

Summary of doctoral dissertation on:

**„Evaluation of the effectiveness of chemotherapy of breast cancer
with the application of magnetic resonance relaxation times
and the photodynamic method”**

Author: Elżbieta Ostańska

**Faculty of Medicine, University of Rzeszów, Rzeszów, Poland
Supervisor: Dr hab. n. med. inż. Dorota Bartusik- Aebisher, Profesor UR**

Treatment of breast cancer is a combination therapy and includes topical treatments, such as surgery and radiotherapy, and systemic treatments such as chemotherapy and hormone therapy, and targeted treatments. In order for the applied form of treatment to be effective and efficient throughout the treatment phase, it must be constantly monitored. In this study, clinical magnetic resonance imaging and the photodynamic method were used to assess the effectiveness of chemotherapy in breast cancer.

The experiment consisted in collecting breast cancer tissue samples during surgery, which were examined with the use of magnetic resonance imaging (MRI) using a 1.5 Tesla apparatus (GE OPTIMA) and the photodynamic method. The obtained physicochemical tissue measurements were compared with the histopathological images of the postoperative material. Tumor tissues were also subjected to photodynamic therapy using rose bengal to reduce neoplastic cells of breast cancer by analyzing the effectiveness of PDT in an in vitro study.

The conducted research confirmed that healthy tissue and neoplastic tissue after chemotherapy, based on the difference in water content, have different relaxation times in the MRI examination. Additionally, the PDT therapy applied to neoplastic tissues caused damage to the cytoplasmic membranes, resulting in damage to lysosomes and mitochondria. Tissues treated with chemotherapy and PDT stage showed further changes in the degradation of the neoplastic tissue.

The study confirmed that using clinical magnetic resonance imaging, it is possible to differentiate between treated and untreated tissues by analyzing relaxation times. Additionally, the effectiveness of PDT in neoplastic tissues was confirmed in vitro.

