Appendix 1: Model details

Primary exposure:

Constant exposure was defined as the continual presence of infection (such as fungal conidia or bacteria) in 20 cells, chosen at random in each iteration and lasting 1-10 days in each cell. *Periodic exposure* was defined as the presence of an infective agent in 70 cells chosen at random every 900 iterations (three months). These cells continued to be infectious for 100 iterations (10 days) after which they no longer held primary contagion. The duration of contagion in these cells in both types of primary exposure was arbitrary, thus allowing us to explore the impact of disease over time.

While primary exposure can be thought of as the novel introduction of pathogen into the nest from an external source, it can also be introduced via the internal source of dead individuals. Although we discuss the results of our model as though dead workers were quarantined, removed from the nest or buried and therefore incapable of infecting nestmates via social interaction, our results can also be interpreted as though primary exposure resulted from a failure to remove infected corpses. To examine whether or not our results would differ if all introduction were from external sources, we examined the same scenarios of disease spread while restricting the incidence of primary exposure to the periphery of the nest (within two cells of the maximum *r*). This restriction had no effect on survival and these models are not presented.

Worker development and mobility:

To simulate normal colony growth, 25 eggs were added every 300 iterations (≅ to 30 days) in accordance with some observed patterns of oviposition in small social insect colonies (Castle 1934), though any pattern of oviposition (e.g. single large groups of eggs with synchronous maturation prior to subsequent oviposition, or overlapping generations) can be used if it is held constant across experimental models (Fefferman et al. *in prep*). Workers aged during each iteration and after an appropriate number of iterations in a given developmental stage (Rosengaus and Traniello 2001; see Table 2) workers progressed to the next stage until reaching 'adulthood'. Initially, immature individuals did not move away from the center of the nest, but as they matured, they were allowed to move "outward" by one cell to avoid an artificially dense nest center and emulate the often centripetal age-related movement of workers. These restrictions on movement reflect the limited mobility of young larvae in natural colonies of termites and most species of social Hymenoptera (Wilson 1971).

Topology, colony size and density:

All models defined a simplified, two-dimensional circular nest with ~10,000 "cells", or discrete areas through which an initial population of 1000 "workers" could move and interact. No restriction was made on the number of workers occupying a single cell at a time and workers were only able to interact if they occupied the same cell. Colony size should not impact the results of our model because colony size and nest size are seen to vary proportionally in natural settings. Therefore, density and its concomitant effect on nestmate interaction rates should remain constant. To reflect ontogenic changes, our model focused on demographic distribution rather than colony size per se.