

6. Transgenic Mosquitoes Transfer Genes to Native Mosquito Species

Prelims- Science & Technology- Biotechnology

Mains- GS-III- Science and Technology- developments and their applications and effects in everyday life; Awareness in the fields of Biotechnology

Why in News?

- ▶▶ Genes from genetically-modified *Aedes aegypti* mosquito were found to have been transferred to naturally-occurring *A. aegypti* mosquito population in three areas in Brazil where transgenic mosquitoes were released.

Transgenic Mosquitoes:

- ▶▶ A transgenic Mosquito is one that contains a gene or genes which have been artificially inserted instead of the mosquito acquiring them through reproduction.
- ▶▶ Transgenic strains of mosquitoes were developed to
- ▶▶ Replace or suppress Wild Vector Populations
- ▶▶ Reduce Transmission
- ▶▶ Deliver Public Health gains are an Imminent Prospect.

Background:

- ▶▶ About 4,50,000 transgenic male mosquitoes were released each week for 27 months (June 2013 to September 2015) in three areas in Brazil.
- ▶▶ Transgenic mosquitoes (TMs) were developed to minimize/eliminate the mosquito borne diseases.
- ▶▶ Genetic analysis of naturally occurring mosquitoes were done prior to the release and at six, 12, and 27-30 months after the releases.

Highlights:

- ▶▶ *A. aegypti* mosquitoes are responsible for transmitting dengue, chikungunya and Zika virus. Researchers from Yale University studied 347 naturally-occurring *aegypti* mosquitoes for transfer of genes from the transgenic insects.
- ▶▶ The transgenic strains can be distinguished from naturally-occurring mosquitoes by using fluorescent lights and filters.
- ▶▶ They found that some transgenic genes were found in 10-60% of naturally-occurring mosquitoes.
- ▶▶ Also, the naturally occurring *aegypti* mosquitoes carrying some genes of the transgenic mosquitoes were able to reproduce in nature and spread to neighbouring areas 4 km away.

Issue:

- ▶▶ As per claims made by the British company Oxitec Ltd, which had developed the technology and field-tested it in several countries,
- ▶▶ The genetic strategy employed to control aegypti population known as RIDL (the Release of Insects carrying Dominant Lethal genes) is supposed to only reduce the population of the naturally occurring *A. aegypti* mosquitoes and not affect or alter their genetics.
- ▶▶ Also, offspring are not supposed to grow to adult mosquitoes and reproduce.
- ▶▶ The claim was that genes from the release strain would not get into the general population because offspring would die. But that did not happen.
- ▶▶ The genetic strategy works on the premise that the transgenic male mosquitoes released frequently in large numbers would compete with the naturally occurring male mosquitoes to mate with the females.
- ▶▶ Offspring from the mating of transgenic male mosquito and naturally occurring female mosquito do not survive to the adult stage.
- ▶▶ This is because tetracycline drug, which prevents the dominant lethal gene from producing the lethal protein during rearing in labs, is not present in sufficient quantity in nature.
- ▶▶ In the absence of tetracycline, there is overproduction of the lethal protein causing the larvae to die.
- ▶▶ At present, it is unclear if the presence of transgenic mosquito genes in the natural population will affect the disease transmission capacity or make mosquito control efforts more difficult.