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Brazil releases genetically modified mosquitoes to fight dengue fever

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LONDON: Thousands of British made genetically engineered mosquitoes were released by Brazilian researchers in Rio de Janeiro on Thursday infected with bacteria that suppress dengue fever.

The hope is they will multiply, breed and become the majority of mosquitoes, thus reducing cases of the disease.

The British biotech firm Oxitec has altered the DNA of the *Aedes aegypti* mosquito to prevent it from spreading the potentially deadly virus.

Oxitec's new factory in the Brazilian city of Campinas, outside Sao Paulo, is the first in the world to launch production of genetically modified (GM) mosquitoes to target dengue.

The mosquitoes, which Oxitec has dubbed OX513A, have been bred to carry a sort of genetic self-destruct mechanism that causes their offspring to die before they reach sexual maturity, preventing them from reproducing.

The Oxford-based biotech firm found the perfect way to cut down on the world's malaria and dengue numbers - create and release genetically engineered mosquitoes which are sterile and unable to reproduce.

The Oxitec mosquito is a strain of the wild species that contains two additional genes.

The Oxitec males (which cannot bite) are released to seek out and mate with the wild females.

Their offspring inherit the additional genes and die before becoming functional adults.

They also inherit a marker that is visible under a special light, making monitoring in the field simple and helping ensure that dengue mosquito control programmes succeed.

Brazil has now become the first country to allow the commercial release of the genetically modified (GM) mosquito, OX513A.

In several trials, successive releases of the Oxitec males have been shown to reduce substantially the wild population of dengue mosquitoes in the treated area.

Hadyn Parry, CEO of Oxitec said the mosquito *Aedes aegypti* is the main vector of dengue, a virus that infects an estimated 390 million people per year worldwide. "The dengue mosquito lives in and around the home and is known for being difficult to control. Conventional methods currently in use have shown themselves to be insufficient to prevent the spread of the disease," Parry said.

To make a genetically modified mosquito, Oxitec's scientists had to find a way of incorporating the new gene into the mosquito's own DNA, from where it will be copied into every cell of the mosquito's body.

The process began with mosquito eggs. Using special glass needles, so sharp that the point can only be seen clearly under a high-powered microscope, Oxitec's scientists injected very small amounts of DNA into the end of a mosquito egg. The amount of DNA injected into each egg is miniscule - typically around 10 thousand-millionths of a litre.

Many of the eggs injected in this way didn't survive.

In others, the DNA which was injected weren't incorporated into the mosquito's cells. But in a very few eggs, the new DNA was taken up by the mosquito's cells and were cut and pasted into the mosquito's own genome. So this ensured that in the sperm cells of a male mosquito, or the egg-producing cells of a female, the new DNA was passed on to their offspring.

After being injected, the eggs were hatched, and the resulting mosquitoes carefully looked after until they reach adulthood.

The DNA which was injected contains a lethal gene, but it also contains a fluorescent gene which allows the genetically modified mosquitoes to be identified using a special microscope.

The sterile males are then released into the environment, where they mate with wild females. Females usually only mate once, so a female which mates with a sterile male doesn't produce any offspring. As a result, the population as a whole is reduced. Eventually, with enough sterile releases, the population of the target insect in an area can be dramatically reduced or even eliminated.

India too will soon have a similar army of indigenous genetically engineered mosquitoes which are sterile and unable to reproduce.

Oxitec is collaborating with Gangabishan Bhikunal Investment and Trading Limited (GBIT) to develop and produce the technology in India.