Lessons for Zoonotic Disease and Vector Eradication - from past successes in New Zealand

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Introduction
Regional and global disease eradication remains attractive for epidemiologists and policy-makers.1 For New Zealand (NZ), we searched the literature for documents from the relevant government agencies, and communicated with officials involved in past eradication efforts to identify common lessons.

Findings
**Hydatids:** In NZ in the early 20th century, hydatids had relatively high human infection rates2 and large economic impacts on the sheep industry. Key aspects of the successful eradication programme included:

- Government-sponsored education of farmers which provided the impetus for the National Hydatids Act of 1959.3 This legislation instituted the National Hydatids Council which allowed industry, pet owners and government to collectively devise and drive eradication efforts.3
- The Council initially instituted compulsory testing and treatment of dogs with arcohelmintic hydrobromide. This on-the-spot testing provided an opportunity to educate dog owners.4 Subsequently regular anthelmintic treatment of dogs became the mainstay of treatment.5
- Surveillance continued throughout the programme; sheep offals were monitored to allow targeted investigation of dogs from affected properties and restricted livestock movement from infected flocks.5
- Department of Health campaigns in the print media and in films were used to increase awareness of hydatids and risk reduction.2

**Brucellosis:** The support for brucellosis eradication in NZ came primarily from the economic impact on agricultural exports6 but there was also a significant risk to human health.7 Key aspects of the successful programme included:

- A compulsory national elimination programme began in 1972 based on standardised serologic testing at a central laboratory.6
- Serologic assessment was bolstered by on-going surveillance systems; compulsory veterinary assessment of bovine abortions and bulk milk testing of low risk herds.6
- In the later stages of the programme, cattle movement was restricted to prevent spread from subclinically infected herds.7
- Funding was initially provided by the Government but became self-sustained based on levies from within the programme.7

**Invasive mosquito:** The discovery of the southern saltmarsh mosquito in NZ in 1998 raised public health concerns (eg, this mosquito can potentially spread Ross River fever). Key aspects of the successful eradication programme included:

- Cross-government agency action with cooperation from local government, landowners, residents, Māori communities and environmental groups.
- Involvement of entomological expertise from Australia8 and the USA.
- Spraying of sites with live larvae with Bti (Bacillus thuringiensis israeilensis), treatment of infested areas with S-methoprene granules, and habitat management.
- Intensive surveillance activities at all likely mosquito habitat.
- Sustained funding commitment by Government supported by robust technical and scientific advice, health impact assessments and cost-benefit analyses.

**Introduced mammalian pests:** For conservation reasons, NZ has eradicated rodents from more than 90 islands9 and numerous other introduced mammalian pests (possums, rabbits, etc) have also been eradicated from these islands.10 Key aspects of the eradication efforts include:

- Having a clear goal of eradication (rather than control).
- Robust and meticulous planning which involved research, contingency measures, incorporation of best available tools and techniques, risk management considerations, and the flexibility to cope with unexpected difficulties.11
- Having an adaptive management approach and learning from previous eradication projects (both successes and failures).

Key lessons
These various eradication programmes cover very different organisms: parasites, bacteria, mosquitoes, and mammalian pests. Nevertheless, some of the major lessons identified are of note:

- Having a clear goal of achieving eradication.
- Understanding the disease/vector ecology and the points of intervention.
- Having effective tools available to achieve eradication.
- Securing long-term funding and collaboration across government agencies (agriculture, biosecurity, and health).
- Having cooperation and input from the public, non-government organisations, local government, and indigenous communities (Māori in NZ).
- Having well-planned and well-resourced campaigns that are sustainable for long periods (even decades).
- Having detailed surveillance systems to guide refinements of eradication efforts and to confirm success.
- Utilising strong technical and scientific information to underpin operational actions.
- Implementing a comprehensive communications strategy that can ensure that national and local stakeholders are kept informed and actively involved with the programmes.

References
2. Godschalck G. Social History of Medicine 2011 [E-pub 10 March].