



MALARIA CONTROL – SCIENCE & TECHNOLOGY

NEWS: In a radical approach, scientists have shifted their focus from genetic modification of malaria-causing mosquitoes to malaria-causing parasites.

WHAT'S IN THE NEWS?

About

- Traditionally, efforts to control malaria have focused on mosquito vectors.
- Some key approaches include:
 - **Radiation-Sterilised Mosquitoes:** Release of sterilised male mosquitoes prevents fertilisation, reducing mosquito populations.
 - **Slowing Parasite Growth in Mosquitoes:** Genetic engineering slows the growth of Plasmodium parasites within mosquito guts, halting the transmission to humans.
 - **Genetically Modified Mosquitoes:** Mosquitoes are engineered to thrive and spread genetic resistance to Plasmodium parasites through mating, reducing transmission rates.

Life Cycle of Malaria Parasite

- Malaria-causing parasites **first enter the human liver** after a mosquito bite.
- Infection and symptoms occur only when the parasites move from the liver into the bloodstream.

Female mosquitoes only produce eggs with an **X** chromosome.
Male mosquitoes produce sperm with either an **X** or a **Y** chromosome. For this reason, it is sperm from the **male** that ultimately **determines** the sex of the mosquito offspring.



How the Modification Works?

- **Immune Priming:** Genetically modified parasites act like a vaccine, priming the immune system during the liver stage to shield individuals from future infections.



- **Controlled Growth Arrest:** Parasite growth is arrested on **day six** (late-arresting parasite), allowing sufficient time for immune system activation before the parasite is killed.
- **Early vs. Late Arrest:** Early arrest (day one) limits immune exposure, reducing effectiveness, whereas late arrest enhances immune priming for better protection.

Significance of the Development

- **Vaccine-Like Effect:** Genetically modified parasites act as a **natural immune** booster, providing protection similar to a vaccine.
- **Targeted Approach:** Unlike methods focusing solely on mosquitoes, modifying parasites directly disrupts the Plasmodium life cycle, reducing the risk of disease.
- **Overcoming Resistance:** With rising insecticide resistance in mosquitoes and drug resistance in parasites, this approach offers a promising alternative strategy.
- **Enhanced Efficacy:** Late-arresting parasites allow for stronger immune system activation, increasing the effectiveness of malaria prevention.

Challenges and Concerns

- **Biosafety Issues:** The release and use of genetically modified organisms (GMOs) carry biosafety risks that must be addressed.
- **Ethical Considerations:** Genetic modification of parasites raises ethical questions about altering natural biological systems.

Source: <http://hindu.com/sci-tech/science/preventing-malaria-using-genetically-modified-malaria-parasites/article68955241.ece#:~:text=Genetically%20modified%20malaria-causing%2>