Each and every single cell in our body can be compared to the modern big city. A well-organized system with a lot of traffic ongoing and its tight regulation. Each cell, like each city, needs power plants that will provide the energy for the system to be sure that it works correctly. In our body, those cells' power plants are called mitochondria. They are complicated structures that provide the energy for the cell to be sure that it works properly. Malfunctions in the way how cities' power plants works may lead to the power shortage or even power outage that will disorganize complicated city system. A similar situation can be observed within the cell. If mitochondria do not work properly it will influence cell effectiveness that may even lead to cell death. Therefore, it is not surprising that defective mitochondria are proved to cause numbers of diseases mainly affecting muscles or neurons performance. Additionally, there are also several illnesses that are believed to have its origins from unhealthy cell power plants with Parkinson's Diseases being the most prominent. To be able to prevent those diseases from happening, or treat them once they occurred, we have to know how mitochondrial stability is controlled. Up to date, there are several ways of regulation recognized and described but there are still many puzzles missing. For example, we know that proteasome, a complex structure that is degrading unneeded or damaged proteins, contributes to the control of mitochondrial health. However, the place within the cell where it exactly occurs is not known but these studies will change it.

To answer this question I am going to use a simple and well-described model organism – roundworm *Caenorhabditis elegans*. Those tiny animals, only 1mm long, are one of the most popular and useful laboratory animals. It is mainly due to the fact that you can easily introduce gene mutations or genes from other animals into worms to investigate their roles. This helps to better understand how similar processes are working in humans. Additionally, worms are transparent, therefore by using microscopes you can directly observe how processes in the cell are happening. In my project, I am going to introduce new proteins to the worms cells, for instance, one that after activation can emit light, what will allow me to see where proteasome is doing its job.

Results of this project will have an impact on several aspects of our life. First of all, it will not only help us to understand how mitochondria are kept healthy but it will also open up new pathways for investigating this process. Once we better understand the story about how the whole regulation is performed we can use this knowledge for developing new drugs against diseases caused by defective mitochondria. Future successful treatments will significantly increase the quality of our lives and will have a great impact on the society.