SAVING THE HAWAIIAN HONEYCREEPER BIRDS

MINI-LESSON

PERSONAL GENETICS EDUCATION & DIALOGUE

STUDENT MATERIALS

Introduction

Can genetic technology be used to rescue the Hawaiian honeycreeper birds? What are the big hopes and concerns to weigh when thinking about genetics and preserving endangered animals?

A new generation of genetic tools has opened up a way to change the world around us to improve human health, crops, and the environment. However, not everyone agrees these tools would be a benefit, and some people worry about unintended consequences of their use. We explore these issues by looking at the story of the honeycreeper birds in Hawaii.

What are These Birds Like and Why are They Important?

Hawaiian honeycreepers are beautiful, colorful birds that are beloved by many people all over the world. Known to Hawaiians as *I'iwi*, honeycreepers are an important part of the ecosystem on the Hawaiian Islands, and they are culturally important as well. The Indigenous peoples of Hawaii have used feathers from honeycreepers to make ceremonial cloaks called *ahu'ula* and helmets known as *mahiole*.

Watch this video to see and hear why these birds are so amazing: Hawaiian I'iwi bird by *The Nature Conservancy*.

Honeycreepers are at risk of extinction and the people of Hawaii and others are looking for ways to protect and preserve these birds. Their habitat is being harmed by human activity. Another threat to the survival of these birds is a deadly bird disease, called avian malaria (note: the word "avian" means "relating to birds").

How Might a Form of Genetic Engineering Called CRISPR be Used to Protect the Honeycreepers?

Avian malaria is caused by parasites that spread to the honeycreepers through mosquito bites. Hawaiian honeycreepers have no natural defenses against this disease.

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To escape the threat of disease, honeycreepers are forced to live at higher altitudes where the temperatures are too low for the mosquitoes to survive. However, to gather food, the birds have to travel into the valleys, and this is where they might encounter mosquitoes that could infect them with malaria. Since the early 2000s, the Hawaiian honeycreeper population has fallen an average of 68% (in their core habitat) to 94% (on the edges of their living area).

One idea to prevent the extinction of these birds is to reduce or eliminate avian malaria by editing the mosquito DNA. How? First, it would involve the use of a type of genetic engineering called "genome editing", which can be used to make specific and targeted changes to an organism's DNA.

Watch this video to learn about genome editing: CRISPR: A gene editing super power by *SciShow*. This video talks about both the science and the ethics of the genome editing tool, CRISPR. The key thing to understand is that CRISPR is a technique that allows scientists to change, alter, and replace pieces of DNA that can affect how an organism functions.

How Could CRISPR be Used in Mosquitoes? What Sort of Changes Could be Made to Their DNA?

Imagine a genetic change that could prevent mosquitoes from carrying the malaria parasite. Or a genetic change that reduces the size of the mosquito population. CRISPR could potentially be used to introduce one of these genetic change into the DNA of the mosquitoes, so they would be less able or unable to give the avian malaria disease to the honeycreeper birds. This genetic change could be rapidly spread through the Hawaiian mosquito population by using a specialized technique called a "gene drive". A gene drive increases the chances that the genetic change is passed from one generation to the next.

Watch this video to learn what a gene drive is: What's a gene drive? by *Risk Bites*. This video explains how traits are typically inherited. And it talks about how a gene drive boosts the chances that a particular trait will be passed on to the next generation.

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STUDENT WORKSHEET

Name:____ **Date:**____________

1. List two reasons why the Hawaiian honeycreeper birds are at risk of extinction.

2. Describe the main goal of using a gene-drive to alter mosquitoes that are harming Hawaiian honeycreeper birds.

3. Scientists and local community members are thinking about whether it is a good idea to alter the DNA of mosquitoes to stop them from infecting honeycreepers with the avian malaria parasite. What are two questions that you think should be asked before deciding what to do?

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