

Sex life of killer fungus finally revealed

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Biologists at The University of Nottingham and University College Dublin have announced a major breakthrough in our understanding of the sex life of a microscopic fungus which is a major cause of death in immune deficient patients and also a cause of severe asthma.

The discovery of a sexual cycle in the fungal pathogen *Aspergillus fumigatus* is highly significant in understanding the biology and evolution of the species and will shed new light on its ability to adapt to new environments and its resistance to antifungal drugs. It is hoped the results of this research will lead to new ways of controlling this deadly disease and improved treatments for patients infected with it.

First described 145 years ago this killer fungus, until now, had no known sexual cycle and was only thought to reproduce by production of asexual spores. But researchers from the School of Biology at The University of Nottingham and from University College Dublin, have finally been able to induce sexual reproduction in this potentially lethal pathogen showing, for the first time, that *A. fumigatus* possesses a fully functional sexual reproductive cycle.

Dr Paul Dyer is an expert in the sexual development and population variation of fungi and co-author of 'Discovery of a sexual cycle in the opportunistic fungal pathogen *Aspergillus fumigatus*', which will be published in *Nature* on 30 November 2008.

Dr Dyer said: "This discovery is significant for providing both good and bad news. The bad news is that we now know that *Aspergillus fumigatus*

can reproduce sexually, meaning that it is more likely to become resistant to antifungal drugs in a shorter period, and the sexual spores are better at surviving harsh environmental conditions. The good news is that we can use the newly discovered sexual cycle as a valuable tool in laboratory experiments to try to work out how the fungus causes disease and triggers asthmatic reactions. Once we understand the genetic basis of disease we can then look forward to devising methods to control and overcome the fungus".

The spores of *A. fumigatus*, which feeds on dead or decaying organic matter, are widespread in the atmosphere. It has been estimated that everybody inhales around 200 spores each day. These spores are normally eliminated by the innate immune response. However, this fungus has become the most prevalent airborne fungal pathogen due to its ability to cause infections in hosts with a weakened immune system, with at least a 50 per cent mortality rate in humans. Four per cent of patients in modern European teaching hospitals have invasive aspergillosis; it is the leading infectious cause of death in leukaemia and bone marrow transplant patients. The fungus is also associated with severe asthma and sinusitis.

Almost one-fifth of all fungi have no known sexual stage — these include many *Aspergillus*, *Penicillium*, *Coccidioides* and *Malassezia* species which are of major economic and medical importance. However, some of these species have apparently functional sex related genes and this research could lead to a sexual revolution for many other of these supposed 'asexuals'.

The research was carried out in collaboration with Dr Hubert Fuller and his final year PhD student Céline O'Gorman from the UCD School of Biology and Environmental Science at University College Dublin. The study was funded by an IRCSET Postgraduate Research Scholarship, an EC Marie Curie Training Fellowship and a grant from the British

Mycological Society, which facilitated research visits by Céline O'Gorman to The University of Nottingham.

Many fungi reproduce by sexual means. The molecular-genetic and physiological mechanisms controlling sex in fungi are being investigated at The University of Nottingham with the aim of devising new methods for the control of fungal diseases and promoting sex in beneficial species. The consequences of sex for genetic variation and evolution are being studied in model species of fungi including plant pathogens and Antarctic lichen-forming fungi.

Source: University of Nottingham

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