

Thesis topics of Organic Chemistry Department for the 2nd semester of the 2023/2024 academic year

Dr. Bokor Éva

Institute of Chemistry

Chemical Glycobiology Research Group

Chemistry Building E-423

e-mail: bokor.eva@science.unideb.hu

BSc and MSc thesis topic:

Synthesis of new glycosyl heterocycles and their half-sandwich platinum metal complexes

Platinum complexes (e. g. cisplatin, oxaliplatin) are widely used chemotherapeutic agents for the treatment of cancer. However, these drugs frequently cause serious side effects. Thus, there is a continuing search for other platinum metal complexes with better anticancer properties. In this regard, the half-sandwich type complexes of platinum-group metals (e. g. Ru, Os, Rh, Ir) represent a promising compound class. Recently, we have synthesized a series of such type of complexes incorporating heterocyclic monosaccharides as N,N-bidentate ligands. Several of these derivatives have been shown to be active against different cancer cells. For a detailed structure-activity relationship the aim of the diploma work will be the synthesis of new glycopyranosyl heterocycles and their half-sandwich type complexes.

Dr. Timári István, assistant professor

Structural Biology, Molecular Recognition and Interaction Research Group

NMR Facility, Department of Organic Chemistry

website: <https://debnmr.unideb.hu/>

email: timari.istvan@science.unideb.hu

BSc and MSc thesis topic:

Application of advanced NMR methods for the structure elucidation of biologically active molecules

The biological activity of any molecule is primarily determined by the structure of the given molecule. Nuclear magnetic resonance (NMR) spectroscopy is one of the most powerful techniques for investigation of molecular structure in atomic detail. Due to the growing number of regulatory requirements for example in drug development, and consequently the increasing number of measurements required, there is a continuous demand for innovative methods that can provide maximal information in the shortest time possible. We will apply advanced NMR experiments to determine the structure of biologically active compounds, such as carbohydrates and peptides.

Dr. Juhászné Dr. Tóth Éva

Institute of Chemistry

Chemical Glycobiology Research Group

Chemistry Building E-409

e-mail: toth.eva@science.unideb.hu

BSc thesis topic (1 Biochem. Eng. student):

Synthesis of *C*-galactosyl-formaldehyde-benzoylhydrazones and their platinum metal complexes

In the Chemical Glycobiology Research Group (Department of Organic Chemistry, University of Debrecen) a large number of bioactive monosaccharide derivatives have been designed and synthesized for many years. During this work sugar containing half-sandwich platinum metal complexes have been synthesized and patented. Some have shown (sub)micromolar cytostatic activity against carcinoma, lymphoma and sarcoma cancer cells as well as antibacterial activity against multiresistant Gram positive bacteria.

Based on these preliminaries the aim of this research work to extend the SAR (structure – activity relationships) studies for different anhydro-aldose and aldonolactone (thio)semicarbazones, benzoylhydrazones and amidrazones by preparing of a diverse set of their new platinum metal complexes. Investigation of their antineoplastic activity will be performed in collaboration with Institute of Medical Chemistry, University of Debrecen.

Vágvölgyiné Dr. Tóth Marietta and Dr. Kaszás Tímea

Institute of Chemistry

Chemical Glycobiology Research Group

Chemistry Building E-409

e-mail: toth.marietta@science.unideb.hu

e-mail: kaszas.timea@science.unideb.hu

BSc thesis topic (1-1 student):

Study of reactions of nitrile oxides with *endo*- and substituted *endo*-glycals

During the thesis, new compounds and in some cases new chemical syntheses are intended to be developed. The main aim of this project is to study the feasibility of several synthetic methods with carbohydrate substrates, which can provide potentially biologically active compounds. Our group has elaborated synthetic procedures for the preparation of anhydro-aldoximes by the transimination reaction of semicarbazones. Oximes can be applied for the *in situ* generation of nitrile oxides, which can be further transformed in various ways. We plan to investigate the reactions of nitrile oxides with *endo*- and substituted *endo*-glycals to form new isoxazoline derivatives.

Study of reactions of nitrile oxides with vinyl and acetylene derivatives

In this project new compounds and in some cases new chemical syntheses are planned to be developed. The main aim of the thesis work is to study the feasibility of several synthetic methods with carbohydrate substrates, which can result in potentially biologically active compounds. Our group has elaborated a synthetic method for the preparation of anhydro-aldoximes by the transimination reaction of semicarbazone derivatives. These oximes will be applied for the *in situ* generation of nitrile oxides and react with vinyl and acetylene derivatives to form new isoxazoline and isoxazole derivatives.