

## FUNGAL BIOLOGY

## Same-sex mating and host-range expansion

## Online links

*Plasmodium falciparum*  
[http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=genomeprj&cmd=Retrieve&dopt=Overview&list\\_uids=9538](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=genomeprj&cmd=Retrieve&dopt=Overview&list_uids=9538)

*Trypanosoma cruzi*  
[http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=genomeprj&cmd=Retrieve&dopt=Overview&list\\_uids=9530](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=genomeprj&cmd=Retrieve&dopt=Overview&list_uids=9530)

Microbiologists from Duke University have unraveled the story behind the emergence of a virulent fungus strain that was responsible for an 1999 outbreak of meningoencephalitis on Vancouver Island, Canada. Two clonal lineages of the same 'sex' — one local strain found in the Pacific Northwest, and another that originated in Australia — combined through sexual reproduction to yield the hypervirulent recombinant genotype that was primarily responsible for the outbreak.

*Cryptococcus gattii* is a yeast normally restricted to tropical and subtropical regions of the world. Identification of this pathogen as the causative agent of the Vancouver Island outbreak indicated a new and expanded geographical range for this microorganism, prompting questions about its origin and evo-

lution. To address these questions, Joseph Heitman, James Fraser and colleagues undertook a large-scale genealogical analysis of *C. gattii* isolates that were linked to the outbreak and compared them with each other and with the global *C. gattii* population. This analysis revealed that the outbreak isolates comprised two distinct genotypes — a major genotype (95% of isolates) that is hypervirulent and a minor genotype (5% of isolates) that is less virulent and has an identical genotype with fertile isolates from an Australian recombining population. This analysis also revealed evidence of sexual reproduction between the outbreak genotypes; however, instead of the classical fungal  $\alpha$ - $\alpha$  sexual cycle, Fraser *et al.* found evidence that the major-outbreak hypervirulent genotype descends from a same-sex mating event involving two  $\alpha$  mating-type parents.

Further studies will be required to ascertain the prevalence of same-sex *C. gattii* mating in nature and whether this process facilitated the production of infectious fungal spores. However, these findings do establish the importance of same-sex reproduction in fungi by allowing the expansion of a pathogen into a new geographical region, ultimately resulting in an infectious-disease outbreak in humans. The earlier demonstration of same-sex mating in *Cryptococcus neoformans*, a sibling species of *C. gattii*, and the authors' assertion that other parasites, includ-

ing *Trypanosoma cruzi*, *Leishmania* species and *Plasmodium falciparum*, could harbour a same-sex cycle that produces progeny with altered characteristics, has fascinating implications for our understanding of parasite pathogenicity and host range.

David O'Connell

## References and links

**ORIGINAL RESEARCH PAPER** Fraser, J. A. *et al.* Same-sex mating and the origin of the Vancouver Island *Cryptococcus gattii* outbreak. *Nature* **437**, 1360–1364 (2005)

**FURTHER READING** Idnurm, A. *et al.* Deciphering the model pathogenic fungus *Cryptococcus neoformans*. *Nature Rev. Microbiol.* **3**, 753–764 (2005) | Lin *et al.* Sexual reproduction between partners of the same mating type in *Cryptococcus neoformans*. *Nature* **434**, 1017–1021 (2005) | Kidd *et al.* Comparative gene genealogies indicate that two clonal lineages of *Cryptococcus gattii* in British Columbia resemble strains from other geographical areas. *Eukaryot. Cell* **4**, 1629–1638 (2005)



The origin of a *Cryptococcus gattii* outbreak. An original  $\alpha$ - $\alpha$  mating event involving an avirulent  $\alpha$  parent that likely originated in Australia (orange circle) yielded a virulent recombinant (yellow circle), and ongoing  $\alpha$ - $\alpha$  mating could enable robust infectious spore production and outbreak expansion. Image adapted from Fraser *et al.* © (2005) Macmillan Magazines Ltd.