Epidemiological, evolutionary, and economic determinants of eradication tails

Rupert Mazzucco, Ulf Dieckmann, Johan A.J. Metz

www.elsevier.com/locate/yjtbi

PII: S0022-5193(16)00160-0
DOI: http://dx.doi.org/10.1016/j.jtbi.2016.03.019
Reference: YJTBI8587

To appear in: *Journal of Theoretical Biology*

Received date: 10 July 2015
Revised date: 24 December 2015
Accepted date: 11 March 2016

Cite this article as: Rupert Mazzucco, Ulf Dieckmann and Johan A.J. Metz Epidemiological, evolutionary, and economic determinants of eradication tails *Journal of Theoretical Biology,* http://dx.doi.org/10.1016/j.jtbi.2016.03.019

Epidemiological, evolutionary, and economic determinants of eradication tails

Rupert Mazzucco[a,b,*], Ulf Dieckmann[a], and Johan A. J. Metz[a,c,d]

[a] Evolution and Ecology Program, International Institute for Applied Systems Analysis, Schlossplatz 1, 2361 Laxenburg, Austria

[b] Department of Microbiology and Ecosystem Science, University of Vienna, Austria

[c] Institute of Biology and Mathematical Institute, Leiden University, Netherlands

[d] Netherlands Centre for Biodiversity, Naturalis, Leiden, Netherlands

[*] mazzucco@iiasa.ac.at

Highlights

- We provide a model-based analysis of eradication tails.
- For the first time, we quantitatively study the trade-off between infectivity and mobility.
- Eradication tails depend on how the extinction threshold is approached.
- Pathogen evolution counteracts eradication measures.
- The cost structure of eradication measures strongly shapes eradication tails.

Abstract

Infectious diseases still generate huge socio-economic costs and many people would like to see them gone entirely. While success stories like with smallpox and rinderpest give hope that this may be possible, many other eradication attempts have failed. Eradication requires huge and costly efforts, which can only be sustained if sufficient progress can be reported. While initial successes are usually easily obtained, progress often becomes harder as the disease becomes rare (during the "endgame"). Often a long "eradication tail" of slowly decreasing incidence level frustrates eradication efforts, as it becomes unclear whether