

**The effect of nitric oxide on histone protein acetylation status  
in *Phytophthora infestans* (Mont.) de Bary**

In the course of evolutionary changes pathogens have developed many invasion strategies, involving the endogenous signaling molecules such as nitric oxide (NO). It has been documented that also phytopathogens belonging to fungal-like microorganisms are able to synthesize NO and use it to their own benefit. The main idea of the presented project is to recognize the new aspect of NO metabolism in the oomycete plant pathogen *Phytophthora infestans* (Mont.) de Bary, associated with the histone protein acetylation/deacetylation phenomenon, since this previously unrecognized link could play an important role in the high evolutionary flexibility of the pathogen, manifested by host jumps and adaptation to new micro-environments. Interestingly, oomycetes lack an efficient DNA methylation system defined as 5-methylcytosine, therefore reversible acetylation could serve as an alternative mechanism of quick transcriptional reprogramming in the face of changes within the environment.

Firstly, the research will focus on the molecular identification of NO-triggered alterations in the histone protein acetylation patterns in the *P. infestans* structures. What is more, the effect of NO on histone acetyltransferases (HATs) and histone deacetylases (HDACs) gene expression will be determined since balancing the action of these enzymes belonging to two superfamilies regulate dynamic lysine acetylation. Next, immunodetection as well as bioinformatic analysis of NO-mediated post-translational modifications of HATs and HDACs are planned. To describe an indirect effect of NO on recruitment of activators and repressors of transcription, chromatin immunoprecipitation followed by deep sequencing will be also performed. Finally, identification of physiological consequences of NO-dependent changes of histone acetylation patterns will complement the project.

The intended research will involve isolates of the oomycete plant pathogen *P. infestans* differing in the degree of virulence towards potato (*Solanum tuberosum* L.). This approach creates a useful background for a comparative study to indicate events implicated in pathogen virulence. Additionally, the experiments will be performed both in the saprophytic and *in planta* phases, which makes it possible to demonstrate changes involved in both developmental and pathogen invasion strategies.

The results obtained in a time-course of the proposal will have an original and significant impact on the basic research related not only to the molecular mechanisms of epigenetic control of gene expression in *P. infestans*, but also global histone protein acetylation/deacetylation phenomena in pathogenic eukaryotes. In particular, NO would affect various HATs and HDACs present in pathogenic microorganisms to control the expression of numerous genes specifically implicated in the offensive strategy and adaptation to new micro-environments. Thus, the NO can play a strategic role in the aggressor operation under environmental pressure.