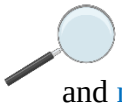
Every day, cancer patients rely on chemotherapy pharmaceuticals such as cyclophosphamide, fluorouracil and methotrexate in their uneven fight for life. These drugs, from the group of so-called cytostatics, are effective weapons against cancer, intended to target rapidly dividing cancer cells. They inhibit their division and thus the growth of cancerous tumors. Ultimately, however, they do not exhibit an action focused only on cancer cells, acting non-targeted on all cells in the body. In addition, a certain amount of these drugs end up in wastewater, and even despite modern processes for treating used water, they eventually reach natural bodies of water, where they can interact with the organisms inhabiting a given ecosystem. Inland aquatic ecosystems are full of microorganisms that play a key role in maintaining ecological balance. Some of them – bacteria – are essential for the decomposition of organic matter, nutrient cycling and even in water purification processes. So, what happens when environmental bacteria are exposed to drugs designed to fight cancer cells? The proposed project explores this topic, focusing on cytostatic drugs – dangerous substances used in chemotherapy processes.

However, the significance of this research goes beyond the environmental impact. There are concerns that the presence of cytostatic drugs in water could contribute to an alarming increase in the number of drug-resistant bacterial strains. This phenomenon is one of the most significant health threats of our time, making it more difficult to combat seemingly harmless infections and increasing the risk of disease spread and even patient death. Bacteria exposed to cytostatic drugs may undergo adaptation phenomena that help them resist the effects not only of adverse external environmental conditions, but also, or even especially, of antibiotics. The present project therefore presupposes the investigation of these mechanisms, focusing on how bacterial lipid membranes reorganize in response to exposure to cytostatic drugs and what proteins responsible for excretion of harmful substances are expressed



In this regard, the proposed research project aims to investigate how environmental levels of the most environmentally hazardous cytostatic drugs – cyclophosphamide, fluorouracil and methotrexate - affect bacteria from a group of highly resistant strains found in inland water bodies – *Pseudomonas aeruginosa*, *Escherichia coli* and *Acinetobacter baumannii*. By studying the effects of these drugs on metabolism and cell surface properties, the project aims to understand how bacteria adapt to toxic conditions resulting from the presence of environmental levels of cytostatics. This knowledge is crucial because disruptions in microbial metabolic processes can lead to broader ecological consequences, potentially affecting water quality and the health of entire ecosystems. By seeking answers to how the presence of cytostatic drugs in the environment can contribute to processes of increasing bacterial resistance, this research can provide information on potential strategies for addressing this dangerous phenomenon, while also highlighting the need to protect the environment.

This project is about more than just bacterial resistance. It's about protecting our ecosystems, improving public health and promoting sustainable pharmaceutical practices. By studying the untold impact of cytostatic drugs, a side goal of the project is to promote a more responsible approach to drug use and disposal, while ensuring that life-saving treatments do not come at the expense of the environment and human health.