INNATE IMMUNITY

A protective fungal spore coat

Although every breath we take contains thousands of fungal spores, these spores do not trigger an immune response. Latgé and colleagues, writing in a recent issue of *Nature*, show that the surface hydrophobin (RodA) that forms the rodlet layer around fungal spores (the conidia) prevents their recognition by dendritic cells (DCs) and the subsequent immune response.

To test why conidia are not immunogenic, the authors looked *in vitro* at the effect of *Aspergillus fumigatus* RodA on human DCs. The protein did not elicit a response, as measured by the production of cytokines and proliferation of CD4⁺ T cells. RodA does not act as an inhibitor of DCs, as DCs were activated when exposed to RodA mixed with *A. fumigatus* antigens that are known to activate these cells.

The protective role of RodA in *A. fumigatus* conidia was confirmed by exposing DCs to conidia that

lacked RodA (owing either to a deletion of the gene that encodes RodA ($\Delta rodA$) or to chemical removal of the rodlet layer) or to germinated spores, which have shed RodA. The DCs responded to these morphotypes by producing inflammatory cytokines, chemokines and reactive oxygen intermediates. Conidial hydrophobins that were purified from other air-borne filamentous fungi were also unable to induce an immune response in DCs, and chemical removal of the rodlet layer made the conidia immunogenic. It therefore seems that the rodlet layer provides a protective layer around the conidia of filamentous fungi that covers the immunogenic molecules in the underlying cell wall. Finally, the protective role of *A. fumigatus* RodA was demonstrated *in vivo*. When mice were inoculated intranasally, $\Delta rodA$ conidia and germinated spores elicited immune

responses, as measured by the infiltration of neutrophils into the lungs and the production of cytokines and chemokines in the lungs, whereas purified RodA and wild-type conidia were immunologically inert.

The avoidance of immune activation has benefits for both the fungus and the host. For the host it prevents chronic activation of the immune system in response to the constant inhalation of spores, whereas for the fungus it prevents rapid elimination, allowing the cells to survive in the lungs of the host until an opportunity to germinate and proliferate arises.

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ORIGINAL RESEARCH PAPER Aimaganianda, V. et al. Surface hydrophobin prevents immune recognition of airborne fungal spores. *Nature* **460**, 1117–1121 (2009)

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