Potential Public Health Use of Gene Drive Approaches to Reduce Vector-Borne Disease

Gene Drives and Engineered Ecology
Global Forum on Scientific Advances Important to the BWC
2 December 2019
New tools are needed to stop vector-borne diseases

Vector-borne diseases kill 700,000 people per year

Existing tools are important but control is expensive

Over 200 million malaria cases per year, >90% in Africa

>$3B per year is spent on malaria control; still not enough
Gene drive approaches may help prevent disease

**Less transmission of disease**

- Fewer vectors over time...
- ... or they can't carry disease

**Spread through mating lowers costs**

- Simulated gene drive spread (purple)
- ~100 km

**Gene drive is specific to vectors**

- Only 5 main species transmit malaria in Africa
- 3500 other mosquito species, millions of insect species
Progress has been impressive; challenges remain

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<th>Progress</th>
<th>Challenges</th>
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<td>▪ Gene drive demonstrated in malaria vectors in the lab</td>
<td>▪ Translation of lab results to a wide range of environments</td>
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<td>▪ Lab mosquito populations suppressed or altered to prevent disease transmission</td>
<td>▪ Potential persistence and/or spread of field studies</td>
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<td>▪ Burkina Faso approved genetically sterile male mosquitoes for study</td>
<td>▪ Adapting legal and policy frameworks developed for crops to vectors</td>
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Risks are being systematically identified and assessed

Goal and risk identification

Systematic risk assessment
Our goal is to provide new **options** for disease control

**Inputs**
Scientific and technical understanding (lab, field, modeling, strategy)

**Informed decisions**
Regulatory and policy decisions at the national, regional and local levels

**Results**
Improved disease control and elimination with fewer resources