere in the United States, and if that mosquito's around, they can just, by sheer chance, be bitten by the correct mosquito and then spark an outbreak. The other thing is, people are starting to test more for dengue. I think awareness of dengue has gone up. There's an FDA-cleared blood test available, and I think that people do look for it more than they probably did in the past.

[Ted Pistorius] Okay, I want to go back to these mosquito control programs that were successful at minimizing these other diseases. Why did they stop?

[Amesh Adalja] I think there were a lot of different reasons and some of them include some wariness over the use of DDT, which a lot of people may have heard about that happened after the publication of Rachel Carson's book *Silent Spring*. And I think, also, we did so well at mosquito control in some areas that it kind of became a victim of its own success, that it became less of a priority, so then people didn't think of it as something that they needed to continually do and be vigilant about. And I think, you know, the whole collapse of the malaria eradication program really was a major factor.

[Ted Pistorius] After your review of the recent outbreaks, you and your co-authors came up with three key recommendations. Could you please tell us about those?

[Amesh Adalja] The first one was to involve the clinical and laboratory community promptly to get people aware of the disease, and to start testing and to know how to test. The other one was to provide accurate information to the public, and I think this has to do a lot with some of the stuff we saw with the tourism bureaus and making sure you get the correct information out to people who might be coming from other areas there to know what areas have the highest mosquito densities, what to do when they see mosquitoes, what to do, what kind of protective measures to take, and then, if they start to get symptoms, how to get tested for it. And the third one is to engage the affected community in vector control, case identification, and case reporting. So I think that it's interesting because dengue is a disease that sometimes happens in people's backyards; there's people who have bird baths or tires or just debris in their backyard where standing water collects. And oftentimes vector control and public health people can't get into everybody's backyard, so it's going to involve community involvement to actually start to get rid

of these mosquito habitats by dumping water and using screens and doing things like that. You have to get the community involved and some places have done very interesting things like having plays for school children in order to get them motivated to do that kind of stuff. So I think that's one of the key - probably one of the most important of our recommendations is to get the community involved.

[Ted Pectorius] And even without a dengue outbreak, there are plenty of terrible diseases caused by mosquitoes. You've enumerated some of the good practices everyone should follow. Are there others?

[Amesh Adalja] Well, as I said before, just to reiterate, try to keep your windows closed or use intact screens if you're going to have your windows open. When you're in areas with high mosquito densities, try to use mosquito repellents and wear clothing that minimizes exposed areas. Sometimes that may be hard in places like Florida where people are in shorts and t-shirts, but putting mosquito repellent on would help. One of the important things is to also don't allow standing water to accumulate in pots, tires, trash, and other materials because that allows mosquitoes to have places to lay their eggs. And try to keep abreast of the warnings that may be issued by your state or local health departments, because once the first case of dengue occurs in a locale that's not used to it, it's usually going to be a pretty widely publicized affair, so people will be talking about what to do and when mosquito vector people are going to be out to come inspect homes and things like that.

[Ted Pectorius] Well thank you, Dr. Adalja. I've been talking with Dr. Amesh Adalja about his paper, *Lessons Learned during Dengue Outbreaks in the United States, 2001-2011*, which appears in the April 2012 issue of CDC's journal, *Emerging Infectious Diseases*. You can see the entire article online at www.cdc.gov/eid.

If you'd like to comment on this podcast, please send an email to eideditor@cdc.gov. For *Emerging Infectious Diseases*, I'm Ted Pectorius.

[Announcer] For the most accurate health information, visit www.cdc.gov or call 1-800-CDC-INFO.