Project 2.3 Chiral hybrids of quinones and quinols with double anticancer and antimicrobial activity against drug-resistant pathogens as potential agents in hospitalization of cancer treatment

Supervisor: Prof. Ryszard Ostaszewski, PhD Dsc.
Institute: Institute of Organic Chemistry PAS
www: https://www.icho.edu.pl/en/zespol/ryszard-ostaszewski-group/

Background:

Reports preparation, publications preparation, synthesis of organic compounds using metal catalyzed organic reactions and enzymatic reactions.

Aim:

Cancer is a crippling and challenging disease. Despite the progress in the development of cancer treatments, there is no suitable cure for most advanced cancers.

Cancer patients are also affected by multidrug resistant (MDR) infections, often associated with considerable morbidity and mortality. On the basis of the literature reports, naturally occurring quinones and quinols have been identified as groups of compounds with both of these activities.

Our preliminary results show that the decarboxylative coupling reaction is a convenient tool for the synthesis of variously substituted quinones, which can be further transformed to quinols. However, a stereoselective variant of this is available.

The reaction remains unknown. The main topic of the project is to develop a selective decarboxylative cross-coupling reaction using various aromatic and aliphatic chiral nonracemic acids. After optimisation, a compound library will be prepared and used for biological assays for antimicrobial and anticancer activity. The results obtained will be correlated with the dual inhibition properties towards enzymes recognised in cancer therapy, thioredoxin reductase 1 (TrxR1) and tyrosinase.

Anticancer cell assay and part of antimicrobial assays will be conducted in cooperation with our partners from the European Network Action COST CA21145 for the diagnosis and treatment of antibiotic-resistant bacterial infections (EURESTOP). The Molecular Knocking of selected compounds with enzymes will be carried out with our partner from the COST CA21162 action, Establishing a Pan-European Network on Computational Redesign of Enzymes (COZYME).

Requirements:

- an excellent academic background;
- MSc degree in organic chemistry, biotechnology (or close date of MSc thesis defence);
- good knowledge of organic synthesis or biocatalysis;
- good knowledge of databases (Reaxys, SciFinder);
- good knowledge of analytical techniques utilized in organic chemistry (NMR, MS, IR);
- fluency in English.