

Proposal for Dissertation Topic in the Doctoral Study Programme at the Faculty of Pharmacy, Masaryk University

Study type (full-time/distant): full-time

Full name of the study programme: Medicinal chemistry

Department*): Department of chemical drugs

Head of the Department: doc. PharmDr. Ing. Radka Opatřilová, Ph.D., MBA

Number of available stipends: 1

Dissertation topic

Design and synthesis of new fluorophores for the detection of biomolecules

Summary

Fluorescent labeling of biomolecules is currently a very widespread biomolecular method of their detection. The dissertation will aim to prepare and evaluate a new group of stable fluorophores for labeling biomolecules, especially those that are difficult to detect or the sensitivity of their detection is not satisfactory. First of all, the prepared fluorophores will be applied to the detection of oligosaccharides and glycans. Glycans attached to protein molecules play a dominant role in living systems and are responsible for many biological and physiological processes (regulatory and recognition functions, cellular communications, gene expression, etc.). Glycosylation is also one of the key critical attributes of the quality of monoclonal antibody-based biotherapeutics. Altered glycosylation may affect the efficacy or safety of drugs.

Preliminary aims

(1) Development of methodology for the preparation of basic skeletons of stable fluorophores characterized by high absorption coefficients and high fluorescence quantum yields (this also includes the design of suitable structures, design of their synthesis, synthesis itself, physicochemical characterization of prepared compounds, etc.). (2) Modification of the most suitable basic skeletons in order to find suitable functional groups for their attachment to individual types of biomolecules. (3) Evaluation of their suitability for the detection of biomolecules using standard analytical methods (HPLC and CE with MS and fluorescence detection) in cooperation with the Institute of Analytical

Chemistry of the ASCR. (4) Further modification of structures in order to achieve the best possible parameters in the analytical determination of biomolecules.

Grant funding

- Information about associated grant(s): The application for grant support was submitted this year (GA ČR).
- Information about the availability of employment or project funding above the framework of the MU-awarded stipend: [Klikněte nebo klepněte sem a zadejte text.](#)

Brief requirements according to the Subject Area Board (SAB)

- Publication activities: Experience with publishing scientific papers and previous active participation in conferences are welcome. Prior to study completion, the student must be an author of at least two papers in journals with impact factor (first author in at least one of these).
- Information about a compulsory scientific stay abroad: Participation in internships abroad at the University of Neuchâtel, Switzerland is expected.
- The student's involvement in teaching activities at the faculty: The student will be involved in teaching organic and medicinal chemistry.
- English language knowledge (specify the requirements): Knowledge of English by word and in writing is a must (the students must be able of understanding the scientific literature).

Information about the supervisor

Name, surname, titles: doc. Ing. Pavel Bobál, CSc.

- Publication activity of the supervisor: Number of publications in Web of Science: 40, h-index: 13
- Success in grant project submission (grant projects awarded): Internal Grant Agency MUNI: MUNI/A/1510/2020, MUNI/A/1682/2020; GACR 16-07193S (2016-2019); Internal grant agency UVPS Brno: 315/2019/FaF, 320/2018/FaF, 323/2017/FaF, 327/2016/FaF, 50/2014/FaF, 108/2013/FaF, 91/2013/FaF, 80/2012/FaF, 49/2011/FaF, 51/2011/FaF, 63/2011/FaF; Interní vzdělávací agentura VFU Brno: 2019FaF/3150/83, 2018FaF/3150/78, 2015FaF/3150/89, 2014FaF/3150/62, 2014FaF/3150/64; University Development Fund: 162/2013/G6, 1131/2012/F3/a.
- International cooperation (potentially with the possibility of student's stay): prof. Reinhard Neier, University of Neuchatel, Switzerland; prof. David Lightner, University of Nevada Reno,

USA; Dr. Július Brtko, Institute of experimental endocrinology, Biomedical Research Center SAS, Slovak republic.

- Number of current doctoral students led by the supervisor: 4
- Number of successful PhD graduates led by the supervisor and their further career: 1 (assistant professor, Dept. Chem. Drugs, Faculty of Pharmacy MU)

Information about the Consultant

Name, surname, titles:

- Publication activity of the supervisor: Number of publications in Web of Science: , h-index:
- Success in grant project submission (grant projects awarded): Klikněte nebo klepněte sem a zadejte text.
- International cooperation (potentially with the possibility of student's stay): Klikněte nebo klepněte sem a zadejte text.
- Number of current doctoral students led by the supervisor: Klikněte nebo klepněte sem a zadejte text.
- Number of successful PhD graduates led by the supervisor and their further career: Klikněte nebo klepněte sem a zadejte text.