
ANOPHELES SINENSIS

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00:00:00,000 --> 00:00:03,810
In the Amazon Rainforest, few animals are as dangerous to humans

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00:00:03,830 --> 00:00:06,040
as mosquitoes that transmit malaria.

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00:00:06,060 --> 00:00:11,790
In the Western Hemisphere, 90 percent of all malaria cases occur in the Amazon,

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00:00:11,810 --> 00:00:15,080
but it’s not spread evenly across the tropical region.

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00:00:15,100 --> 00:00:18,000
While malaria has decreased in the Brazilian Amazon,

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00:00:18,020 --> 00:00:22,230
the disease has been steadily increasing in the Peruvian Amazon.

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00:00:22,250 --> 00:00:27,980
In the past 5 years, Peru has had on average the second highest rate in the South American continent.

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00:00:28,000 --> 00:00:32,340
Despite having interventions such as bed nets and indoor sprays,

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00:00:32,360 --> 00:00:38,980
challenges still lie in identifying where to send resources before malaria outbreaks occur and spread quickly.

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00:00:39,000 --> 00:00:43,090
Now scientists are attempting to tackle this challenge using NASA satellites.

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00:00:43,110 --> 00:00:49,860
Our project in the Amazon is trying to understand the way malaria is transmitted in a tropical environment.

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00:00:49,880 --> 00:00:53,160
We know that malaria risk is associated with certain environmental conditions

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00:00:53,180 --> 00:00:54,890

that we can detect with satellites.

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00:00:54,910 --> 00:00:57,700
To understand what environmental conditions to look for,

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00:00:57,720 --> 00:01:00,680
it helps to know how malaria spreads in the Amazon.

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00:01:00,700 --> 00:01:03,870
Malaria is caused by a parasite called Plasmodium

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00:01:03,890 --> 00:01:09,230
and it’s transmitted to humans when mosquitoes carrying the parasite feed on your blood.

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00:01:09,250 --> 00:01:14,180
There are roughly 40 species of malaria-transmitting mosquitoes worldwide,

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00:01:14,200 --> 00:01:20,120
but in the Amazon the Anopheles darlingi species is most responsible for spreading malaria.

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00:01:20,140 --> 00:01:25,760
The key to this study is predicting where the darlingi mosquito breeding sites are with NASA satellites.

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00:01:25,780 --> 00:01:30,610
The project is using a model called the Land Data Assimilation System, or LDAS,

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00:01:30,630 --> 00:01:36,980
and this gets input from NASA satellites that provide information on precipitation, temperature,

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00:01:37,000 --> 00:01:41,920
and land cover. This informs scientists where mosquito breeding sites are likely to form.

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00:01:41,940 --> 00:01:46,230
Mosquitoes need rainfall to form their breeding sites - puddles and ephemeral ponds.

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00:01:46,250 --> 00:01:50,710
Rainfall also influences soil moisture. That will be important for vegetation.

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00:01:50,730 --> 00:01:55,170
It will also change the humidity conditions near the surface where mosquitoes are breeding and living.

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00:01:55,190 --> 00:01:57,710
Rainfall also eventually makes its way into the river

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00:01:57,730 --> 00:02:03,130
and a lot of river discharge will mean that there’s lots of breeding sites along the banks for mosquitoes.

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00:02:03,150 --> 00:02:08,210
There are strong patterns of malaria throughout the year, but these patterns aren’t consistent.

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00:02:08,230 --> 00:02:10,300
As well as changes from season to season,

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00:02:10,320 --> 00:02:16,110
global effects such as El Nino and climate change can disrupt where mosquitoes breed.

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00:02:16,130 --> 00:02:20,010
Another factor that NASA satellites can detect is changes in land.

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00:02:20,020 --> 00:02:23,480
The conversion of forest to non-forest is the most important change that we worry

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00:02:23,480 --> 00:02:26,860
about for malaria control and the detection of hot spots.

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00:02:26,880 --> 00:02:31,980
In Peru, land is cleared for activities such as agriculture, logging, and mining.

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00:02:32,010 --> 00:02:35,030
And studies have found that cleared land in this region

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00:02:35,050 --> 00:02:38,830
increases the number of malaria-transmitting mosquitoes.

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00:02:38,850 --> 00:02:42,540

Changes in the land don’t just influence where mosquitoes are,

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00:02:42,560 --> 00:02:47,530
it also influences where humans are and this is a key component in this study.

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00:02:47,540 --> 00:02:51,500
One thing that we’ve learned in this project is just how important it is to consider

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00:02:51,500 --> 00:02:54,120
human movement when thinking about malaria risk.

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00:02:54,160 --> 00:02:58,500
People work on land that is used for agriculture, logging, and mining

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00:02:58,510 --> 00:03:02,340
so that increases the amount of human traffic to that area.

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00:03:02,360 --> 00:03:07,080
Where people meet malarial mosquitoes that’s where you get high risk for transmission.

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00:03:07,100 --> 00:03:11,690
Figuring out where people are getting infected forms the crux of predicting malaria.

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00:03:11,710 --> 00:03:16,730
Peru currently measures how many malaria cases are being detected in health posts.

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00:03:16,750 --> 00:03:20,170
But this isn’t always where true malaria outbreaks are occurring.

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00:03:20,190 --> 00:03:24,540
People are not necessarily being diagnosed where they were infected with malaria.

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00:03:24,560 --> 00:03:28,830
They could be getting infected where they are working, which could be 100 miles away.

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00:03:28,850 --> 00:03:33,290
To incorporate this factor, the study is combining the LDAS data with models that

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00:03:33,310 --> 00:03:38,070
give estimates about where people are traveling based on studies of seasonal employment.

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00:03:38,090 --> 00:03:43,060
The study will predict where malaria outbreaks will occur 12 weeks ahead of time

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00:03:43,080 --> 00:03:47,000
and help the country send resources to specific regions efficiently.

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00:03:47,020 --> 00:03:49,160
While the project is focused on malaria,

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00:03:49,180 --> 00:03:53,380
scientists say it can adapt to other diseases such as Zika and Leishmania.

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00:03:53,400 --> 00:03:59,190
Precipitation and other environmental conditions are key factors in how diseases spread