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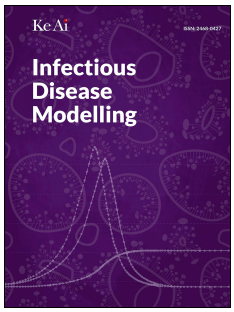

The epidemiological models of Karl-Peter Hadeler

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The epidemiological models of Karl-Peter Hadeler

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Dedicated to the memory of my friend KP Hadeler

ABSTRACT
The most frequently cited articles out of KP Hadeler's 45 papers with epidemiological applications are summarized. Parasitic diseases which increase the death rate of the hosts proportional to the integer number of parasites present were described by integral equations for the generating function of the age- and time-dependent number of parasites. A model was derived for a population structured by the continuous level of parasitic infection. Stimulated by the spread of AIDS a new class of epidemic models was developed which take into account explicitly the formation and separation of pairs. For predator-prey populations with parasitic infections threshold conditions for the persistence of the predator were derived. The interaction of epidemics and demography was analysed. Several epidemiological conditions led to backward bifurcations associated with multiple infective stationary states.

Keywords epidemic models; parasitic diseases; pair formation; predator-prey populations; epidemics and demography; backward bifurcation

1 Introduction

Hillen et al. (2006) describe the wide range of topics covered in KP Hadeler's mathematical and biological oeuvre. With eight papers and his last book (Hadeler 2017) on quiescent phases in dynamical systems since 2007 he even widened his field of interests (see e.g. Hadeler 2013). The two areas to which he contributed most are the dynamics of infectious diseases (including parasites) (45 papers) and eigenvalue problems (31 papers, see Thieme 2017). Out of his 24 papers on reaction-diffusion processes, 12 articles are covered in the survey on hyperbolic and kinetic models for self-organized biological aggregations and movement by Eftimie (2012).

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