

Student project on the evolution of spore killing genes in pathogenic fungi

Meiotic drive allows selfish genetic elements to bias their own representation in the offspring. One example of meiotic drive is spore killing in fungi, which have been well-described in *Podospora anserina*. In this species, carriers of the so-called *Spok* (spore killing) gene kill sibling spores that do not carry this gene (see Figure below). Bioinformatic research has found *Spok*-like genes in diverse families of fungi, with several diverged copies within species. The Vogan lab focuses on describing the evolution of this gene family in the plant pathogenic fungi *Fusarium* using both laboratory and bioinformatic approaches. Below are four example projects that can be tailored to interest and time constraints of the student.

- 1) Describe the evolution of *Fusarium Spok*-like elements using phylogenetic analysis of whole genome sequence data.
- 2) Simulate the evolution of several *Spok*-like elements within a single species using the simulation framework SLiM.
- 3) Investigate the specificity of the toxin and antitoxin domains of *Spoks* that co-exist within one species using laboratory cloning and transformations in budding yeast.
- 4) Model the potential of decoupling the toxin and antitoxin function to maintain accessory chromosomes.

We are open to discuss project ideas with the interested student.

Contact Dr. Aaron Vogan, aaron.vogan@ebc.uu.se

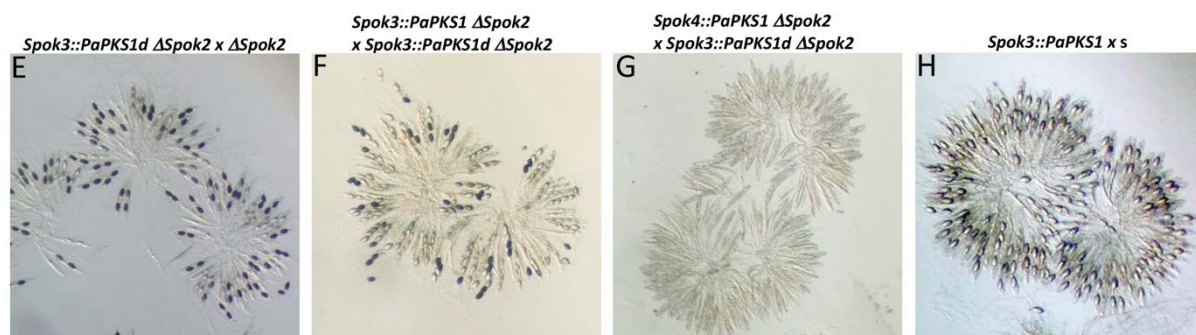


Figure shows example of spore killing occurring in *Podospora anserina* crosses (adapted from Vogan *et al.* 2019).

References

- P. Grognet, H. Lalucque, F. Malagnac, P. Silar, *Genes that bias mendelian segregation*. PLoS Genetics, 10(5): e1004387, 2014.
- A. A. Vogan, S. L. Ament-Velásquez, A. Granger-Farbos, J. Svedberg, E. Bastiaans, A. J. Debets, V. Coustou, H. Yvanne, C. Clavé, S. J. Saupe. *Combinations of Spok genes create multiple meiotic drivers in Podospora*. eLife, 8: e46454, 2019.