

URLs

FUNGAL BIOLOGY

To mate or not to mate?

Fungal sex is a hot topic, owing to recent studies in the opportunistic pathogens *Candida albicans* and *Cryptococcus neoformans*. Now, Paoletti *et al.* reveal that *Aspergillus fumigatus*, an often fatal opportunistic human pathogen, might have a sexual cycle too.

Genetic analyses in the aspergilli have been hindered because this group is asexual (imperfect). Inspection of the recently completed genome sequences of *Aspergillus nidulans* (a model for cell biology), *A. fumigatus* and *Aspergillus oryzae* (important in the industrial production of soy sauce) revealed that *A.*

fumigatus has a mating-type locus that is typical of sexual ascomycete fungi. This warranted further investigation, as improved genetic analyses alone would be a welcome boon for researchers keen to understand the virulence of this pathogen.

Although finding seemingly intact mating-type genes is exciting, it only indicates the potential for sex. In a paper just published in *Current Biology*, Paoletti *et al.* report experimental evidence for sex. Sex is not possible without two partner strains, which in filamentous ascomycetes are named *MAT1-1* and *MAT1-2*, so finding two distinct mating-type alleles was the first important endeavour. The sequenced strain has a *MAT1-2* locus. Degenerate PCR was used to amplify a putative *MAT1-1* sequence (the α box) from environmental isolates. One interesting feature that arose when the sequence of this *MAT1-1* locus was completed was that it contained some *MAT1-2* sequences, indicating that the sexual partner strains might be derived from a homothallic ancestor that contained both loci.

What about the environmental abundance of the mating-type strains? Using multiplex PCR, the karyotypes of 290 environmental and clinical isolates were determined. All strains were either *MAT1-1* or *MAT1-2* with a 1:1 ratio of *MAT1-1* to *MAT1-2*. Unlike *C. neoformans* isolates, there was no bias to one mating type in clinical isolates. In fact, both mating types were present

in different strains isolated from the same patient. Mating types were not geographically isolated, so a 1:1 ratio strongly suggests either that mating does occur or that these two mating types arose very recently and that insufficient time has passed for drift away from this ratio.

Having identified the partner strains, population genetic analyses were used to evaluate polymorphisms in intergenic regions. The presence of 9 conserved substitutions in both mating types is a strong indicator that recombination through sex has probably occurred over time. Semi-quantitative PCR showed that genes in the mating-type locus, which include the *MAT* mating-type genes and those encoding a pheromone and pheromone receptors, were expressed in both mating types in mycelia. This is clear evidence that the mating-type genes are active, a surprise in a nominally 'asexual' fungus. However, sex still hasn't been observed in the lab.

Hints of sex in fungi are not new but, increasingly, it seems that more fungi are having sex. This might prove important in generating the diversity that is required to exploit environmental niches and to be successful pathogens.

Susan Jones

References and links

ORIGINAL RESEARCH PAPER Paoletti, M. *et al.* Evidence for sexuality in the opportunistic fungal pathogen *Aspergillus fumigatus*. *Curr. Biol.* **15**, 1242–1248 (2005)

