Summary

Cancer diseases are one of the leading causes of death in the world. Contemporary methods of treatment do not always bring the expected effect and unfortunately adversely affect healthy cells. In recent years, increasing resistance of cancer cells to the chemotherapeutics used has been observed. That is why new and effective cancer treatments are still being sought. The search for new chemotherapeutics is two-fold: by modifying known drugs and by synthesizing new compounds with high biological activity. This dissertation concerns the synthesis of fused pyrazolines derivatives with a chromanone or flavanone ring and comparison of cytotoxic activity of obtained compounds. The doctoral dissertation included several stages. The first step concerned the synthesis of (*E*)-benzylidene-chroman-4-ones and (*E*)-benzylidene-2-phenylchroman-4-ones and spiro-1-pyrazoline derivatives. The structures of all compounds were characterized using physicochemical and crystallographic methods. In the second stage of my Ph.D. thesis, I focused on assessing the biological properties of compounds. The main part was cytotoxicity studies on selected cancer cell lines. Encouraged by positive results, I decided to broaden my research to check if there are interactions between compounds and erythrocytes. I conducted a study consisting of assessing the integrity of the erythrocyte membrane under the influence of synthesized compounds and evaluated the morphology of RBCs using a phase-contrast Opta-Tech inverted microscope. For compounds with the highest cytotoxicity, a cell cycle analysis was performed to see in which phase of the cycle the tested compounds would inhibit the proliferation of the cancer cell. The third part of the research included both experimental and theoretical calculations. I determined the lipophilicity parameter using the experimental method and the Molinspiration Cheminformatics computer program. Lipophilicity is one of the most important descriptors used in the design of new drugs. Besides, the energy and binding site of selected compounds for human albumin was determined and a Hirshfeld surface analysis was performed to check the type of intermolecular interaction. Also, I was looking for relationships between the biological activity of compounds, lipophilicity, and their structure, which is used in models of quantitative structure-activity relationship (QSAR) to predict the pharmacokinetics and pharmacodynamics of drugs.