



Genetically Modified Mosquitoes

For Prelims: Genetically Modified Mosquitoes, Dengue, Zika, Yellow Fever.

For Mains: Health, Diseases.

Why in News?

Recently, the US conducted an **open-air study of genetically engineered mosquitoes** which shows promising results.

- The aim of the study is **to reduce the population of wild *Aedes aegypti* mosquitoes** that are a **vector for viruses** such as chikungunya, [dengue](#), [zika](#) and [yellow fever](#).
- The mosquitoes had **already been field-tested in Brazil, Panama, the Cayman Islands, and Malaysia**, but no such study was conducted in the United States.

<u>Vector</u>	<u>Disease caused</u>	<u>Type of pathogen</u>
Mosquito <i>Aedes</i>	Chikungunya	Virus
	Dengue	Virus
	Lymphatic filariasis	Parasite
	Rift Valley fever	Virus
	Yellow Fever	Virus
	Zika	Virus
<i>Anopheles</i>	Lymphatic filariasis	Parasite
	Malaria	Parasite
<i>Culex</i>	Japanese encephalitis	Virus
	Lymphatic filariasis	Parasite
	West Nile fever	Virus

What are Genetically Modified Mosquitoes?

- GM mosquitoes are mass-produced in a laboratory to carry two types of genes:
 - A **self-limiting gene** that prevents female mosquito offspring from surviving to adulthood.
 - A **fluorescent marker gene** that glows under a special red light. This allows researchers to identify GM mosquitoes in the wild.

- GM mosquitoes produced in the laboratory lay eggs. These eggs carry the self-limiting and fluorescent marker genes.
- GM mosquito eggs that carry the self-limiting gene are released into an area. Once they have hatched and develop through to the adult stage, **they are available to mate with wild females**. The genes are passed on to offspring.
 - The male mosquitoes have a protein (the tTAV-OX5034 protein) that prevents female offspring from surviving when male OX5034 mosquitoes mate with wild female mosquitoes.
- The **female offspring die before they become adults**. The expected result is that the number of *Aedes aegypti* mosquitoes in the area decreases.

What are the Related Concerns?

- Genetically modifying insects to control their population to curb the spread of a disease is **not a novel idea**. Similar efforts began a decade ago, with scientists now attempting to engineer [ticks](#) to prevent diseases.
- The concerns **ranged from the modified mosquitoes harming people**, its impact on mosquito-eating species and other unintended consequences such as the emergence of a deadly virus.
- Experts also believe that **reducing the population of the virus-spreading mosquito is not enough** to curb a potential outbreak.

Zika Virus

- Zika virus is a **mosquito-borne flavivirus** that was first identified in Uganda in 1947 in monkeys.
- It was **later identified in humans in 1952** in Uganda and the United Republic of Tanzania. Outbreaks of Zika virus disease have been recorded in Africa, the Americas, Asia, and the Pacific.
- Zika virus disease is **caused by a virus transmitted primarily by Aedes mosquitoes** and can be passed from a pregnant woman to her foetus.
- Sexual transmission of Zika virus is also possible.
- There is **no vaccine or medicine for Zika**. Instead, the focus is on relieving symptoms and includes rest, rehydration and acetaminophen for fever and pain.

Dengue

- Dengue is **transmitted by several species of mosquito** within the genus *Aedes*.
- Symptoms include fever, headache, muscle, and joint pains, and a characteristic skin rash that is similar to measles.
- The **dengue vaccine CYD-TDV or Dengvaxia** has been approved in about 20 countries.

Chikungunya

- Chikungunya is caused by a **mosquito-borne virus**.
- It is transmitted by ***Aedes aegypti* and *Aedes albopictus* mosquitoes**.
- Its symptoms are characterized by abrupt fever and severe joint pain, often in hands and feet, and may include headache, muscle pain, joint swelling or rash.
- There is **no specific antiviral drug treatment** for chikungunya.
- There is **no commercial chikungunya vaccine**.

Yellow Fever

- It is an **acute viral haemorrhagic disease** transmitted by infected mosquitoes. The "yellow" in the name refers to the jaundice that affects some patients.
- Symptoms of yellow fever include fever, headache, jaundice, muscle pain, nausea, vomiting and fatigue.
- **Yellow fever vaccine which is known as 17D** and according to the [World Health Organization \(WHO\)](#) also, it is safe and affordable. However, there are reports of multisystem organ failure following vaccination.

UPSC Civil Services Examination, Previous Year Question

Q. Consider the following statements: (2017)

1. In tropical regions, Zika virus disease is transmitted by the same mosquito that transmits dengue.
2. Sexual transmission of Zika virus disease is possible.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Ans: (c)

Source: DTE

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