Cécile COURRET University of Rochester

Meiotic drivers are selfish genetic elements which break the fundamental rules of Mendelian inheritance. They prevent the production of gametes that do not contain them, favoring their own transmission to the detriment of the rest of the genome. Drivers are thus an important source of genetic conflicts and often trigger the evolution of suppressors. They are now subject of intensive research because of their impact on genome evolution and their high potential for applications in genetic biocontrol. In addition, they disrupt fundamental processes such as meiosis and can give insight into parts of the genome poorly understood such as the heterochromatin. During my PhD I studied a case of X-linked meiotic drive in D. simulans that disturbs the segregation of the Y chromosome during meiosis II, resulting in a strong female bias in the progeny. One of the drivers is a dysfunctional allele of HP1D2, a member of the fast-evolving Heterochromatin Protein 1 gene family, often associate to genetic conflict. HP1D2 is expressed in spermatogonia and enriched on the Y chromosome. The aim of my research was to characterize the other players in this system. Besides the system is still evolving in natural populations, representing a unique opportunity to study the evolution of intragenomic conflict in natura. In natural populations drivers are neutralized by autosomal suppressors and resistant Y chromosomes. We performed a quantitative trait locus (QTL) mapping to reveal the high genetic complexity of autosomal suppression. We also studied the dynamics of the system in natural populations, revealing that intragenomic conflict can drive the rapid replacement of Y chromosomes. In addition, we sequenced a panel of Y chromosomes to retrace its evolutionary history. Generally, my work provided a deeper insight into the genetic basis and the evolution of this system, allowing to better understand the dynamics of meiotic drivers in nature and how they impact genome biology and evolution.