Cardiovascular diseases and cancer are the two most common causes of death worldwide. In 2019, heart diseases contributed to 18 million deaths, while cancer caused nearly 10 million deaths. Cancer and cardiovascular diseases are related to each other. Both are often diagnosed in advanced age and frequently co-occur in older patients. Moreover, certain drugs used in cancer treatment may cause cardiologic side effects.

Anthracyclines including doxorubicin are the most frequently implicated antineoplastic agents associated with cardiotoxicity. Despite significant advances in oncology and the invention of targeted therapies or immunotherapy, doxorubicin remains the basic treatment for patients with breast cancer, sarcomas, some lymphomas or leukemia.

Doxorubicin damages the heart slowly, and the risk of cardiac complications increases with the dose. The development of heart failure may occur even many years after the end of chemotherapy, which, considering its use in young patients with potentially curable breast cancer, is a significant clinical problem. Cardiotoxicity that occurs during oncological treatment may require a dose reduction of chemotherapy agents, which may result in less effective treatment. Moreover, cardiologic complications decrease patients' quality of life and life expectancy. Therefore, it is necessary to thoroughly understand the mechanisms leading to the development of cardiotoxicity to successfully prevent and manage it.

The goal of our project is to assess the role of the apelinergic system in the development of doxorubicin-induced cardiotoxicity. This system is involved in the regulation of the cardiovascular system. Animal studies have shown that apelinergic system exerts a protective influence on the heart muscle. Moreover, decreased apeline production, may be related with pathological processes that induce heart failure.

Based on this knowledge, we have hypothesized that disturbances of the apelinergic system may be involved in the development of doxorubicin-induced cardiotoxicity. To evaluate this, we will conduct a study in rats, which will assess how the chronic use of doxorubicin affects the function of the apelinergic system. Moreover, we will check how the administration of drugs that stimulate and inhibit the activity of this system affects the heart damage caused by doxorubicin. During the experiments, the cardiac function will be assessed regularly using electrocardiographic and echocardiographic tests. At the end of the experiment, tissues will be collected from animals for further histopathological, genetic, and molecular studies; this will allow the assessment of the degree of cardiotoxicity and the involvement of selected molecular processes.

The studies we plan will be the first to comprehensively analyze the role of the apelinergic system in the development of this dangerous complication of chemotherapy. Our observations will contribute not only to understanding the mechanisms underlying the heart-damaging effect of doxorubicin but also to finding ways to effectively treat and prevent them.