

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

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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.

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BSc thesis topic (2 students):

Synthesis of half-sandwich platinum-group metal complexes of anhydro-aldose and aldolactone (thio)semicarbazones, benzoylhydrazones and amidrazones as potential anticancer agents

Carbohydrates are the most common natural compounds, which, in addition to playing a significant role as skeletal and nutritional functions, are also involved in the structural construction of the cell surface and in the vital cell recognition processes taking place there. These compounds are a relatively unexploited source of drugs and therefore offer exciting new therapeutic opportunities. The results achieved in the functional understanding of carbohydrate-protein interactions enabled the development of a new class of small molecule drugs. Glycomimetics imitate the biological functions of carbohydrates, so the investigation of their structure-effect relationship is essential, which opened a new path in pharmaceutical research.

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 aldolactone (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

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BSc and MSc thesis topic (1-1 student):

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.