The purpose of the project is to characterize anticancer activity of new photosensitive complexes of transition metals, which can be augmented or attenuated by irradiation with visible light with spatiotemporal selectivity. The compounds will include complexes of platinum (cisplatin analogs), palladium, gold, and silver.

As reported by many papers, the complexes of transition metals show strong cytotoxic activity. The examples of substances of this type are cisplatin and its derivatives such as carboplatin or oxaliplatin, which are well-known chemotherapeutics. They are applied in the therapy of many cancers, including cancers of ovaries, testes, head, neck, and bladder. The action of cisplatin is based on binding of its molecules to nucleobases present in the DNA chain, mainly to guanine. This binding results in the changes in the DNA structure, inhibits its replication and thereby inhibits RNA transcription, stops cancer cells division and finally leads to their death. Unfortunately, cisplatin is strongly toxic also to normal tissues. This toxicity is the cause of numerous adverse effects of cisplatin such as infections, bleeding, fatigue, emesis, diarrhoea, ototoxicity, kidney failure, breathing difficulties, and secondary cancer. Moreover, the efficacy of cisplatin and its derivatives decreases with time due to the development of drug resistance, including cross-resistance.

The solution to the problem of the adverse effects of the substances which are complexes of transition metals, such as cisplatin, may be the introduction into their molecules of compounds, which change their structure upon irradiation with light of specific wavelength. Such changes may bring about changes in the pharmacological properties of the drug, including changes in their anticancer activity. Optimally, such changes should be stimulated by irradiation with visible light of specific wavelength and it also should be possible to revert them using visible light of different wavelength.

As found in our preliminary studies such properties are shown by platinum complexes containing the molecules of a photosensitive compound which is a derivative of arylazopyrazole. Compounds of this type are called photoswitches. The molecule of this particular photoswitch changes its shape from elongated to curved, i.e., undergoes trans-cis photoisomerization when irradiated with 365-400 nm light and becomes elongated again upon subsequent irradiation with 530 nm (green light). The molecule of this compound changes its shape from curved back to elongated also without irradiation, but this process is then very slow. During preliminary *in vitro* studies using murine melanoma (B16) and murine breast cancer (4T1) we have shown that the platinum complex containing the photoswitch is relatively low toxic, while after irradiation with 530 nm light it becomes much more toxic for these cells. It is then expected that it will be possible to strengthen the anticancer activity of the metal complexes of this type selectively in a precisely determined area and for a determined time after its systemic or local administration in the less toxic form. To the best of our knowledge the photosensitive anticancer complexes of the transition metals, platinum derivatives in particular, have not been obtained yet.