

Polysialic acid (polySia) chains are linear polysaccharides composed of sialic acid monomers. The majority of biological polySia chains are bound to membranes. There are several known biological functions of membrane polysialic acid chains, for example, they can influence fertilization, induce neuronal plasticity of human nervous system, or enhance the metastatic potential of tumor cells, and these functions can depend on the length of polySia chain. Expression of polySia on the surface of cancer cells and the interaction of polySia with apposing cells may facilitate cell detachment, tumor growth, invasion, and metastasis. The aim of this proposal is to investigate the role of polySia in modulation of biophysical properties of plasma membrane in cancer cells and in modulation of their migration rate and cell-cell adhesion.

The project describes the research on the role of polySia in changing of physiological functions of cancer cells. Both changes in membrane anisotropy (direction-dependent properties) and in membrane electrical potentials have been found to be important early events in cancer cells. Data obtained in this project may also help to understand the role of polySia in modulation of biophysical properties of plasma membrane in cancer cells. This knowledge should be useful in understanding biological mechanism(s) of polySia-mediated cellular phenomena, including cancer cell metastasis, and possibly, in the future, advance our knowledge towards developing the proper medical treatment.

Polysialic acid is interesting sugar from the viewpoint of structure and the biological function. PolySia plays important roles in nervous system development and it is involved in the detachment and metastasis of cancer cells. This is why the researchers are fascinated with this polysaccharide. There are many publications on the structure and function of polySia, but the molecular mechanisms underlying of polySia are not well understood, for example there are many undiscovered issues related to polySia role in the process of metastases. There are many questions concerning the interactions of polySia with the plasma membrane of cancer cells. The reason for taking this research is the desire to better understand the human physiology of this diverse sugar, as well as understand the role of polySia in cancer cell metastasis in human organism. Cancer is known on the second highest place with regard to the cause of the untimely death, and more and more young people are diagnosed with cancer every year. The proposed research on cancer cells may enable to better understand the mechanisms that underlie invasion and may also allow the development of new, more effective therapies.