

Briefing on Gene Drive Technology

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Concerning RNA-guided gene drives for the alteration of wild populations

KEVIN M ESVELT*, ANDREA L SMIDLER, FLAMINIA CATTERUCCIA* AND GEORGE M CHURCH*

U.S. researchers call for greater oversight of powerful genetic technology

By Elizabeth Pennisi | Jul. 17, 2014, 2:00 PM



BIOTECHNOLOGY

Regulating gene drives

Regulatory gaps must be filled before gene drives could be used in the wild

By Kenneth A. Oye,^{1,2*} Kevin Esvelt,^{3*} Evan Appleton,⁴ Flaminia Catteruccia,^{5,6} George Church,³ Todd Kuiken,⁷ Shlomiya Bar-Yam Lightfoot,² Julie McNamara,² Andrea Smidler,^{5,8} and James P. Collins⁹

cannot be used to engineer populations of viruses or bacteria. Second, a newly released drive will typically take dozens of generations to affect a substantial proportion of a target population, unless drive-containing organisms are released in numbers consti-



Harvard scientists want gene-manipulation debate

Cautious advance on altering nature

ARTICLES



Safeguarding CRISPR-Cas9 gene drives in yeast

James E DiCarlo^{1-3,7}, Alejandro Chavez^{1,2,4,5,7}, Sven L Dietz^{1,2,4,6}, Kevin M Esvelt^{2,4} & George M Church^{1,2,4}



MATTER

A Call to Fight Malaria One Mosquito at a Time by Altering DNA



OPEN ACCESS

PERSPECTIVE

Conservation demands safe gene drive

Kevin M. Esvelt , Neil J. Gemmell

Published: November 16, 2017 • <https://doi.org/10.1371/journal.pbio.2003850>

Gene drive technology is 100% non-profit

Gene drive should be a nonprofit technology

By KEVIN M. ESVELT / NOVEMBER 27, 2018

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Gene drive systems could lastingly alter or suppress local or global populations of a target species, potentially eradicating mosquito-borne diseases.

PHILIPPE HUGUEN/AFP/GETTY IMAGES

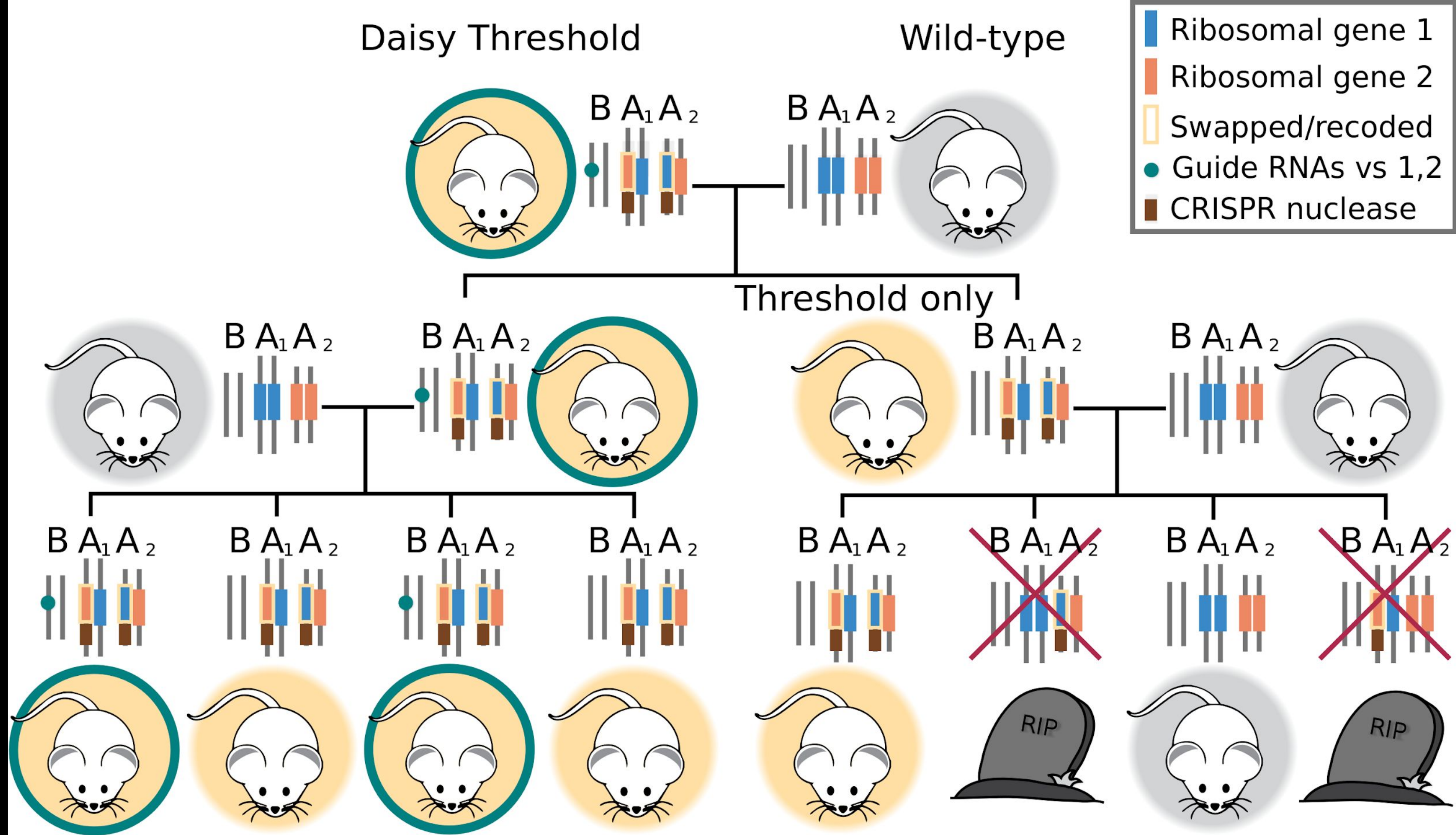
- Intellectual property prevents for-profit use to enable public health applications



<Videos explaining gene drive>

Genes can
vote!

(with drive)



Natural selection
favors
engineered
here



Natural selection
favors
wild-type
here

Predator-Free 2050 seeks to eradicate invasive black and brown rats from Aotearoa





Our work is guided by Maori iwis of Aotearoa

We need a registry for ecological editing research

- Openly share proposals before experiments begin
- Actively invite concerns & community guidance
- Require community sponsorship to register and proceed



Esvelt KM (2016) *Nature*
Esvelt KM (2017) *Science*
Kofler et al (2019) *Science*



Key Points

- There are **many kinds of gene drive**: some offer much *better* localization than a normal engineered gene
- Ecological effects **depend on the alteration** and the organism, not the drive system
- The technology is **100% non-profit**, and intellectual property can keep it that way
- **Indigenous communities are interested** in ecological editing technology and are guiding development
- **We need a registry** requiring local community guidance of all applied research

The local communities who will be affected and know their environments best should guide and decide