SZKOŁA DOKTORSKA
BioMedChem
Uniwersytetu Łódzkiego
i Instytutów Polskiej
Akademii Nauk w Łodzi

UNIC

Supervisors of the BioMedChem Doctoral School of University of Lodz and Lodz Institutes of the Polish Academy of Sciences in medical science

Name of academic staff member	Area of scientific and research interests / <u>Proposed topics for the doctoral thesis</u>
Dr hab. Anna Brzostek prof. IMB PAS Institute of Medical Biology of Polish Academy of Sciences in Lodz ✉ abrzostek@cbm.pan.pl ☎ +48 42 272 36 06 ORCID: https://orcid.org/0000-0002-7335-9853 *Leading discipline - medical sciences*	<u>Area of scientific and research interests</u>: Studies on the molecular basis of the acquisition of resistance to antimycobacterial compounds; identification of proteins and enzymes involved in the repair of mycobacterial DNA damage, studies on the mycobacterial metabolic pathways. <u>Proposed topics for the doctoral thesis:</u> The role of vitamin B12 in maintaining and regulating *Mycobacterium tuberculosis* virulence lipids synthesis. Molecular and metabolic basis of vitamin B12 role in mycobacterial virulence. The utilization of „Trojan horse" conjugation with vitamin B12 to facilitate antitubercular drug delivery.
Prof. dr hab. Jarosław Dziadek Institute of Medical Biology of Polish Academy of Sciences in Lodz ✉ jdziadek@cbm.pan.pl ☎ 42 42 272 36 10 ORCID: https://orcid.org/0000-0003-1427-884X *Leading discipline - medical sciences*	<u>Area of scientific and research interests</u>: Molecular basis of drug resistance and drug tolerance of tubercle bacilli. Searching for potential antituberculosis drugs and their target sites in mycobacteria. DNA repair processes, cholesterol metabolism, two-component signal transduction system in the aspect of Mycobacterium tuberculosis virulence. <u>Proposed topics for the doctoral thesis:</u> The project addresses the urgent need for innovative therapeutic strategies against *M. tuberculosis*, particularly given increasing multidrug resistance. It focuses on targeting RNA metabolism by characterizing and inhibiting selected key RNA-processing enzymes. The hypothesis is that disrupting RNA processing will sensitize bacteria to existing drugs and compromise persistence. The project will validate selected inhibitors, develop screening tools, and identify small molecules with antimycobacterial efficacy, integrating enzymology with translational research for novel tuberculosis therapeutics.

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Leading discipline - *medical sciences*

Area of scientific and research interests:

The aim of meiosis is to generate gametes by recombining the chromosomes and reducing the genome from diploid to haploid. However, in mitosis haploid genome and recombination have catastrophic, oncogenic outcomes. Consequently, the process of somatic cell division requires the accurate and specific silencing of meiotic genes when cells transition to mitosis. Interestingly, failure of this silencing occurs in approximately 15% of human cancer patients who re-express the meiotic SYCP1 protein. We find that SYCP1 re-expression is induced by common chemotherapy treatments causing DNA damage induction. The process of meiotic recombination involves similar mechanisms to DNA double strand break repair (DSBR) and due to this similarity SYCP1 re-activation in cancer cells may contribute to genome instability. In this project you will investigation potential mechanisms driving SYCP1 re-expression in cancer. You will investigate the biology of SYCP1 re-expression in cancer, the effect it has on cellular physiology and response to chemotherapeutics.

This interdisciplinary project will involve a unique breadth of training with complementary approaches. During this interdisciplinary project you will develop a unique combination of skills in pathology, cell biology, big data, proteomics, genetic and imaging techniques. A broad range of inter-disciplinary approaches (CRISPR-Cas9 genome editing and DNA pull-downs followed by mass spectroscopy) will help you develop diverse technical expertise. Furthermore, this multi-disciplinary training will give you a broad range of skills allowing a wide choice of career options, both within and outside of academia. Our group is committed to supporting the development of early career researchers. Successful candidate will not only join a vibrant department but will also be supported in attending national and international conferences as well as undertaking training to further develop and pursue their own career development. Our laboratory https://www.mcclurglab.com/ is a collegial, supportive environment that champions talent, diversity and equity.

The project is suited to a student with at least a good Masters (Upper Second Class in Biological or Life Sciences).

Proposed topics for the doctoral thesis: ***Project title:*** Why do cancers cells re-express meiotic SYCP1 protein?

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Leading discipline - *medical sciences*

Area of scientific and research interests:
Collectins and ficolins in infections, cancer and autoimmune diseases. Microbial structure-induced activation of complement and coagulation systems.

Proposed topics for the doctoral thesis:
Biological activity of outer membrane vesicles of Gram-negative bacteria.