



## Use of the gene drive system in harmful species' suppression in the ecosystem

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CRISPR  
Ethic  
Ecosystem

### Abstract

In this review proceeding, we will discuss what gene drive is and how it can be used. Should gene drive be used, or not in many aspects? How ethically correct is it to apply gene editing techniques? Should people implement crspr method that could have big impacts on the ecosystem? These questions will be discussed in more details in our study.

## Introduction

Firstly, let's look at what a gene drive is, gene drivers: It is a biased inheritance system that ensures or increases the probability of transmission of a desired trait to a local population and all populations associated with this species through sexual reproduction between generations of any DNA sequence. If we examine the content of how the gene drive works in more detail; in of the examples, it is a system based on gene driven HEGs, that is, a guided endonuclease gene. The way HEGs work is based on cutting both strands of the DNA helix at a particular knee. The organism uses homology-directed DNA repair (HDR) to repair the cut sites. Thus, the organism can copy and use any similar sequence in the cell to fill in these gaps. In this way, we can create deliberate gaps so that the organism can copy and use the correct sequence. This trait is passed on from generation to generation. The targeted gene is transported to fixation within a short period of time instead of settling in the gene with long evolutionary processes [1]. Although the use of the gene drive system has very useful promises, the deliberate or accidental release of only one genetically modified organism into the environment carries great risks for the ecosystem, as it may affect the genetics of an entire species and even related species. For this reason, it has always been a matter of debate whether it should be used or not since its discovery. If we talk about the possible risks of using gene drive in general, it may cause an unknown downstream effect on the entire ecosystem, or countries may deliberately use treacherous gene drive to release a genetically modified organism into nature for warfare. Gene drive use poses some ethical dilemmas. On the other hand, using gene drive, disease-carrying insect vectors can be destroyed, agricultural pests can be suppressed without harming the environment and non-target organisms, or it can offer the opportunity to counter invasive species that have formed in the ecosystem or to provide the opposite effect for endangered species [2]. As an example of the use of gene drivers for pest control, we can take the pest problem in New Zealand. The pest problem is a big problem in many parts of the world and needs to be solved for the good of humanity and the world. The pest infestation in New Zealand has been going on for a very long time. Although many studies have been tried to solve this problem, none of them have brought a permanent solution. New Zealand needs special treatment due to its location and a few other features. Many pests enter this country intentionally or accidentally from many overseas countries. It has become a necessity to use the gene drive system for the suppression of vespin hornet and brush-tailed rat species, which have caused great damage to the country and require urgent intervention, especially recently. As New Zealand is an island country, it is a suitable field environment for biological research and testing new technologies. On the other hand, there are reasons why this should be done as early as possible, for example, some drugs and methods used by the public for pest control (sodium fluoroacetate) cause great harm to the ecosystem, species can become resistant to these drugs. For such reasons, these methods are not permanent and sustainable solutions. In fact, the use of these drugs can directly

harm people, as well as the environment. Trying new technologies becomes mandatory for many reasons such as using them in the context of adequate and detailed research and applications [1-3].

## Discussion

Throughout the article, we have discussed what gene drive is and what it can be used for. Although the use of many gene drive systems is under intense discussion for their utilization to improve our production and life styles, there are also those who argue that we should not interfere with the functioning of the environment itself. Human beings have already influenced and disrupted the way the world works. According to many studies, the world we live in has ceased to be sustainable a while ago and is faced with risks such as exceeding irreversible thresholds day by day. In this case, if something is not done and if we exceed certain threshold values on behalf of our resources and living things, it may not be reversible. For such reasons, the use of the gene drive system comes to the fore. However, when the system is started to be used, the risks that may occur should be considered and proceed in this direction. In addition, studies should be viewed from an ethical point of view. At this point, certain ethical codes can be created. For every action to be taken, these codes must be followed and the approval of the public must be obtained. In order to establish ethical codes, some institutions such as NASEM have started to work on creating an independent expert panel. With such moves, possible environmental risks and bioterrorism can be prevented [3]. Humanity has to keep up with the changing world. As Charles Darwin said, "Throughout the long history of humanity (and the animal kingdom), those who have learned to cooperate most effectively and adapt themselves have prevailed," this is part of evolution. If we have a chance to suppress mosquitoes that carry diseases such as malaria, which has been the great enemy of generations, and to save millions of lives, we must establish certain rules by conducting the necessary research, experiments and examinations, and step into this new world within the framework of these rules and requirements [1-3].

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