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Biological Control Techniques and Diseases Spread by Mosquitoes

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Abstract

The world's enormous relationship between fauna and flora today is caused by many things, including the largest ever increase in population and the expansion of transportation infrastructure. These forces break down boundaries in biogeography, causing species to first appear in unfamiliar environments. The Americas are expected to suffer damage worth more than $120 billion annually as a result of these species' invasion. Pandemics and epidemics caused by arthropods have the potential to spread lethal viruses and parasites, posing a threat to the world's expanding human and animal populations.

Keywords: Mosquitoes • Chemoreceptors • Bio insecticides

Introduction

Diptera: Mosquitoes Due to their role in disease transmission, culicidae) are the most harmful vectors. Commerce and tourism are introducing important mosquito species to new ecosystems. Commercially available chemical compounds have a favorable safety profile, but their toxicity to the nervous system and human skin can result in rashes, swelling, and eye discomfort. The most significant drawback of these products is that pesticide resistance is becoming more common in recent years and that finding and treating all places where mosquitoes breed is extremely difficult, if not impossible. There is an urgent need for new vector-control methods and tools that target adults and aquatic stages.

Description

The lactic acid and CO_2 in our sweat, which are detected by chemoreceptors in their antennae and mask by repellents, are the primary factors that attract mosquitoes to humans. The most widely used and effective insect repellent is DEET (N,N-diethyl-meta-toluamide). Biobased mosquito repellents are methods for controlling pests that make use of harmless active components derived from plants, fungi, or bacteria. Bio-based natural mosquito repellents are preferred to chemical repellents in areas where endemic mosquito resistance and environmental concerns limit product use. The most effective synthetic repellents are DEET (N,N-diethyl-m-toluamide) and IR3535 (N-butyl-N-acetyl)- aminopropionic acid. If used in insect-repellent clothing that lasts a long time, several nanoparticles that have been synthesized and successfully impregnated into cotton fabrics show high efficacy against mosquito larvae and adult populations. This suggests that they could be used as environmentally friendly methods of controlling mosquitoes. There has been a lot of debate regarding this method of control because the use of synthetic repellents causes pesticide resistance in mosquitoes, causes harm to non-target animals, and puts the environment in danger [1-3].

There are a number of advantages to using IGRs to control mosquito populations, including their selectivity and low environmental toxicity. They are antagonists or analogues of hormones that stop insects from growing. Methoprene and pyriproxyfen, two IGR insecticides that act as juvenile hormone agonists, are becoming increasingly popular. They can kill mosquito larvae, but they may prevent adult mosquitoes from emerging; Diflubenzuron and novaluron are two alternatives to insecticides that kill mosquitoes. Mosquitoes and other pests have developed resistance to commonly used IGRs like methoprene and pyriproxyfen, according to numerous recent studies. This highlights the need to develop novel chemicals and discover new mosquito targets.

On Aedes larval breeding water, a novel RNAi-based bioinsecticide derived from D-RNA molecules was recently developed and tested. The surviving larvae and adults had altered morphology and chitin content, and the larvae treated with dsRNA had significantly reduced viability. When diflubenzuron is added, this novel bioinsecticide has the ability to kill insects. Another study found that feeding adult male Aedes aegypti with double-stranded RNAs (dsRNAs) that targeted testis genes significantly decreased their fertility. These brand-new methods aim to stop mosquitoes in their aquatic stages by killing them with sound waves that either stop them from emerging or kill them immediately. They have demonstrated that they are an excellent non-chemical treatment for drinking water sources. This method has been shown to be very effective when used correctly in a variety of common amounts found in peri-domestic water containers without harming non-target animals or breeding resistance in mosquito populations. Additionally, sensitive audio data on the amount of adult wingbeat noises specific to a species can be collected by even the most basic and inexpensive mobile phones. This makes it possible to simultaneously record the time and location of human-mosquito encounters, making it an effective tool for acoustically mapping the global distribution of mosquito species.

The battery-powered sound-baited gravid Aedes trap, which may be an effective alternative to the costly Biogents Sentinel (BGS) trap, is just one of several new acoustic-based techniques that have been developed for the management of mosquitoes during rear-and-release operations. Other new techniques include the Gravid Aedes trap. Pesticide resistance, inadequate control programs, an absent and under-educated workforce, and a lack of financial resources and infrastructure are just a few of the complicated factors that contribute to the persistence of epidemics and the spread of diseases transmitted by mosquitoes despite current efforts. There are a lot of mosquito-borne illness control systems out there, each with its own advantages and disadvantages. However, integrated vector management systems, which employ receding horizon control techniques and may take into account a

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variety of goals, appear to provide the best control options that are not only quick and long-lasting but also the most cost-effective [4,5].

Conclusion

Improving current methods, such as the sterile insect technique, the release of insects with dominant lethality, or transgenesis, may provide crucial solutions for preventing outbreaks, minimizing resistance, and reducing risk to populations at risk. In contrast, vector control programs should pay more attention to and take into account promising strategies that have previously demonstrated their usefulness but are underutilized.

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Conflict of Interest

No potential conflict of interest was reported by the authors.

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