

PhD position at the IBMP in Strasbourg

Analysis of small RNA-regulated genes playing a role during virus invasion in plants

The team of Manfred Heinlein at the IBMP (<http://www.ibmp.fr>) in Strasbourg is seeking a highly motivated PhD candidate with a strong interest in RNA silencing and plant:virus interactions.

Viruses are responsible for ca. 47% of crop epidemics, cause major crop losses, and are the primary cause of emerging diseases in plants. Despite extensive research the mechanisms that regulate the outcome of plant:virus interactions with respect to disease are not understood. Virus infection in plants depends on the ability of viruses to replicate and spread their genomes from one cell to the next through plasmodesmata. The cellular events involved in viral cell-to-cell movement are intensely studied; however, we know still very little about plant:virus interactions orchestrating this process at the level of gene expression. An important mechanism governing plant:virus interactions is RNA silencing as it targets RNA of both the virus and its host. While plants use antiviral RNA silencing and defense gene activation to inhibit the virus, viruses control and manipulate host RNA silencing pathways and defense gene expression with specific effector proteins (silencing suppressors) and, potentially, with virus-encoded small RNAs (sRNAs). The aim of current research in the Heinlein team is to identify and characterize RNA silencing-based mechanisms and target genes playing a role in the tug-of-war between the virus and its host in cells at the spreading virus front and to identify their role in the development of disease.

The PhD thesis will be incorporated into the ongoing Plant Knowledge-Based Bio-Economy (Plant-KBBE) Project « Genes and Mutants Affecting Virus Infection in Rapeseed (GAMAVIR) ». This project is coordinated by M. Heinlein and performed in collaboration with international experts in Germany and Spain.

B. napus and *N. benthamiana* mRNA transcriptome, small RNA and mRNA degradome profiling data derived from microdissected viral infection sites in plants will be used to identify sRNA:target mRNA pairs. The PhD student will address the function of these sRNA:target mRNA pairs during virus infection using various assays, including Northern blots, RLM-RACE, AGO-IPs, silencing reporter constructs and knockout/overexpressing mutants. The aim is to identify host genes that are manipulated by the virus by hijacking the host RNA silencing pathway. Such genes represent important targets for improving virus resistance in crops.

The Heinlein team is international and the laboratory language is English. The IBMP is the largest center dedicated to Plant Molecular Biology in France. It has staffed core facilities for DNA sequencing, protein production, qRT-PCR, bioimaging, proteomics, and metabolomics and it hosts numerous international PhD students and postdoctoral fellows.

For applications and further information please write to manfred.heinlein@ibmp-cnrs.unistra.fr.

Related publications:

Heinlein M (2015): Plant virus replication and movement. *Virology*, 479-480C: 657-671

Amari K, Di Donato M, Dolja VV, and Heinlein M (2014): Myosins VIII and XI play distinct roles in reproduction and transport of *Tobacco mosaic virus*. *PLoS Pathog* 10, e1004448

Amari K, Vazquez F, and Heinlein M (2012): Manipulation of plant host susceptibility: an emerging role for viral movement proteins? *Front.Plant Sci* 3:10.