ABSTRACT

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Title of diploma thesis: Development of 3D spheroid cultures derived from human breast adenocarcinoma cell line MCF-7 and murine colon carcinoma cell line CT-26

In recent decades, photodynamic therapy (PDT) has become a topic of intensive research in the context of experimental models of tumors, especially for the treatment of solid tumors. The study mainly focuses on research of novel photosensitizers (PS), which should provide better efficacy, higher tumor specificity and lower toxicity to non-malignant tissue. PDT is based on the interaction of PS, the presence of molecular oxygen, and light, leading to the formation of reactive oxygen species causing damage of tumor tissue. 3D tumor spheroids should provide a better tool for the study of tumor microenvironment, anticancer drugs, or therapeutic approaches. In contrast to 2D cell cultures, they are mimicking *in vivo*-like cell-cell and cell-matrix interactions.

In our work, we studied the cytotoxicity of original phthalocyanine PSs designated P40, P44, ZIP300 and the clinically used compound PhotoSens® on 3D cell cultures derived from CT-26 and MCF-7 cell lines generated using an ultra-low adhesion plates. We have also studied the invasive behaviour of spheroids after PDT with the studied compounds. The distribution of PSs in spheroids was evaluated by confocal microscopy.

Cell viability was assessed by two methods based on different principles: reduction of resazurin and determination of ATP activity. The amphiphilic cationic compound P40 showed highest phototoxicity in both cell lines. Invasive potential has been

demostrated only in spheroids derived from the CT-26 cell line. These spheroids exposed to all PSs showed reduced ability of invasivity after irradiation. Confocal microscopy revealed a different distribution of PSs – while P44 was located mainly at the surface of the spheroid, ZIP300 was located mainly in the necrotic core. PhotoSens® and P40 were located throughout the whole spheroid volume.