

Linking energetics to muscle phenotype: the importance of intracellular microdomains on the regulation of AMP-activated kinase

Summary

The aim of this project is to study in detail how energetics affects the signaling pathways in skeletal and heart muscle tissue. You will learn interdisciplinary skills combining experimental and theoretical approaches to extract as much information as possible from your data.

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| Research field: | Chemistry and Biotechnology |
| Supervisors: | Rikke Birkedal Nielsen Marko Vendelin |
| Availability: | This position is available. |
| Offered by: | School of Science Department of Cybernetics |
| Application deadline: | Applications are accepted between May 03, 2021 00:00 and May 31, 2021 23:59 (Europe/Zurich) |

Description

Muscles turn chemical energy into mechanical work. They are tightly packed with structures that govern excitation-contraction coupling, contractility, and energy production to fuel the work. Muscle performance is limited by energetics in time or space. White muscles have greater power, but their performance is short-lived, whereas red muscles have less power, but can work for longer. This difference between muscles is due, in part, to differences in the structural organization and expression of the enzymes responsible for energy transfer between different parts of the cell.

Alterations of energy transfer affects the muscle phenotype. Recent studies suggest that this effect is through activation of the overall energy sensor, AMP-activated kinase (AMPK), which regulates metabolism both acutely and long-term through gene expression. The specific aim of this project is to determine whether interactions between energy transfer systems and AMPK vary between different types of muscles and how this relates to the formation of microdomains imposed by intracellular structural organization. You will study this in different strains of transgenic mice with altered energy transfer. You will use the experimental data as input for mathematical models expected to reveal whether and how the formation of microdomains in the cells affects energy transfer and AMPK signaling.

We are an interdisciplinary laboratory using a range of approaches from different disciplines to address biological questions. Different staff members have different backgrounds, including in biology and physics. Whatever your background is, we can teach you the necessary skills. The working language in our laboratory is English.

This project is financed through a grant awarded to our laboratory by the Estonian Research Council.

The applicant should have:

- MSc in biology, physics, chemistry, or related field
- Strong written and oral communication skills in English

The following experience is beneficial:

- Laboratory work in general
- Animal handling
- Molecular techniques (cell culture, infection/transfection of cells, working with antibodies)
- Fluorescence microscopy
- Working knowledge of statistics
- Working with databases

- Programming in Python



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