

# Open PhD position 2026/2027



Institute of Experimental Botany  
of the Czech Academy of Sciences

## Translational checkpoints as determinants of male gametophyte fitness

### Project Description

#### Introduction

The male gametophyte of flowering plants represents a highly specialized and dynamic cellular system whose development and function critically depend on precise regulation of gene expression. Pollen grains and pollen tubes are characterized by strong reliance on translational and post-transcriptional control. Consequently, translational regulation has emerged as a central topic in plant reproductive biology.

To date, most studies have focused on translational initiation and its regulatory factors. In contrast, downstream mechanisms ensuring translational fidelity and quality—such as ribosome stalling recognition, no-go decay, nonsense-mediated decay, and ribosome recycling—remain poorly characterized in plants, particularly in the context of reproduction. These translational surveillance pathways are essential for maintaining proteostasis and preventing the accumulation of aberrant or truncated proteins that may compromise reproductive function.

Growing evidence suggests that translational quality control is especially important under stress conditions. Heat stress, one of the major environmental factors impairing plant fertility, strongly affects protein synthesis and folding. Understanding how translational checkpoints contribute to pollen fitness and stress resilience is therefore of fundamental importance and has clear relevance for plant reproductive success under changing climatic conditions.

#### Aims

The main aim of this PhD project is to elucidate the **role of translational quality-control and surveillance mechanisms** in male gametophyte development and function. The project seeks to determine how these pathways contribute to **translational robustness** during key **developmental transitions** and how they affect pollen performance under optimal and **heat-stress conditions**.

**Specific objectives** include:

- (i) identification of key **translational checkpoint components** active in pollen,
- (ii) characterization of their spatial and temporal **regulation during pollen development and pollen tube growth**,
- (iii) assessment of the developmental and physiological **consequences of impaired translational surveillance**, and
- (iv) evaluation of their contribution to **pollen thermotolerance**.

The project will extend current concepts of translational regulation beyond initiation and provide a more comprehensive framework for understanding gene expression control in plant reproduction.

### **Methods and experimental approach**

The project will primarily use the model plant *Arabidopsis thaliana*, enabling the integration of genetic, molecular, and cell-biological approaches. Mutant and transgenic lines affecting selected translational quality-control factors will be analyzed. Ribosome profiling will be employed to assess genome-wide translational dynamics, complemented by transcriptomic analyses.

Advanced imaging techniques, including confocal and fluorescence microscopy, will be used to study cellular localization and developmental phenotypes. Functional consequences will be evaluated using established pollen assays (viability, germination, pollen tube growth) under control and elevated temperature conditions.

### **Expected background of the student**

Applicants are expected to have a basic background in molecular biology, genetics, or cell biology, preferably with an interest in plant systems. Motivation for experimental research, analytical thinking, and willingness to learn advanced genomic and imaging techniques are essential.

### **Research environment, collaboration, and funding**

The project will be conducted at the Institute of Experimental Botany of the Czech Academy of Sciences, within the Laboratory of Pollen Biology, in collaboration with Faculty of Science, Charles University, and international partners.

The PhD student will be co-funded by the supervisor through grant and institutional resources guaranteed by the host institution. Funding availability is secured and will not disadvantage the applicant during the admission process.

### **Suggested reading**

- Chaturvedi P, Wiese AJ, Ghatak A, Závěská Drábková L, Weckwerth W, Honys D (2021) Heat stress response mechanisms in pollen development. *New Phytol* 231: 571-585, DOI: 10.1111/nph.17380
- Hafidh S, Honys D (2021) Reproduction Multitasking – the Male Gametophyte. *Annu Rev Plant Biol* 72: 581-614, DOI: 10.1146/annurev-arplant-080620-021907
- Joazeiro CAP (2019) Mechanisms and functions of ribosome-associated protein quality control. *Nat Rev Mol Cell Biol* 20: 368-383, DOI: 10.1038/s41580-019-0118-2
- Klodová B, Potěšil D, Steinbachová L, Michailidis C, Lindner AC, Hackenberg D, Becker JD, Zdráhal Z, Twell D, Honys D (2023) Regulatory dynamics of gene expression in the developing male gametophyte of *Arabidopsis*. *Plant Reprod* 36: 213-241
- Poidevin L, Forment J, Unal D, Ferrando A (2020) Transcriptome and translome changes in germinated pollen under heat stress uncover roles of transporter genes involved in pollen tube growth. *Plant Cell & Environment* DOI: 10.1111/pce.13972
- Sze H, Klodova B, Ward JM, Harper JF, Palanivelu R, Johnson MA, Honys D (2024) A wave of specific transcript and protein accumulation accompanies pollen dehydration. *Plant Physiol* 195: 1775-1795

**Application form:** <https://forms.gle/zxDLQjYW149rYd356>

### **Contact**

**prof. RNDr. David Honys, Ph.D.**

Laboratory of Pollen Biology  
Institute of Experimental Botany, Czech Academy of Sciences

**E-mail:** [honys@ueb.cas.cz](mailto:honys@ueb.cas.cz)

**Web:** [www.pollenbiology.cz](http://www.pollenbiology.cz)

