

Interactions of non-steroidal anti-inflammatory drugs (NSAIDs) with photosynthetic apparatus as an essential factor of their phytotoxicity

In recent years, more and more attention has been paid to the presence of pharmaceuticals and their metabolites in the environment, which is caused by their constantly growing consumption and production. The group of drugs most frequently detected in the environment and posing a real threat are non-steroidal anti-inflammatory drugs (NSAIDs). Many of them are not metabolized in the body and end up in the sewage in unchanged form, others are only slightly degraded by the intestinal microflora, and some of them can accumulate in living organisms. Ineffective disposal of pharmaceuticals in sewage treatment plants and their effluents from landfills cause contamination of the aquatic environment with drugs and their derivatives. This problem also applies to Poland, because the level of their consumption is one of the highest in Europe, and the efficiency of their removal from wastewater is relatively low. This fact poses a serious threat to all organisms exposed to them. Significant amounts of NSAIDs are found in seas and inland waters, including groundwater, which is the main source of drinking water. Because NSAIDs are used by humans, their effects on mammalian cells have been extensively studied. However, there are no studies so far that would indicate the exact mechanism of action of NSAIDs on plant cells and the key process of photosynthesis for all plant organisms.

The project aims to verify the hypothesis that NSAIDs directly affect the photosynthetic apparatus of spinach (*Spinacia oleracea*). To achieve the intended goal, we will conduct experiments using thylakoids and PSII complexes (BBY molecules) isolated from spinach and treated with selected representatives of NSAIDs: indomethacin, flufenamic acid, and nabumetone, which, despite belonging to the same group of drugs, differ in structure. We suspect that this may result in a different mechanism of action or a different degree of phytotoxicity. The obtained results will contribute to broadening the knowledge about the mechanism of the phytotoxic action of NSAIDs. The implementation of the project is also intended to draw public attention to the problem of constantly increasing water pollution with drugs and their impact on non-target organisms.