

PLOS Science Wednesday: Hi reddit, my name is Natasha and my PLOS NTDS study investigates how different insecticides impact blood-feeding behavior of *Ae. Aegypti* mosquitoes in Puerto Rico – Ask Me Anything!

PLOSScienceWednesday¹ and r/Science AMAs¹

¹Affiliation not available

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Abstract

Hi Reddit, My name is Natasha Agramonte and I am a Research Fellow at the CDC Entomology Branch and a PhD Candidate at the University of Florida. My research focuses on how insecticide resistance affects mosquito blood-feeding behavior. I recently published a study titled ‘Pyrethroid resistance alters the blood-feeding behavior in Puerto Rican *Aedes aegypti* mosquitoes exposed to treated fabric in PLOS Neglected Tropical Diseases. Insecticide resistance is a problem in mosquito control, because it increases disease risk, control costs, and environmental damage. Using a pyrethroid-susceptible and a pyrethroid-resistant strain of *Ae. aegypti*, we observed the blood-feeding behavior using fabric treated with four distinct but related insecticides. The results of this study indicated that higher amounts of pyrethroid chemicals are necessary to reduce blood-feeding behavior in the resistant Puerto Rican strain of *Ae. aegypti*, but interestingly the blood-feeding resistance was different (and lower!) than when the chemicals were directly applied to the mosquitoes for two chemicals: permethrin and etofenprox. I look forward to answering any and all of your mosquito questions at 1pm ET. Ask me Anything! Don’t forget to follow me on Twitter @mosquito_PhD.

[REDDIT](#)

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PLOSSCIENCEWEDNESDAY [R/SCIENCE](#)

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Hi and thanks for joining us!

Do you think there should be a stronger push for repellents such as DEET, icaridin, and IR3535 versus insecticides in resistant areas?

[PHealthy](#)

Yes, I think the use of repellents should be encouraged in areas with more resistance as repellents act on different targets than insecticides (at least that is what the latest research has found, since the mode of action for repellents hasn't been fully worked out like for insecticides). The issue with this, however, is that although it can be empowering to take personal control of your own protection from mosquitoes, it can be difficult to control the behavior of a population where disease prevention is the goal. Often the use of insecticides is preferable because it doesn't depend on the need to change a behavior in the population you are trying to protect.

What is your opinion of efforts to release genetically modified mosquitoes into the wild? I'm worried about unexpected consequences. Is that rational?

[asbruckman](#)

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While fear of the unknown can seem rational, especially that of a technology you are unfamiliar with, I don't think there is a rational reason to be fearful of the currently proposed genetically modified mosquitoes. Not all genetically modified organisms are modified the same way, thus it always helps to ask how they are modified before deciding on how it might affect you. The GM mosquitoes that I have seen most often proposed for release into the wild affect their ability to mate and produce baby mosquitoes. The ones I'm most familiar with modify genes that make males sterile, and since some female mosquito species mate only a few times, these females will not have offspring. The genes are limited to sex chromosomes in the mosquito, thus shouldn't affect people they come in contact with (male mosquitoes don't bite) and should have essentially no effect on other animals that eat mosquitoes (dragonflies, fish, and rarely bats).

Thanks for coming to talk to us! We are sending a student to do field work in PR shortly (to study the recovery). Should we be worried about mosquito-born diseases? What health precautions do you take when you are doing field work there?

[asbruckman](#)

Mosquito-borne diseases are definitely a concern if you have a student that will be doing field work in Puerto Rico. Zika virus is still prevalent on the island as is Dengue virus, which is endemic on PR. There are no vaccines currently approved for either of these viruses, thus precautionary measures should be taken. I often use the mnemonic of the 4 D's: dress, DEET, dusk/dawn, and drain. Dress in longer sleeves and pants, wear repellent, avoid prolonged outdoor activity at dawn and dusk, and drain standing water. If you are wearing repellents, make sure to use one of the EPA approved ones: <https://www.cdc.gov/zika/prevention/prevent-mosquito-bites.html>, and re-apply every 2-4 hours as directed.

Is the mosquito laser viable? Do you think it will ever be commercialized?

https://en.wikipedia.org/wiki/Mosquito_laser

[BiereDeGarde](#)

I have seen this advertised at several of the scientific conferences I attend, and while I think the technology is interesting and useful, I don't think that it will be viable for its intended purpose. I think the technology could be more useful for mosquito trapping surveillance, as a mosquito population estimator, rather than using a laser to zap mosquitoes out of the sky.

I live in Brooklyn, NY. In the past month I have noticed a new kind of tiny, vicious, day-biting mosquito in my neighborhood. We already have loads of tiger mosquitoes. Is there any point to trying to report this new kind to any agency? Thanks.

[dieticksdie](#)

It's always helpful to report this kind of information when you notice something different in your area. NYC has a strong mosquito control community and they use mosquito complaint information to help prioritize control efforts. If you have a specific observation, it can be useful for mosquito control efforts by checking surveillance traps in the area to see if a new species has moved into the area, or if an existing species is gaining ground in an area. In NYC, you can report any mosquito-related complaints or observations here: <http://www1.nyc.gov/nyc-resources/service/5846/mosquito-swarm-report>. I have a colleague that works in the area, and I know NYC recently launched new mosquito information websites so you can learn what to do about mosquito activity and also learn when mosquito spraying

will occur in your neighborhood: <http://www1.nyc.gov/site/doh/health/health-topics/mosquitoes.page>.

I have two questions. One is related: - How do you define insecticides? Are these products used on humans, such as DEET or products used on crops? (Can mosquito's become resistant to DEET? That is my personal field experience)

And unrelated:

- Is it true that mosquitos are more drawn to certain bloodtypes? I'm a type 0- and seem to bring all the bugs to the yard.

[DontUseYourOwnName](#)

Insecticides are chemicals that are used to control insects, specifically with the aim to kill them. DEET and other repellents are often described as 'tasting bad' to mosquitoes, because their goal is to get them to move away from you, and not necessarily to kill them. Most repellents will not kill mosquitoes. Some insecticides are used on crops to protect plants from insects that would eat them (are reduce the crop value). Occasionally, the insecticides used for crops and for mosquito control are similar, which can result in resistance in mosquito populations, even when the mosquitoes themselves aren't being targeted. Mosquitoes in the wild can't become resistant to DEET, as resistance is as a result of some mosquitoes being killed by an exposure to a chemical and then the mosquitoes that survive reproducing and spreading their favorable genes for resistance to a certain chemical. Deet-resistance has been reported in a lab setting, but the doses of DEET and the conditions necessary for this to occur are difficult to produce outside of a lab.

Would a rotating cycle of removing one entire class of pesticides after another from global use for a certain period of time do anything to keep insects from developing pesticide resistance?

[dieticksdie](#)

Rotating the use of pesticides in an area would be useful, provided that they have a different MOA (mode of action). One notable example of this is DDT and pyrethroid pesticides belong to different chemical classes, but have a common mode of action (sodium channel modulators). It wouldn't be realistic to try and rotate these on a global level (who would enforce that?), and many of the people using these pesticides often need to factor in the cost of these pesticides. However, insecticide resistance can be costly as the more chemical is necessary to kill/deter them once resistance develops.

How do the recent hurricanes in Puerto Rico and the Southeast U.S. affect mosquito populations? Does the current generation get killed due to high winds?

[sliop24](#)

Hurricanes do a good job of killing or displacing the adult mosquitoes, which provides a temporary relief from mosquitoes in the area where a hurricane just passed through. However, the flooding from a hurricane causes a large spike in flood-water mosquito species starting about 2 weeks after the hurricane has passed. This was recently seen with Irma, where Hernando county in Florida reported 26,000 mosquitoes in a single trap overnight:

<http://www.miamiherald.com/news/state/florida/article176459191.html>

Welcome and thanks for taking the time to share your research with us!

I've heard that if mosquitoes were wiped out there wouldn't really be any negative effects on the ecosystem. Is that true or is it more complicated than that?

Also, you mentioned in your comment that "...the blood-feeding resistance was different (and lower!) than when the chemicals were directly applied to the mosquitoes for two chemicals: permethrin and etofenprox."

What sort of differences did you see with those chemicals and what does that mean?

[PapaNachos](#)

As much as people would love if we wiped out mosquitoes, it's a pretty impossible task to wipe them all out. There are over 3500 species of mosquitoes. Thankfully, there are only about 150 species of mosquitoes that spread human diseases, so most of our control efforts are concentrated on just a few species. If a few of these species could logistically be eradicated, it would have a negligible effect on the ecosystem. Although there are animals that eat mosquitoes (dragonflies, fish, a few bats, and even some other mosquito species!) no animals have mosquitoes as a major source of nutrition, thus removing them from that system wouldn't negatively affect them. The United States did participate in a very large campaign involving several countries to try and eradicate a single mosquito species: *Aedes aegypti*, from the 1940s to the 1960s. The campaign was hard fought and did beat the species out much of the Americas, but when the money for the efforts dropped, and control efforts were relaxed, *Aedes aegypti* slowly re-established much of the America.

The differences that I saw with these two chemicals was that even though there was an expectedly high amount of chemical necessary to kill the resistant strain of Puerto Rican mosquitoes, less chemical was needed (compared to the controls) to stop them from blood-feeding through insecticide-treated cloth.