Master's Thesis Project: Friendly Neighbours? Investigating Mitochondrial Transfer Between Cells

Project aims

Can mitochondria from one cell function successfully inside another? There is increasing evidence that mitochondria can move between cells, altering metabolism and restoring cellular function, raising important questions about mitochondrial transfer, compatibility, and cellular identity.

This project aims to establish a reliable method for transferring mitochondria between cells and determine whether transferred mitochondria can restore metabolic function in cells lacking functional mitochondria, providing the basis for an exciting new research project investigating mitochondrial compatibility.

The student will work with 143B and mitochondria-deficient 143B Rho cells. The project will address the questions:

- Can mitochondria be transferred efficiently into 143B Rho recipient cells?
- Which mitochondrial transfer method is most effective?
- Can transferred mitochondria restore metabolic function in recipient cells?
- How do recipient cells respond to the introduction of functional mitochondria?

Tasks

The student will undertake experimental laboratory work and associated data analysis. Tasks will include:

- Mammalian cell culture using 143B and 143B Rho cells.
- Experimental planning and optimisation of mitochondrial transfer protocols.
- Isolation and fluorescent labelling of mitochondria from donor cells.
- Comparison of mitochondrial transfer methods, including co-culture and centrifugation-assisted delivery.
- Assessment of mitochondrial transfer using fluorescence microscopy.
- Detection and quantification of transferred mitochondrial DNA using digital PCR.
- Real-time measurements of cellular metabolism using the recipher system.
- Analysis, visualization, and biological interpretation of experimental data.
- Scientific writing and presentation of the findings.

The student will gain hands-on experience in mammalian cell culture, mitochondrial biology, fluorescence imaging, molecular biology, digital PCR, and metabolic phenotyping. The results will contribute to future research examining whether mitochondria from different cell types—or potentially different species—can function in new cellular environments.

Requirements

We are looking for a motivated Master's student with:

- A background in cell biology or a related subject.

- An interest in mitochondrial biology, cellular metabolism, physiology, or biomedical research.
- An ability to work carefully and independently in a laboratory environment.
- Good scientific communication and writing skills in English.

Previous experience with mammalian cell culture is preferable.

Practical information

Extent/credits: 45 or 60 hp, with preference for a 60 hp project.

Start date: Spring 2027.

Location: Programme for Physiology and Environmental Toxicology, Evolutionary Biology Centre, Uppsala University.

Supervision: Andrea Cediel Ulloa and John Lees, Uppsala University.

Contact: John Lees, john.lees@ebc.uu.se

To apply, please send a short CV describing your educational background and any relevant laboratory experience. Informal enquiries about the project are also welcome.