



Europe's fight against mosquito-borne viruses (Episode 24)

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Europe faces a new challenge: Mosquito-borne viruses, such as chikungunya, zika, and dengue, are now prevalent throughout the region, driven by warmer temperatures. Europe must combat these potentially debilitating diseases through education and prevention. Diana Rojas Alvarez (World Health Organization) joins host Monica de Bolle to explain why mosquitoes have moved so far north and the steps Europe has taken.

This podcast is produced by the Peterson Institute for International Economics.

MONICA DE BOLLE: In recent years, Europe has started educating and preparing its citizens for something new and unwelcome: the mosquito season. That's because more mosquito-borne viruses, like chikungunya and West Nile, are spreading north. The mosquito that can spread chikungunya virus is now established in 16 European countries and 369 regions, up from just 114 regions a decade ago, according to the European Centre for Disease Prevention and Control.

The cause? Longer summers, hotter temperatures, and heavier rainfall. Europe had to establish from the ground up programs to mitigate the spread of mosquito-borne viruses caused by climate change. What's the lift to implement these programs?

You're listening to an episode of Policy for the Planet, a podcast exploring the global response to the climate crisis. I'm your host Monica de Bolle, a senior fellow at the Peterson Institute for International Economics.

To help us dive in deeper into Europe's response to mosquito-borne viruses, I'm joined by:



DIANA ROJAS ALVAREZ: Diana Rojas. I am the head of the Emerging Zoonosis and High Impact Epidemic Unit. I'm acting interim head in the Epidemic and Pandemic Management Department at the World Health Organization.

MONICA DE BOLLE: An infectious diseases epidemiologist, Diana has spent her career focusing on outbreak investigations, surveillance, and transmission dynamics of infectious diseases, with a particular interest in chikungunya and zika.

Diana, welcome to Policy for the Planet. It is a pleasure to have you with us to discuss this very interesting issue, fascinating but also scary, of mosquito-borne illnesses, mosquito-borne diseases, how they're spreading around the world, how they're reaching places where they were not present before. And in particular, we're going to talk a lot about this one disease called chikungunya, which has shown up in France and is now a concern in Europe more broadly.

But before we start down that path, I wanted to ask you if you could please give us a sort of an overview of the main mosquito-borne illnesses that are currently in this process of spreading all over the world because of climate change, climate issues, as well as a host of other issues. Thank you.

DIANA ROJAS ALVAREZ: Thank you very much for your invitation. So currently there are tens of mosquito borne viruses or vector borne viruses that are currently circulating in the wild. But we have a group of diseases that are transmitted by an urban mosquito that is called Aedes mosquito. There are two main species, one is Aedes initsipta and Aedes albopictus, which is commonly known as the tiger mosquito. And 5.6 billion people live in areas that are at risk for these mosquito-borne diseases. These diseases are mainly dengue, which is the most widespread with more than 130 countries where this disease is transmitted. Then chikungunya that is transmitted in around 119 countries. Zika virus that is transmitted has been found in about 94 countries.

And when all these people are living in these areas where they have the environmental conditions, the weather, the temperature, but also the human behaviors that help the mosquito to lay their eggs and reproduce and keep going with the transmission cycle. So it's very interesting because these mosquitoes, and probably some of you don't know,

These mosquitoes lay their eggs in places where there is clean water accumulated. So it could be flower pots. could be any, even the plates where the water for the pets is. So if it's standing for too long, these mosquitoes, we will lay their eggs in this specific, we



call the breeding site. So when the water reaches the eggs, then the larva will hatch and then it will start the first phase after the egg and then it will develop to be a mosquito.

So it has a full cycle and that's why we talk a lot about the standing water and that's why it's so important because sometimes you see the mosquito fly, think what does it have to do with water? It's because they lay their eggs in these specific places where they if they get filled with water and once the water gets in contact with the with the eggs that's when you start the cycle and then you will have more mosquitoes. So these mosquitoes have been adapting every time we find them in new places.

So they have been adapting to new latitudes. So now this mosquito is very widespread, mostly the *Aedes albopictus* or tiger mosquito in Europe, also in the South of the US probably one or two weeks ago, there was the first Chikungunya case confirmed in the New York state. So, autochthonous case in history. So, they are really, really going up and also down in latitude because now we see more cases in the south of South America where there is seasonality, there are the seasons and we were not seeing this kind of autochthonous transmission, but also in altitude because the mosquito has been adapting at, let's say 20 years ago, the mosquito could just live at 800 meters above the sea level. And with the increasing temperatures, now the mosquito has adapted and now is found at the 2,200 meters above the sea level. So just imagine the amount of population who lives in that gradient that before was completely not at risk, but now they are at risk.

MONICA DE BOLLE: Yeah, this is fascinating because I am from South America and I have lived with these mosquitoes when I was living in South America. I lived with these mosquitoes for, you know, the whole of my life. And now you start seeing them really just spread out everywhere and these diseases becoming becoming a novelty where where they arrive. And it is it is scary.

So can you talk a little bit about the diseases themselves and in particular chikungunya, what it is, why is it so hard to diagnose, what are the common symptoms that people should know about, and most importantly, the long-term aspects of these diseases, which I think is often overlooked when we think mosquito-borne diseases, we think, yeah, we'll protect ourselves, you know, and we don't think much about it. But actually having one of these diseases and highlighting here chikungunya is a problem. It's not just you know, an immediate problem for an individual, but it could be a longer term problem causing a lot of public health issues.



DIANA ROJAS ALVAREZ: Yes, absolutely. So chikungunya, it's a, well, it belongs to a family of viruses that cause very severe joint pain. So the main symptom is very high fever. And then the second main symptom is very severe joint pain. But when I say very severe joint pain is that if it affects the hands or the, or the feet or it will be a very, very severe joint pain that will not allow people to do their usual activities, such as holding a pen, such as typing on a cell phone or even typing on a computer, or even holding a knife to cook, right? So it really causes acute disabilities in the population that is affected.

And these disabilities can be extended for even years in about half of the people who get infected with chikungunya. So just imagine someone who was completely previously healthy and after being bitten by a mosquito, they get a chikungunya. And then after that, they are not able to go back to work for four months because they can do the activities that they usually do.

And that's the real burden of chikungunya is the chronic disabilities or as we during the COVID pandemic people were talking about long COVID right because they were like long-term effect of COVID let's say we talk about long chikungunya we call it subacute chikungunya or chronic chikungunya when it lasts for more than six months but when we have the but it's basically the equivalent to long COVID when people have disabilities for more than even five years. So that is where the real burden is.

However, there is also severe chikungunya, because not all the cases are mild in quotes. So the people from the extremes of life, the newborns, or very young infants, because there is transmission during birth. So when a pregnant woman is infected in the last trimester and she's delivering the baby, while she's infected, there is a 50% probability that she will infect the baby during birth. And then the baby will have very severe chikungunya. And then also the elderly population of people with comorbidities also are at higher risk of having severe chikungunya. So that's the people who could be hospitalized and also have potential to die due to chikungunya.

So it's a... it's a very severe disease. It usually is overlooked because it looks at the beginning very similar to dengue, which is the one that is more widespread and is the one that people are more used to think about. also the healthcare, the doctors are more used to diagnosed in the hospitals, right? So when a patient comes with dengue and joint pain and they live in a tropical area, the first thing that comes to mind, if it's a malaria area, they will think about malaria. If it's an urban area, they will think about dengue. And then when it's not any of the two, if there is diagnostic in the area, then



they will start looking for chikungunya. And that's when people will start thinking about chikungunya. But then it takes a little bit of time. And that's one of the challenges for diagnosis.

Also, we have Zika virus, which is the mildest of all of these arbo viruses. However, as you could remember almost 10 years ago, there was a public health emergency of international concern due to Zika because of the congenital Zika syndrome and the long-term effects and neurological manifestations in the newborns and also in some of the populations.

So there is a wide range, but at the beginning they look very similar and this poses challenges in the initial diagnosis of these diseases.

MONICA DE BOLLE: And what you said about the chronic aspects of some of these diseases, in particular, chikungunya, you know, the fact that you can have a substantial number of people who go from having, a mild case of chikungunya to perhaps developing a more longer term chronic disability of some kind, that I would imagine has a pretty big economic toll on the countries that face these endemic problems. And this is now reaching places where the mosquito wasn't present before and therefore, you know, places where the disease is novel. Can you speak to this, you know, to the sort of huge economic burden or the impact of the disease in terms of the socioeconomic aspects of a country?

DIANA ROJAS ALVAREZ: So let me give you some examples. So back in 2013 and 2014, when chikungunya emerged in the Americas, it emerged in the Caribbean. So it was introduced in an island in the Caribbean, and it spread really, really quickly throughout the Caribbean. And the Caribbean islands, have, well, small populations, and they live on tourism. So just imagine having a big outbreak affecting all the susceptible population because it was a completely new virus. And that includes the doctors, the people who work at the hotels, the people who work at the airport, the police. Everyone was infected at some point. So they had to fully stop receiving tourists because there was no one to take care of them.

And the thing is that these outbreaks are really fast. So once you start the circulation, the transmission goes from few tens of cases to thousands of cases in two or three weeks. So by the time that you realize that you are in an outbreak, you have already a lot of people infected. So this causes very high economical consequences in countries in general.



That's the acute phase, but then those who are still with chronic symptoms, they might lose their job because they might not be able to go back to what they were doing before. So it's also the quality of life, the impact in quality of life and the capacity to go back to the usual self before the infection. And that also has an impact in mental health and... the economy of the countries also, but also the additional mental health and quality of life.

MONICA DE BOLLE: Yeah, I think this is quite shocking when you think, I think the illustration of the Caribbean is a very powerful one because they are economies that are so heavily dependent on tourism that if they stop, that's it. There's nothing for anyone. So I think it gets straight to the point of how these mosquito-borne illnesses can have major consequences in the economy.

Well, let me switch over to... What is actually being done? I mean, we know that there are places around the world, countries around the world where the mosquito is already local, it's endemic, it's there, it's very hard to get rid of. And, you know, people just kind of have to live with the fact that they are at risk for catching this disease. And the whole focus is usually on getting the information out to people, information such as what you mentioned before, you know, standing water. Be careful with flower pots, be careful with leaving standing water, clean standing water and so on.

But now we're seeing the virus reach places where it wasn't before. And these viruses reach places where it wasn't before because the mosquitoes, as you said, are adapting. And Europe has become a focal point because a number of cases have developed in Europe. What is being done? What is being done to contain the spread of the mosquito possibly to you know, impede it from becoming native to the locations where it has now arrived.

DIANA ROJAS ALVAREZ: Well, that's an excellent question. And what I can say is that climate change is not helping because you have these two different mosquitoes. You have the *Aedes aegypti*, which is more common in Southeast Asia, the Pacific and Latin America and South America. And then you have *Aedes*, which lives inside the households of the people. So when you go to a tropical area, if you're invited to a house, you go and they usually have this big buckets full of water, just in case that the water goes off, because it is used to happen for decades and there is a cultural thought that you might not have water tomorrow, right? So that's one of the main drivers of transmission when we talk about *Aedes aegypti*.



But with *Aedes albopictus*, which is the tiger mosquito, which is the one that has been gaining space in Europe, this one is more found in the nature. So it's found in the tree holes. It's found in the water pots below the plants, in the flower pots. And so the reservoirs, the breeding sites of these mosquitoes are completely, they are a bit different and more natural. So it makes it even trickier to control. And also this mosquito is gaining space little by little. And when people realized it's in many, many places.

So what Europe has done is to set up a surveillance network to track these mosquitoes and other invasive species, because these are not native species from Europe. They have been invading literally Europe and other areas. So they have this entomological surveillance system that what it does is to monitor the invasion of these mosquitoes throughout Europe, and this is led by the European CDC. And they are preparing now. Now they have traps and they are tracking where the mosquito is reaching, and they are doing vector control activities to try to stop the mosquito from keep spreading and find a new permanent place of living.

However, mosquitoes have lived in this planet for longer than us. So they adapt really quickly. So if you start controlling some of the places where they lay their eggs, they get really creative and they find new places, even when there is some very tiny, tiny little bit of water to breathe there because they know how to survive and how to adapt. And that's part of evolution, right? The more you are able to adapt, the more you will survive in the long run.

So they have been tracking these mosquitoes, they have been doing a vector control activities. The communities play a very important role and Europe, as a lot of other endemic countries, they work with the communities and they try to communicate the risk and change the behavior to prevent people from...from having reading sight that is usually unconscious. If people really know that what they are having there can create disabilities for life, I'm pretty sure people will get rid of that stagnant water. So the communities play a very important role. Also the multidisciplinary approach is key. So we need to educate the population and the communities, changing the water and encouraging the different communities to prevent these mosquitoes from spreading.

For example, here in Geneva, they have, before the summer starts, they start sending the eggs of male mosquitoes infected with a bacteria that will prevent, once the eggs, hatch, so you have to put that little paper full of the eggs, then you put it in water, these mosquitoes will hatch, they will become larvae, will become adult mosquitoes, are male



mosquitoes, and then when they find the female, they will mate, and then the female mosquito won't be able to lay good eggs to reproduce.

People are getting really creative. are new technologies that are trying to protect the environment because before it was just pesticides to kill the adult mosquitoes, but now there are new technologies that are supporting. So yeah, there are different strategies that are available, but really the community plays a very important role. Countries are working on education, but also it's very difficult for people in Europe who, like you say, you are from South America, you are used to thinking about mosquito-borne diseases and dengue. Probably you heard about dengue at least once in your life or you met someone who was infected with dengue. In Europe it's very hard to change because it's a completely new thing.

These are tropical diseases that don't happen in Europe. Like, why are we getting this? And so when you talk about climate change, of course it plays a very important role, but the communities also play a role. So we might not be able to fight climate change at the increasing temperatures because when the planet is sick, right? That's the sickness of the planet.

But then these diseases are the... the impact of this climate change in humans. so, because now we have more and more of these mosquitoes that are adapting to these circumstances. yeah, a lot that is being done, but we are fighting with a very hard enemy because the mosquitoes adapt very quickly and they have been living for way more years than humans. So they always find their way, but there are...

There are innovations and we need to control these breeding sites so we avoid them from keeping reproducing.

MONICA DE BOLLE: Yeah, it's very interesting the initiative you mentioned about the these mosquitoes, the male mosquitoes, the eggs of these mosquitoes, which are which are already infected with a bacteria that prevents further reproduction of these species and the way by which, you know, European countries are using that as a way to control the spread of the mosquito. But I would imagine also to control for or try to control for an invasive species becoming a native species, yeah, which is precisely the problem that we have in other endemic areas. So South America, for example, these species are already, they've become native. They may have been, you know, invasive at some point, but they're now native. And so these sorts of initiatives don't really work. And the



kinds of things that people do is more along the lines of flagging how to, what to do with standing water and so on, rather than having these kinds of initiatives.

So I would imagine, how do you see that? How do you see the possibility of some European countries actually preventing these species from becoming native?

DIANA ROJAS ALVAREZ: Well, it's a possibility, but they need to do it now. Because once the mosquito gets into this habitat and is installed, let's say, in a specific setting, that's when it's going to be more difficult. So once the mosquito has found its habitat, it's cohabiting with humans, it has everything they need to keep reproducing. Because actually, the ones that transmit the viruses are the female mosquitoes. So they feed on blood so they can lay their eggs, right? That's the whole cycle.

So if they have the stagnant water where they can put their eggs and they have human blood or the blood that they need to be able to get a good egg, it's going to be a cycle. So the time is now for those areas where these viruses are just starting to...to evade, the time to stop the evasion is now. Also in Europe and areas where there are seasons, once it starts cooling off, then the mosquitoes go down. That's how it is. That is not a privilege that some tropical areas have, where the weather is the same all year long, and it's tropical and humid all year long.

So those are places where the mosquitoes can...it's even more difficult to fight them. But if some of these activities start at the beginning of the spring, trying to control, so then you can really avoid having the spread of these diseases. Also this year was very unfortunate because there was an outbreak in the Indian Ocean in one of the overseas departments of France that had an outbreak like 20 years ago and they had more than 50,000 confirmed cases. And then there is a lot of traveling to those islands, to mainland France.

So the outbreak really coincides with the time where there were mosquitoes flying around. So if you have an outbreak somewhere else, and then people start traveling, and you have the mosquitoes, you have the right environment, you have everything to have transmission, then that will trigger transmission. So if you can...really decrease the amount of mosquitoes that are flying around when your summer season or spring season or arbovirus season, let's say, will start, then you can really prevent from having even introduction of these viruses. So a lot to do, but there is still many activities that we can all do to prevent this from happening.



MONICA DE BOLLE: So Diana, for the countries that are in Europe that are currently facing the challenge of dealing with this, with the virus, with the mosquito and with the viruses that the mosquitoes transmits, how has their experience been? mean, in other words, have these countries faced very large costs with the education programs that they're putting in place? Have they faced differential difficulties in getting the communities involved?

What is that like for different countries in Europe right now?

DIANA ROJAS ALVAREZ: So actually, the countries had to start from the beginning, because the doctors, for example, most of them have never seen these tropical diseases during their training. They see them on the books, but one thing is when you see it on the books, and a different thing is when you have a patient in front of you. So having to change that mind, because when someone is traveling or is coming from any of the tropical countries, and if they have fever and if they have been back for less than a week, then you think, it might be a tropical disease.

But if someone comes with exactly the same symptoms and they haven't traveled, if you have never seen a tropical disease, it will be very difficult for you to think that it could be a tropical disease if you are in Europe. So that was the first step, trying to work with the doctors and the healthcare workers in having the suspicion of these tropical diseases or viruses in this case. The second one, they had to build capacities from the lab side, from the laboratory side to be able to confirm these diseases because one is the suspicion that this is a viral disease, but something different is actually doing the confirmation. they have to, they had the capacities already for to do diagnosis of other type of viruses.

So it was adapting and leveraging on those capacities to do diagnosis of arboviruses. Then you also need to start doing the mosquito surveillance. So for some of the countries, some of the tropical countries, they do this with their eyes shot. They know exactly what to do. They know that they have to look at the mosquito, follow the mosquito, control the mosquito, train the doctors. There is a full structure. But for these countries, it was something new. The surveillance system. So you need a surveillance system that people can use to start reporting cases. it will raise an alarm, and people can go and control each of these clusters or cases. And then, of course, additionally to that is the work with the communities.



So it's really a full package that you need and an integrated package that is needed to be able to prepare, prevent, and control for these diseases with key components that play a very important role. So you can miss one of them because you can be following the mosquito, but if your surveillance system is not capturing the cases or your doctors are not thinking about even chikungunya, look some of these cases in the first days they think that they have a virus and then when the pain is not gone for two or three weeks that's when they go to the doctor and if someone is not thinking that it could be chikungunya they could end up in a rheumatologist and they can get diagnosed as a potential rheumatoid arthritis right.

That's how that's how that's how it would happen if people are not thinking that it could be a tropical infectious disease so then they have work really are training the doctors and the health care workers in the clinical suspicion, at least when the spring starts, if it's in the middle of the winter and it's minus five, it's not gonna happen. But once the temperature starts increasing and they start seeing mosquitoes, people need to start thinking in tropical diseases because now there is potential of seasonal transmission. And I think Europe has been working really strongly. Our regional office from WHO with the countries with the European CDC in setting a seasonal surveillance system and trainings and reminders for the communities in general that is a risk. So they are trying to raise the risk perception also in in general in the communities, in the governments, in the health care workers and so on this cases are early detected and quickly controlled so they avoid having further transmission.

MONICA DE BOLLE: So to sum up, is it fair to say that you're fairly optimistic or cautiously optimistic with respect to the ability of European countries, let's say, where these viruses are now popping up to sort of slow down the way by which they're appearing in these places and possibly even, who knows, preventing them from becoming more endemic?

DIANA ROJAS ALVAREZ: Well, there is a chance, yes. So let's say cautiously optimistic because as I said before, climate change is not helping. have more, the temperatures are getting higher and higher. The summers are getting warmer. They are getting also longer. So the environment is getting every time better for these mosquitoes. However, if we take advantage of the the cold season to actually do many of the activities and prepare to early detect to decrease mosquitoes as much as possible to work with the community so they have less of this potential stagnant water, yeah, breathing size that are around, then you can potentially prevent the introduction of



this virus that will then evolve to have local transmission in new areas. So there is a possibility, but there is a lot that needs to be done.

MONICA DE BOLLE: Well, thank you, Diana, so much. This is a really interesting topic. I expect we're going to continue to see the efforts by many different countries, the creativeness that were the creativity that we have seen countries have. And I'm sure we'll want to touch back with you and have a future conversation on how the situation is evolving. So thank you so much for joining us.

DIANA ROJAS ALVAREZ: Absolutely. Thank you for the invite.

MONICA DE BOLLE: You've just finished an episode of Policy for the Planet — thanks for joining us! Don't forget to rate, review and subscribe.

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