DESCRIPTION FOR THE GENERAL PUBLIC

The widespread use of pharmaceuticals has led to the presence of active compounds in the natural environment, raising concerns about potential ecological impacts. β-blockers, a class of pharmaceuticals commonly prescribed for cardiovascular conditions, have gained attention due to their increasing detection in various ecosystems. But how do drugs, including β-blockers, get into the environment? When humans consume medications, their bodies metabolize and absorb only a portion of the drugs. The rest is excreted, introducing these substances into wastewater. Wastewater treatment plants are designed to remove various pollutants but may not completely eliminate pharmaceutical residues. Some drugs can pass through treatment and enter water bodies through treated effluent. As a result, pharmaceuticals are nowadays detected in surface water, groundwater, soil, sediments, and even drinking water. Their presence in the environment is not unnoticeable because often, they negatively affect the non-target organisms, including humans, who do not need these drugs. One of the most promising methods for removing medications from the environment is bioremediation. Through a process known as microbial degradation, drugs like metoprolol (one of Europe's most frequently prescribed β-blockers) are transformed into harmless byproducts. Recently isolated from the environment, the microbial consortium can break down metoprolol and potentially turn an environmental concern into a natural process.

This project aims to understand the power of the isolated microbial consortium in metoprolol degradation by getting to know its genome, metabolism and degradation potential. To achieve it, the project assumes checking its ability to consume different compounds and looking in its genome and produced proteins for unique properties and enzymes responsible for breaking down metoprolol. Next, it is planned to maximize the drug degradation efficiency by the microbial consortium through managing the conditions of the degradation process. Additionally, the ability of the consortium to break down atenolol, which is structurally very similar to metoprolol and, the most popular metoprolol human metabolite – metoprolol acid – which is often found in the environment, will be tested. The last task in the project assumes checking whether the isolated consortium, during metoprolol degradation, generates compounds that may threaten aquatic ecosystems.

In the literature, there is practically no information about metoprolol degradation by microorganisms. We could gain insights into sustainable solutions if we comprehend how microorganisms that can degrade metoprolol work. By harnessing their power, we might unlock eco-friendly methods for managing metoprolol residues in the environment.