

Publication

A quantitative test of the relationship between parasite dose and infection probability across different host-parasite combinations

JournalArticle (Originalarbeit in einer wissenschaftlichen Zeitschrift)**ID** 69836**Author(s)** Ben-Ami, Frida; Regoes, Roland R.; Ebert, Dieter**Author(s) at UniBasel** [Ebert, Dieter](#) ; [Ben Ami, Frida](#) ;**Year** 2008**Title** A quantitative test of the relationship between parasite dose and infection probability across different host-parasite combinations**Journal** Proceedings of the Royal Society. Series B, Biological Sciences**Volume** 275**Number** 1636**Pages / Article-Number** 853-859

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Epidemiological models generally assume that the number of susceptible individuals that become infected within a unit of time depends on the density of the hosts and the concentration of parasites (i.e. mass-action principle). However, empirical studies have found significant deviations from this assumption due to biotic and abiotic factors, such as seasonality, the spatial structure of the host population and host heterogeneity with respect to immunity and susceptibility. In this paper, we examine the effect of the dose level of the bacterial endoparasite *Pasteuria ramosa* on the infection rate of its host, the water flea *Daphnia magna*. Using seven host clones and two parasite isolates, we measure the fraction of infected hosts after exposure to eight different parasite doses to determine whether there is variation in the infection process across different host clone-parasite isolate combinations. In five combinations, a pronounced dose-dependent infection pattern was found. Using a likelihood approach, we compare the infection data of these five combinations to the fit of three mathematical models: a mass-action model, a parasite antagonism model (i.e. an increase in the parasite dose leads to an under-proportionate increase in the infection rate per host) and a heterogeneous host model. We found that the host heterogeneity model, in which we assumed the existence of non-inherited phenotypic differences in host susceptibilities to the parasite, provides the best fit. Our analysis suggests that among 5 out of the 14 host clone-parasite isolate combinations that resulted in appreciable infections, non-genetic host heterogeneity plays an important role. **Keywords:** *Daphnia magna* ; dose-response curve; frailty model; mass-action infection; *Pasteuria ramosa*

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