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SYNTHESIS OF AROMATIC *N*-OXIDES AND EPOXIDES BY BIOCATALYTIC METHODS

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Oxygenation reactions are widely used in industry, however, organic chemistry methods usually require metal catalysts or peroxides. Therefore, more environmentally friendly methods are needed, and as a result, more attention is shifting to the enzymes that catalyse such reactions - various oxygenases. Non-heme diiron monooxygenase PmlABCDEF possesses a broad substrate specificity and can oxidize different chemical groups, including ring heteroatoms and C=C double bonds [1].

N-oxides can be applied in the agriculture, and pharmacy industries. They have increased reactivity compared to regular *N*-heteroaromatic compounds [2]. Oxiranes, also known as epoxides, are important intermediates in organic chemistry and they bear the capacity of wide–ranging ring–opening reactions, which usually occur with predictable regioselectivity and stereospecificity [3]. However, it is a challenging task to selectively oxidize chemical groups of different reactivity (e. g. *N*-oxidation versus epoxidation) in a single molecule, therefore diverse synthesis strategies are employed with multiple reaction steps [4].

In this work, we investigated the selectivity of PmlABCDEF monooxygenase with substrates bearing two possible reaction sites – terminal C=C double bond and nitrogen atom in the pyridine ring. Hence, alkenyl-substituted pyridine compounds having different lengths of carbon chains were synthesized from 3-pyridinol and appropriate alkenyl bromides. Produced compounds were used in the bioconversion reactions with *Pseudomonas putida* KT2440 producing recombinant PmlABCDEF monooxygenase. Reaction products were identified as *N*-oxides and epoxides (the reaction scheme is shown in Fig. 1). The efficiency of the conversion as well as the ratio of different oxidation products depended on the length of the alkenyl chain.

The reaction products were extracted and purified using column chromatography on a silica gel. The obtained compounds were analysed with nuclear magnetic resonance (NMR), thin-layer chromatography (TLC), and high-performance liquid chromatography – mass spectrometry (HPLC-MS).

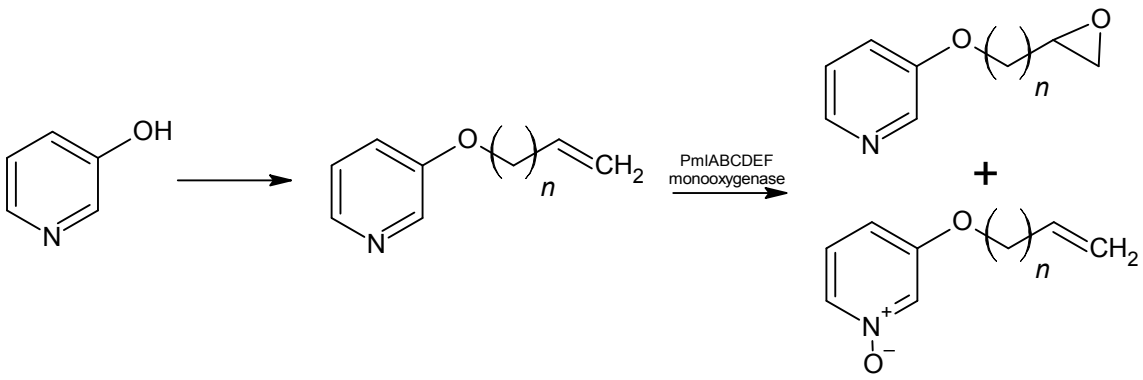

Fig. 1. Substrate synthesis and conversion to oxiranes and *N*-oxides. n is 1 – 6

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