

Genetic Biocontrol of Invasive Rodents Program

The Vision

Innovative Extinction Prevention. This is what the Genetic Biocontrol of Invasive Rodents partnership is developing. In the backdrop of an extinction crisis, we have set out to prove a concept that will make invasive island species eradications more efficient with a non-lethal approach. The goal is to use a naturally-occurring or manufactured “gene drive” in mice to facilitate invasive population transformations to a single sex. With extensive mathematical modeling, cage trials, and simulated natural environment studies to help understand the efficacy and safety of this technology.

The Partnership

World Class geneticists, evolutionary biologists, ethicists, risk assessors, mathematical modelers and regulatory experts have come together to address the problem of invasive rodent management. Fred Gould, Karl Campbell, David Threadgill, John Godwin, Paul Thomas and many others are actively working together to investigate the suitability of this technology. The science has been ongoing for several years, while the dedicated coordination and strategy started in 2016. With an upcoming memorandum of understanding currently in review, the goal of the partnership will be to develop and assess this technology in accordance with global recommendations, including but not limited, to those of the US National Academy of Sciences.



Program Principles

- Transparency of approach and early engagement with researchers, regulators, interested parties, and publics
- Safety is paramount. Regulatory agency requirements are treated as a minimum. Where we identify potential risks, additional investigation and precaution is warranted.
- Process driven, step-wise method with measureable outcomes– programmatically & scientifically
- Operating in regulatory environments with extensive infrastructure and maturity with regards to genetically modified organisms
- Seek harmonization between regulatory agencies on aspects such as risk assessments
- Advance opportunities to both influence and adopt international best practices risk analysis

The Science

Gene drives cause genes to be inherited more frequently than ‘normal’. In sexually reproducing organisms, most DNA sequences have a 50% chance of being inherited by each offspring. Gene drives ensure they are inherited more frequently. Gene drives are naturally occurring in many species. The T-complex is found in mice, including *Mus musculus*, the species that has such a negative impact on endangered island species. Gene drives can also be manufactured using CRISPR-Cas9 or other technologies (e.g. Esvelt et al. 2014; Gantz, Bier 2015).

SRY is the gene that initiates the transformation of embryonic gonadal tissue into testes. Moving SRY into a gene drive, a mouse could be generated that produces exclusively male progeny in a heritable manner. In concept, after releasing a number these mice and waiting of generations, an isolated mouse population would be driven to all male. At that point, natural attrition would occur until mouse expiration/eradication is ultimately achieved without killing a single animal.

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Innovative Extinction Prevention