New CRISPR-based technology to genetically control disease-spreading mosquitoes

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In news– Leveraging advancements in CRISPR-based genetic engineering, researchers at the University of California have **created a new system that restrains populations of mosquitoes that infect millions each year with debilitating diseases.**

What is CRISPR-based new technology?

The newly developed technology is called the "precision-guided sterile insect technique" (pgSIT).

How does it work?

- The pgSIT alters genes linked to male fertility, creating sterile offspring and female flight in Aedes aegypti, the mosquito species responsible for spreading diseases including dengue fever, chikungunya and Zika.
- The **pgSIT uses CRISPR to sterilise male mosquitoes and render female mosquitoes** (which spread disease) flightless.
- The system is **self-limiting and is not predicted to persist or spread in the environment**, two safety features that should enable acceptance for this technology.
- The pgSIT eggs can be shipped to a location threatened by mosquito-borne disease or developed at an on-site facility that could produce the eggs for nearby deployment.
- Once the pgSIT eggs are released in the wild, sterile pgSIT males will emerge and eventually mate with females, driving down the wild population as needed.
- Beyond Aedes aegypti, the researchers believe the pgSIT

technology could be directed to other species that spread disease.

How is it different from Gene Drive?

- The pgSIT differs from “gene drive” systems that could suppress disease vectors by passing desired genetic alterations indefinitely from one generation to the next.
- Instead, pgSIT uses CRISPR to sterilize male mosquitoes and render female mosquitoes, which spread disease, as flightless.

CRISPR technology-

- CRISPR stands for **Clustered Regularly Interspaced Short Palindromic Repeats** which are the hallmark of a bacterial defense system that forms the basis for CRISPR-Cas9 genome editing technology.
- CRISPR is a technology that can be **used to edit genes**.
- The term **“CRISPR” or “CRISPR-Cas9”** is often used loosely to refer to the various CRISPR-Cas9 and -CPF1, (and other) systems that can be programmed to **target specific stretches of genetic code and to edit DNA at precise locations**, as well as for other purposes, such as for new diagnostic tools.
- CRISPR “spacer” sequences are transcribed into short RNA sequences (“CRISPR RNAs” or “crRNAs”) capable of guiding the system to matching sequences of DNA.
- When the target DNA is found, Cas9 – one of the enzymes produced by the CRISPR system, binds to the DNA and cuts it, shutting the targeted gene off.
- Using modified versions of Cas9, researchers can activate gene expression instead of cutting the DNA. These techniques allow researchers to study the gene’s function.