

# Deciphering the counterplay of *Aspergillus fumigatus* infection and host inflammation by evolutionary games on graphs.

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## Abstract

Microbial invaders are ubiquitously present and pose the constant risk of infections that are opposed by various defence mechanisms of the human immune system. A tight regulation of the immune response ensures clearance of microbial invaders and concomitantly limits host damage that is crucial for host viability. To investigate the counterplay of infection and inflammation, we simulated the invasion of the human-pathogenic fungus *Aspergillus fumigatus* in lung alveoli by evolutionary games on graphs. The layered structure of the innate immune system is represented by a sequence of games in the virtual model. We show that the inflammatory cascade of the

immune response is essential for microbial clearance and that the inflammation level correlates with the infection-dose. At low infection-doses, corresponding to daily inhalation of conidia, the resident alveolar macrophages may be sufficient to clear infections, however, at higher infection-doses their primary task shifts towards recruitment of neutrophils to infection sites.

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