Metastasis of tumor is the spread of tumor cells to tissues and organs outside of the place where the tumor developed. The formation of new tumours is an event that causes the death of most tumor patients. Our research focuses on **melanoma**, because it is one of the most aggressive tumors, even a 4 mm tumor is associated with a high risk of metastasis, while a diagnosis of metastatic melanoma is connected with median survival of 6-9 months. Studying what underlies the invasive potential of melanoma is the key to understanding why it is such a devastating disease and can help to develop effective therapies. Tumor cells gain invasive potential not only through genetic mutations, but also by changing their biophysical features, such as the composition of macromolecules in the plasma membrane.

The plasma membrane defines the boundaries of the cell and allows the cell to interact with the environment and communicate with other cells in a controlled manner. To perform these roles the plasma membrane needs lipids, proteins and carbohydrates, the composition and location of these macromolecules is never accidental. Two mechanisms associated with the organization of the plasma membrane were identified: dependent on **nanodomains** - ordered plasma membrane regions consisting of lipids and proteins; and dependent on **cytoskeleton** - a network of fibrous protein structures (e.g. actin, tubulin), involved in cell migration and invasion, thanks to which organelles and substances do not swim freely in the cytosol, but occupy designated places.

In our research, we focus on two proteins that are associated with the plasma membrane of melanoma cells and, as previous studies have shown, they probably interact. One of them is **LamR**, whose **overexpression is considered as a metastatic marker in many types of tumor, including melanoma, and several patented anti-tumor therapeutic approaches targeting LamR**. It is already known that the 37kDa LamR receptor also exist in the form of species with a higher molecular weight, such as for instance 67kDa, but their formation has not been understood yet. LamR functions are surprisingly diverse, it can be located in the plasma membrane, where it acts as a receptor for many extracellular matrix proteins, and it can take part in ribosomes biogenesis or chromatin and histone binding in the cell nucleus. During realization of the doctoral project, **we found out that melanoma cells express LamR apparently as two isoforms (long and short**). **However, there are no scientific reports on the LamR long isoform expression and function.** The second studied by us protein is **gelsolin (GSN)**, an actin binding protein present in humans in the form of three isoforms (a, b and c), which plays a role in melanoma cells' motility.

The cell model in our research are human melanoma cell lines and clones derived from them. We obtained cells that do not produce GSN because the gene encoding it was destroyed. In the same way, we will create cells that will not produce LamR. To obtain cells characterized by the production of individual GSN isoforms (a / b / c) and LamR isoforms (long / short), we will introduce the appropriate sequence encoding the isoform of interest into cells with damaged gene coding for all isoforms. The goal of our research is to determine how LamR isoforms and GSN isoforms affect their mutual mobility in the plasma membrane of human melanoma cells, and which isoforms of LamR interact with which isoforms of GSN. Moreover, we want to identify mechanisms associated with the mobility of the studied proteins in the plasma membrane and we intend to check, whether the LamR long isoform, which has not been investigated yet, is involved in the formation of 67kDa LamR.

Our research will definitely shed light on the mechanism associated with the mobility of GSN isoforms and LamR isoforms, including the unexplored yet long LamR isoform, in the cell membrane of human melanoma cells. We believe that our research will contribute to understanding the biology of melanoma, and will be also used to design new therapeutic approaches to treat this devastating disease.