Supporting Information. Clay, P.A., M.H. Cortez, and M.A. Duffy. 2021. Dose relationships can exacerbate, mute, or reverse the impact of heterospecific host density on infection prevalence. Ecology.

Appendix S1: Meta-Analysis Methods Supplement

Section S1: Meta-analysis methods when infectivity is instantaneous.

To determine whether the dose-infectivity relationships in our literature review were better represented by accelerating, decelerating, or linear relationships when infection was instantaneous, we derived an equation that described the proportion of individuals infected for a given dose of parasites. We model an experiment where N individuals infected with, fed, or covered with P parasites. In the model, the number of individuals that become infected (I) is given by

$$I = \beta(P)^k N \quad \text{(S1)}$$

where β is per-propagule infectivity and k is the dose shape parameter. For a given study, if $k = 1$ then the infection rate increases linearly with dose, if $k < 1$ then the infection rate has a decelerating increase with dose, and if $k > 1$ then the infection rate has an accelerating increase with dose (Figure 1A).

We used Bayesian inference to fit equation eq. S1 to the published data from our literature review. For each study, we then estimated the values of β and $k$most likely to generate the number of infected individuals reported in the studies for each dose treatment. We used vaguely informative priors to prevent β and k from going below 0. In cases where parasite densities were reported as dilutions, we relativized all densities so that the lowest density was

100. This ensured that the parasite density in the experiment was never less than 1. As in non-instantaneous infections, we also tested for sigmoidal dose infectivity relationships by redoing the above analysis with a dose-dependent k.

Section S2: Meta-analysis methods to test whether dose-infectivity parameter is dependent on host feeding rate

To test whether dose-infectivity parameter (k) is dependent on host feeding rate (f), we held f constant at three feeding rates and repeated our meta-analysis. We chose values of f so that over the course of the experiment, individuals would consume 10%, 50%, or 99% of the parasites they were exposed to. The total number of parasites consumed (P_ε) based on an initial propagule density (P_0) is calculated as

$$P_\varepsilon = P_0(1 - e^{-ft}) \tag{S2}$$

Thus, for a given desired proportion of parasites to be eaten by the end of the experiment (P_t, at time t), the feeding rate can be calculated as

$$f = \frac{-ln(1 - P_t)}{t} \tag{S3}$$

We found that regardless of the value of f, the general results of our meta-analysis did not change (Figure S1).

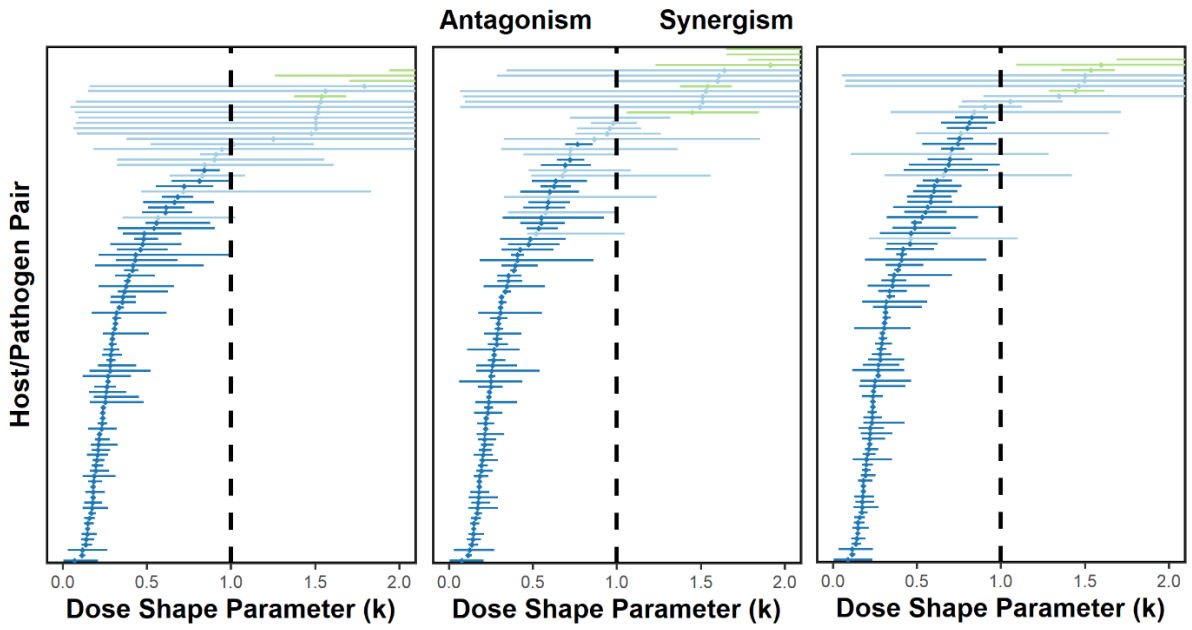

Figure S1: We estimated the dose shape parameter (k) while holding the feeding rate constant within each study such that hosts contacted/removed 10% of propagules over the duration of the experiment (left panel), 50% of propagules (middle panel), or 99% of spores (right panel).