New tools and methods

Using a naturally occurring sterility gene to control invasive house mice

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House mice (*Mus musculus*) are a major ecosystem pest with devastating impact on island ecosystems as non-native invasive species. Current control methods —primarily aerial broadcasting of anticoagulant poisons— raise serious concerns about animal welfare, cause off-target impacts on other species, and are challenging to use in human-inhabited areas. Our research investigates an alternative control strategy using a naturally occurring genetic variant in mice, known as the *t*-haplotype, as a humane and targeted alternative for mouse population management.

The *t*-haplotype has two promising characteristics for pest control. First, males that carry two copies of the gene (*t/t* homozygotes) are completely sterile. Similar to sterile insect techniques, releasing these sterile males into target populations could reduce reproductive rates by increasing the frequency of unproductive mating. Second, males carrying only one copy (*+/t* heterozygotes) transmit the *t* to more than 90% of their offspring instead of the 50% expected under Mendelian inheritance. Thanks to this super-Mendelian mode of inheritance, also known as gene drive, we would expect the *t*-haplotype to spread genetically throughout a target population despite its (sterility) cost, further increasing the frequency of sterile males, potentially leading to population decline.

Here, a mathematical model assessing the potential of the sterile *t*-method for mouse population control will be presented. Our results indicate that eradication is theoretically achievable based on current knowledge. However, the feasibility critically depends on several biological factors that are currently unknown and that require future empirical work, such as population demography, mating behaviour, and the ability of released males to settle and establish target populations. The model further helps to identify strategies to optimise release campaigns. If viable, this approach could offer a safe, effective, humane, and GMO-free alternative to conventional mouse control methods.