DESCRIPTION FOR THE GENERAL PUBLIC

Mitochondria are a very important part of our cells. They are responsible for production of energy, which is not only necessary to fuel our muscles but also to support other crucial functions of our body like vision, hearing and thinking. Dysfunctional mitochondria may cause serious diseases or even death. Despite their importance, we still not quite understand how they are generated in our cells. As everything in our bodies, mitochondria are formed constantly from ingredients such as lipids and proteins, which need to be imported into mitochondria from other parts of the cell. We study the import of proteins into mitochondria. Proteins are very important because they actively fulfill many tasks of mitochondria such as energy production. Mechanisms of protein import into mitochondria have been extensively studied in model organism yeast. This unicellular organism has mitochondria, which are very similar to human mitochondria. The yeasts are also easy to grow, which is important if one plans difficult and demanding experiments. Knowing the mechanisms of protein import in yeast we plan to compare them with analogical processes in mammals. We want to investigate one of the import pathways called TIM23. It imports more than 500 different protein types, which exceeds a half of mitochondrial proteins. Dysfunctions of the TIM23 pathway were described in many pathological conditions as severe as parkinsonism and Alzheimer's disease. We propose a completely novel approach, which has not been employed in this kind of experiments so far. We generated a mitochondrial protein, which can emit light and thus can be observed under a microscope. Microscopy requires much less material than classical large-scale biochemical experiments. This is particularly important because human cells are much more difficult to grow in large amounts. Apart of the shining protein we generated an anchor protein, which binds the shining protein and prevents its import into mitochondria. The elegance of our assay is that we can chemically disrupt this interaction, liberate the shining protein and allow it to find the way to mitochondria. All shining molecules will rush to mitochondria at the same time, which will enable measurements of the speed of the import. Our project will provide important information about functioning of the TIM23 pathway in mammalian cells. In the longer perspective, we will be able to measure the efficiency of protein import in the cells affected by neurodegenerative pathologies.