

The project aims to develop and characterize a nanoplatform composed of liposomes to deliver monoclonal antibodies to cancer cells. After delivery into the cancer cells (more precisely into the cytoplasm of cells), monoclonal antibodies will inhibit the function of specific, essential cancer proteins, blocking the proliferation of cancer cells or leading to their apoptosis (programmed death). Monoclonal antibodies are unique proteins produced by biotechnology methods. They have been used for years in scientific research, diagnostics, and therapy of many diseases like chronic inflammation, autoimmune, and cancer. Monoclonal antibodies are produced by hybridoma cells. All monoclonal antibodies previously used in therapies bind proteins localized outside the cells (for example, viral and bacterial antigens, cytokines, and growth factors that control cell growth and differentiation processes or immune response) or on the surface of cells (receptors on cancer cells that control cancer growth and metastasis). However, intracellular proteins involved in cancer development could also be an excellent target for therapeutic antibodies. Such antibodies can be easily obtained, but delivering them to the cancer cells is problematic because they are too large molecules. In addition, antibodies can only enter cells with special receptors (placental cells, immune cells, and some epithelium). Thus, specific carriers must be developed to deliver antibodies to other cells, including cancer cells. The project aims to obtain and characterize liposomes designed to deliver monoclonal antibodies. Liposomes are nanomaterials that have already been used to deliver components of coronavirus vaccines to the cells. The delivery of liposomes to cancer cells and the intracellular activity of antitumor antibodies will be investigated using various advanced methods (microscopic imaging, flow cytometry analysis). Finally, the pharmacokinetics, biodistribution, and anticancer activity of liposomes with antibodies will be analyzed in vivo using mice bearing breast tumors. The planned research will contribute to developing methods for delivering antibodies to the cells, which may help build modern anti-cancer immunotherapies based on monoclonal antibodies.