Science AMA Series: Zika! Malaria! Chikungunya! What do we need to know about these mosquito-borne diseases and what can be done about them? Ask us anything!

Science$_N$ews[1]andr/ScienceAMAs[1]

[1]Affiliation not available

April 17, 2023

Abstract

Hi Reddit! We are writers for Science News (https://www.sciencenews.org/), a publication of the Society for Science and the Public (https://www.societyforscience.org/). With the recent spread of Zika, there have been concerns about the spread of mosquito-borne diseases. What can be done? What answers can science provide us? Together, we have written extensively on Zika, gene drives, genetically engineered mosquitoes, and general mosquito biology. Ask us anything! I'm Meghan Rosen, and I'm the general assignment reporter at Science News. It's a grab bag beat that I love because I'm always learning about something new (from disaster robots to lead poisoning to a new form of carbon that glows in the dark). This year I've been covering the Zika virus outbreak that emerged in Brazil in 2015, and may be to blame for the country's recent surge in microcephaly cases. I have a Ph.D. in molecular biology and biochemistry (with an emphasis in biotechnology) from UC Davis, and graduated from UC Santa Cruz's Science Communication program in 2012. (https://www.sciencenews.org/article/rapid-spread-zika-virus-americas-raises-alarm?mode=pick&context=169&tgt=nr) I'm Tina Saey, the molecular biology writer at Science News. I cover a broad range of topics from viruses to human evolutionary history, with occasional forays into penguin tongues and water bear survival tactics. Basically, if it has DNA I will write about it. But don't worry, red blood cells and non-DNA-based extraterrestrial life, I've got you covered, too. One of the hottest topics on my beat has been the gene-editing tool called CRISPR/Cas9 and its scientific, medical and ethical implications. Pertinent to this discussion is an application of CRISPR called gene drives. Scientists hope to eliminate mosquito-borne diseases and invasive species, but worry about unforeseen consequences (such as causing the extinction of entire species) of the technology. (https://www.sciencenews.org/article/gene-drives-spread-their-wings) I'm Susan Milius, and I write about creatures great and small, and even photosynthetic, for Science News. I'm aghast at the number of years I just slapped mosquitoes without even wondering which of several thousand species, quite diverse in their tastes, I had just smeared on the wall. (Some are blue. Some hate the outdoors as much as any human couch potato. Some don't even drink blood.) Now those distinctions explain why some major disease-carrying mosquitoes just laugh at our attempts to control them. It took me a bit of exploring other kinds of journalism to realize that after double-majoring in biology and English, I could get a job writing in English about biology. It's a wonderful life, even with mosquitoes in it. We'll be back at 2 pm EST (11 am PST, 7 pm UTC) to answer your questions, ask us anything!* EDIT: What great questions! It's our time to leave, but we'll be checking in throughout the day to see if there are any more questions. Thanks for having us!

the WINNOWER

REDDIT

Science AMA Series: Zika! Malaria! Chikungunya! What do we need to know about these mosquito-borne diseases and what can be done about them? Ask us anything!

SCIENCE_NEWS R/SCIENCE

Hi Reddit!

We are writers for Science News (https://www.sciencenews.org/), a publication of the Society for Science and the Public (https://www.societyforscience.org/). With the recent spread of Zika, there have been concerns about the spread of mosquito-borne diseases. What can be done? What answers can science provide us? Together, we have written extensively on Zika, gene drives, genetically engineered mosquitoes, and general mosquito biology. Ask us anything!

I'm Meghan Rosen, and I'm the general assignment reporter at Science News. It's a grab bag beat that I love because I'm always learning about something new (from disaster robots to lead poisoning to a new form of carbon that glows in the dark). This year I've been covering the Zika virus outbreak that emerged in Brazil in 2015, and may be to blame for the country's recent surge in microcephaly cases. I have a Ph.D. in molecular biology and biochemistry (with an emphasis in biotechnology) from UC Davis, and graduated from UC Santa Cruz's Science Communication program in 2012. (https://www.sciencenews.org/article/rapid-spread-zika-virus-americas-raises-alarm?mode=pick&context=169&tgt=nr)

I'm Tina Saey, the molecular biology writer at Science News. I cover a broad range of topics from viruses to human evolutionary history, with occasional forays into penguin tongues and water bear survival tactics. Basically, if it has DNA I will write about it. But don't worry, red blood cells and non-DNA-based extraterrestrial life, I've got you covered, too. One of the hottest topics on my beat has been the gene-editing tool called CRISPR/Cas9 and its scientific, medical and ethical implications. Pertinent to this discussion is an application of CRISPR called gene drives. Scientists hope to eliminate mosquito-borne diseases and invasive species, but worry about unforeseen consequences (such as causing the extinction of entire species) of the technology. (https://www.sciencenews.org/article/gene-drives-spread-their-wings)

I'm Susan Milius, and I write about creatures great and small, and even photosynthetic, for Science News. I'm aghast at the number of years I just slapped mosquitoes without even wondering which of several thousand species, quite diverse in their tastes, I had just smeared on the wall. (Some are blue. Some hate the outdoors as much as any human couch potato. Some don't even drink blood.) Now those distinctions explain why some major disease-carrying mosquitoes just laugh at our attempts to control them. It took me a bit of exploring other kinds of journalism to realize that after double-majoring in biology and English, I could get a job writing in English about biology. It's a wonderful life, even with mosquitoes in it.

We'll be back at 2 pm EST (11 am PST, 7 pm UTC) to answer your questions, ask us anything!

EDIT: What great questions! It's our time to leave, but we'll be checking in throughout the day to see if there are any more questions. Thanks for having us!

READ REVIEWS

WRITE A REVIEW

CORRESPONDENCE:

DATE RECEIVED:
March 05, 2016

DOI:

Can you tell us the latest findings and recommendations regarding sexual transmission of Zika?

My wife and I are actively trying to conceive a child, but I have business trips planned to Guatemala and Peru this summer. Should we stop and if so, for how long?

holymadness

10.15200/winn.145709.93797

ARCHIVED:
March 04, 2016

CITATION:
Science_News , r/Science , Science AMA Series: Zika! Malaria! Chikungunya! What do we need to know about these mosquito-borne diseases and what can be done about them? Ask us anything!, *The Winnower* 3:e145709.93797 , 2016 , DOI: 10.15200/winn.145709.93797

According to the CDC, Guatemala has reported ongoing transmission of Zika.

So, I would definitely take measures to avoid mosquito bites (long pants and sleeves, bed nets, insect repellent, etc.) You can find more prevention tips here.

Unfortunately, there's still so much we don't know about sexual transmission of Zika. We know that the virus can be present in the semen of infected men, and that it stays in semen longer than it does in blood. But we don't have a good idea of how long Zika lasts in semen, or whether infected men who don't show symptoms still have the virus in their semen.

The CDC advises that pregnant women avoid having sex (or have protected sex) with male partners who've traveled to areas with Zika. For women trying to get pregnant, the CDC recommends talking to a healthcare provider. I know that's not super helpful, but right now it's the best info we have.

Lots more info at CDC's page on Zika and Sexual Transmission **— Meghan**

Every so often I hear about proposals to release sterile mosquitoes to dilute the breeding pool and help curb the population. Are these proposals serious, and do they have potential?

Fenzik

Sterile insect releases have been combating insect problems for half a century now. https://www.sciencenews.org/article/medfly-control-methods-were-ready-pest%E2%80%99s-influx High-tech versions using genetically engineered mosquitoes are being used now. One concern was that decreasing numbers of *Aedes aegypti* could make room for other species of mosquito to take over. In at least one study that does not appear to be the case. http://onlinelibrary.wiley.com/doi/10.1002/ps.4151/abstract Right now the sterile insect releases are limited to fairly small areas. They are labor intensive. In theory, gene drives that target the mosquitoes could vastly reduce the number of mosquitoes you would need to release, but, to my knowledge, no one has developed one for *Aedes aegypti* yet. https://www.sciencenews.org/article/gene-drives-spread-their-wings —*Tina*

My wife is 12 weeks pregnant. We live in the NE United States. I keep hearing on the news about reported Zika virus cases in the US. I hate to play in to the hands of the media and join in on some good old fashioned hysteria, but since my wife is pregnant it is hard to ignore. Realistically, should my wife be concerned about getting infected or even coming across someone that has been?

thekwyjibo

Zika is not spreading locally in the United States, so it's very unlikely that your wife has to worry about being bitten by an infected mosquito. The cases you're hearing about in the U.S are all travel-associated cases (which means that people who live in the U.S. were infected while traveling to an area that has Zika — like Brazil, for example). So far, the CDC has logged 153 of these cases (There's a nice tracker here. For more info about advice on Zika virus and pregnancy, our neuroscience writer (Laura Sanders) has a good roundup. **—Meghan**

Welcome to reddit! I think the work you do is an essential part of information dissemination. Thanks for all you do.

As science journalists, rather than primary researchers, what do you think of the coverage of Zika recently? How do you think science journalism (rather than other forms of popular media) shapes the general public discourse/level of accurate information available to the public? Are there steps you take to avoid fomenting "media hysteria"?

In general, science journalists from outlets such as Science and Nature, are doing an excellent job at public education/outreach. Are there ways you think science journalism, especially in the context of scary disease outbreaks such as Zika, could improve?

p1percub

Good question, and I wish I had more time to answer/discuss!

A lot of the coverage of Zika has been great. Vox has done a super job clearly laying out the facts (See this article published March 1 that answers questions about Zika).

And Nature's always on top of what's new (See this article posted today about the first Zika-linked birth detects seen in Colombia).

I do think there's room for improvement, though (in general, not referring to Vox or Nature!). For example, the alternative theories for microcephaly (pesticides, GM mosquitoes) seemed to instantly get a lot of attention (and headlines). But I think it's important for journalists to do what they can to evaluate the merit of new theories, studies, etc. by talking with scientists and/or digging into the research. (Discover did a good job a while ago debunking the GM mosquito theory.)

For more information, you can check out WHO's article on Zika rumors. **—Meghan**

Welcome to reddit! I think the work you do is an essential part of information dissemination. Thanks for all you do.

As science journalists, rather than primary researchers, what do you think of the coverage of Zika recently? How do you think science journalism (rather than other forms of popular media) shapes the general public discourse/level of accurate information available to the public? Are there steps you take to avoid fomenting "media hysteria"?

In general, science journalists from outlets such as Science and Nature, are doing an excellent job at public education/outreach. Are there ways you think science journalism, especially in the context of scary disease outbreaks such as Zika, could improve?

p1percub

I don't know that you can separate science journalism from other types of journalism. It's all part of the milieu people are exposed to. I see both responsible journalism and sensationalism in the current Zika coverage. At *Science News* we seek out the latest research on a topic and tell people what the state of that research is. If there are unknowns we tell them that and give some idea of the type of experiments that could resolve those questions.
Whenever there is a scary, unknown disease people want and need information. You avoid hysteria by sticking to the facts and trying to dispel myths. I think it's important for people to have access to primary sources of information as well as seeing it through our filter. —*Tina*

Zika was pretty much unheard of by most until recently. Why is it suddenly perceived to be an imminent threat? Is there any actual evidence that it causes birth defects?

seriouslywhybro

The main reason Zika is now considered to be such a threat is the correlation between the outbreak in Brazil and the subsequent rise in the number of babies born with microcephaly. Brazil typically has an average of 163 babies born per year with this birth defect, but from October 2015 to February 2016, the country has reported 5,909 cases. These are considered "suspected" cases, and many may not actually be microcephaly. But the huge swell in case numbers has sparked a lot of concern (enough for a "public health emergency of international concern," according to the WHO).

(You can find current case numbers in the WHO's latest situation report, which came out today.)

Regarding other evidence: Zika RNA has been found in the brains of fetuses with microcephaly, and in amniotic fluid of pregnant women who've been infected. Researchers are also reporting finding antibodies to Zika in the cerebrospinal fluid of babies born with microcephaly. Still, that's all circumstantial evidence. I think the biggest biological clue came out today, in a *Cell Stem Cell* paper

that showed that Zika virus could kill neural progenitor cells (these are cells in a developing embryo that go on to make neurons and other brain cells). Granted this experiment was done in the lab, but it's perhaps the first to show that Zika virus actually harms brain cells. I've summarized this experiment and the case that's building against Zika here.
— Meghan

As a male who does not plan on having any children (or sexual contact with women leading to children), is Zika of immediate personal concern? I know that e.g. Chikungunya is extremely painful and debilitating, but Zika's impact seems to be generally limited, if absolutely horrific. Thanks for doing the AMA!

ProLicks

There is at least one complication of Zika that men not planning to become fathers could face; Guillian-Barre syndrome, an autoimmune disease that attacks the nervous system. Increases of cases have been associated with the spread of Zika. https://www.sciencenews.org/article/scientists-probe-zika%E2%80%99s-link-neurological-disorder —*Tina*

What ever happened to Chikungunya? It was reportedly wide spread in the Caribbean, now you never hear about it.

SexualZergling

Chikungunya is carried by the same mosquito that carries Zika. It is a debilitating virus, but attention has shifted to Zika because of the link with birth defects and Guillian-Barre syndrome. Efforts to control Zika or prevent its spread should help with yellow fever, chikungunya and dengue, too. For more about chikungunya: https://www.sciencenews.org/article/chikungunya-move — *Tina*

Are the claims that Mosquitoes aren't an environmentally important species true? Why haven't we deployed some kind of manhattan project level research to eradicate them? We've done a great job of killing plenty of species just by accident already...

50bmg

Susan: Importance depends on which mosquito species and what it does. And there were fabulous Manhattan-like projects to wipe out *Aedes aegypti* in the Americas. Brazil got certified as free of the beast in 1958 (though the US never did). Alas, when a threat dwindles, so does money for vigilance. I'm looking forward to reading the book *Eradication* by Nancy Leys Stepan. (Bill Gates review: https://www.gatesnotes.com/Books/Eradication)

How much progress is actually being made to wipe out these human-biting mosquitoes? I have heard that we could wipe them out pretty easily, but we still haven't done so.

monkeydave

Efforts to control mosquitoes have been going on all around the world. But it is really, really hard.

Singapore has been on a multi-year crusade to crush *Aedes aegypti*. http://www.dengue.gov.sg/

They have been urging people to get rid of standing water and take other measures to battle the mosquito. But even in a densely-populated place like Singapore, mosquitoes will outnumber people. After all, a female mosquito can lay thousands of eggs. Despite eradication efforts, this year more than 4,800 dengue cases have been reported in Singapore.

Many countries don't have the resources Singapore does. I don't know that it is practical to wipe the mosquitoes out at this point. Gene drives may be able to remove specific species of mosquito https://www.sciencenews.org/article/gene-drives-spread-their-wings

But so far, people have not reported developing a gene drive for *Aedes aegypti*, the carrier of Zika, dengue and chikungunya. The ones that have been described have been for *Anopheles* species, which carry malaria.

Brazil has been deploying genetically engineered mosquitoes against Zika. https://www.reddit.com/r/science/comments/48x2oo/science_ama_series_zika_malaria_chikungunya_what/

The World Health Organization recently addressed this issue. http://www.who.int/emergencies/zika-virus/articles/mosquito-control/en/ —*Tina*

Would you guys support the eradication of mosquitoes or do you think it could cause a negative domino affect to other wildlife? Just curious on your stance.

butterbeany

Susan: Just my opinion: I would oppose eradicating mosquitoes as a whole group, as in all 3,500 of the known kinds. Even trying to think about the unexpected consequences from that makes me grab my forehead in pain. And eradicating any species seems an extreme step morally, not to be taken lightly. Also I think some of the mosquito species are kind of amazing, like the species *Wyeomyia smithii*. Its larvae somehow live in the little deathtrap pools of water where most insects get digested inside the leaves of carnivorous pitcher plants.

http://news.science360.gov/obj/pic-day/20100907/

I recently traveled to Belize and got about 30+ bites during my time there. While Belize is not yet reporting any cases, the surrounding countries have. I would like to be tested back in the U.S., what's the best way to ask my doctor about it?

amgood

You might start by telling your doctor where you have traveled and ask if you should be tested. Here is the CDC's guidance: http://www.cdc.gov/zika/symptoms/ —*Tina*

Hello, thank you very much for this AMA. I have a small (and silly) question (sorry I had no serious one in mind, please excuse as well the approximate English of a Frenchman) :

Do we have any hope of genetically engineering silent mosquitoes ? A mosquito beats its wings from 250 to 600 times per seconds (depending of the species and of the sex), I guess it is half the frequency of the sound it produces, which fall into the spectrum of our hearing bandwidth. Does it exist one or several gene(s) that control this frequency ? Can we modify it ?

twbmsp

Genetic engineering of mosquitoes isn't easy, although it seems to be getting easier thanks to new techniques like CRISPR. Biophysicists or systems biologists interested in studying flight might well be interested in modulating the wing speed of mosquitoes, but I think most people would rather concentrate on the horrible diseases mosquitoes spread. Until the diseases are wiped out, might I suggest noise-cancelling headphones? —*Tina*

Hello, thank you very much for this AMA. I have a small (and silly) question (sorry I had no serious one in mind, please excuse as well the approximate English of a Frenchman) :

Do we have any hope of genetically engineering silent mosquitoes ? A mosquito beats its wings from 250 to 600 times per seconds (depending of the species and of the sex), I guess it is half the frequency of the sound it produces, which fall into the spectrum of our hearing bandwidth. Does it exist one or several gene(s) that control this frequency ? Can we modify it ?

twbmsp

Susan: Another complication in trying to breed silent mosquitoes is whether they would be able to find true mosquito love and carry on the silent species. That whining is important for courtship, at least in *Aedes aegypti*. It's all about his and hers matching whines.

https://www.sciencenews.org/article/love-song-dengue-vector-mosquito

I have a couple of questions;

1. How compact and stable is the zika virus/ what is it's capability to mutate.
2. are there any genes within the zika virus that under just a small amount of mutation could severely worse the transmission or pathogenicity of the disease ?
3. What are the most unique/adapted organelles of plasmodium allowing for the most effective drug targeting ?

Willmono7

Here is some information about the genome structure of Zika virus:
https://microbewiki.kenyon.edu/index.php/Zika_virus

So far, there has been no evidence to suggest that mutations in the virus are making it more virulent. —*Tina*

I came from Malaysia and the disease is prevalent here and along all the other SEA countries. So my question is why isn't Dengue part of the list of diseases you listed above? Has the Dengue fever/disease/problem been 'solved'?

princessvaginaalpha

Unfortunately, the dengue problem is far from solved. People are working on vaccines, but there are four major types of dengue and a person who has had one may get infected with the others. Those multiple strains also pose a problem for reactions to vaccines. As I have mentioned in response to other questions, scientists are exploring a number of strategies to combat dengue. It's too soon to tell how successful they will be. Getting rid of dengue as well as these other diseases will probably require coordinated efforts on many fronts. —*Tina*

Reading about gene drives and the possibility to wipe out species with them is fascinating and a little scary.

But how would that work? If the mutation spread by the gene drive makes the mutated organisms less able to reproduce, wouldn't it *not* spread in the population?

Or would it be a latent vulnerability that would then be turned on later after it had become widespread?

thisjibberjabber

Researchers are exploring many strategies for gene drives. Reducing species numbers, even wiping them out is just one approach.

You're right that it seems counterintuitive that something that reduces fertility would compete and spread in the wild. But that's the beauty of gene drives. They are, at heart, selfish elements that spit in the eye of both Mendel and Darwin.

A recent paper by Didion *et al* shows that a selfish element in mice called *R2d2* can spread easily despite a loss of fertility.
http://mbe.oxfordjournals.org/content/early/2016/02/15/molbev.msw036.full.pdf+html

Now, *R2d2* is not a gene drive (and neither is R2-D2 the droid from *Star Wars*), but the principal is the same. If you can break Mendelian rules of inheritance and get into more than 50 percent of offspring, you can also flout Darwinian rules, even if you're harming the organism's fitness. —*Tina*