Description for the general public

The aim of the proposed project is to investigate possibility of using enzymes from ene-reductase family for obtaining asymmetric compounds, containing phosphorus atom in their structure. Realization of the project will allow both for creating a valuable tool for synthesis of chiral heteroorganic compounds, and better understanding of properties of investigated enzymes. Unlike other methods, use of these enzymes allows for the introduction of up to two asymmetry centers in a single step, what gives a wide range of possible applications.

The first part of the project will be the synthesis of appropriate compounds bearing phosphorus atom in their structure. In this phase of the project classical methods of organic chemistry will be used for synthesis, and modern analytical methods for the analysis of the products, especially important in case of products that have not been precisely described in the literature yet.

Further part of the project will consist of investigation of enzymatic reactions. First, enzymatic reactions will be conducted on small scale to select appropriate conditions, enzymes and range of compounds being accepted by the enzymes. These reactions require cofactors – additional, expensive compounds involved in the biocatalytic process. Therefore next step of the research will be selection of efficient cofactor recycling system, in order to reduce costs of the process and make it more cost effective. After optimization of method, reactions will be conducted in larger scale, to obtain products in quantities sufficient for analysis.

Products of planned enzymatic reactions, may be valuable asymmetric precursors for further transformations into biologically active products. For example, biocatalytic conversion of appropriate compounds containing phosphorus atom in their structure, may be a very useful, easy, and environment-friendly method to obtain asymmetric building blocks for the synthesis of glutamic acid derivatives used for treatment of nervous system diseases, or fosmidomycin derivatives that show very promising anti-malarial activity.