

## **Description for the general public**

Cancerogenesis is a long-term process that consists of various stages: initiation (the first appearance of mutation leading to the primary cancer cell origin), promotion (the accumulation of genetic and epigenetic changes and uncontrolled proliferation), and progression (metastasis). Metastasis is initiated by the invasion of cancer cells to nearby and more distant tissues and organs. It is postulated that metastasis is associated with the degradation of the connections between the cells (proteolysis). In this process, the cells invade blood or lymph vessels (intravasation), actively migrate, adhere to the endothelium, and pass from the vessels (extravasation) to a new metastasis location. Under the influence of many factors present in their new environment, the cancer cells begin to proliferate, forming a tumor metastasis. Neoangiogenesis—the formation of new vessels—also takes place, which allows for further growth of the tumor tissue.

Recent studies have indicated that an important role of microvesicles as membrane fragments released from cells of various types, including cancer cells. The function, composition and the expression of specific markers, depends on the original cell type. Such structures released by tumor cells have been called "oncosomes". They induce tumor progression and metastasis by transporting information between cells. They contain molecules that can transfer signals for the uncontrolled growth and proliferation of other cells. Through the transport of nucleic acids, microvesicles can also induce genetic changes of normal cells. Microvesicles disrupt the control of immunological system through the regulation of immune response. The aim of our project will be to examine whether (and how) secreted exosomes affect the cell biology of thyroid and breast cancers with varying aggressiveness. Thyroid cancer is the most common malignancy of the endocrine system, while breast cancer is the most common among women worldwide. Therefore this research model is thus good basic research. Analysis of microvesicles may reveal relationships between the behavior of cells—that is, their ability to migrate and invade -and the number, morphology and the composition of the secreted exosomes released by different types of tumor. We will select the markers from the protein structures of various type of cells. We will then reduce or overexpress the genes encoding the marker proteins in the tested cells. We will check the effects of these manipulations on the cultured cancer cell lines. We will perform experiments to check the interactions of immune system phagocytes (monocytes, macrophages) to isolated microvesicles. In each of these tests, we will use the newest molecular biology techniques.

This research project can develop knowledge about protein structure which today is poorly understood. The experimental results may be used as a source of new diagnostic and therapeutic purposes. The obtained results may affect new models for the treatment of patients with the use of targeted cancer therapy.