Michal Smida: Functional Genomics

We focus on two major hematologic malignancies, i.e. a malignant tumour disease – chronic lymphocytic leukemia and acute myeloid leukemia, whose therapies often fail, desiring better treatments. We are using the „molecular scissors" CRISPR/Cas9 to generate new cell models carrying patient mutations, characterize mechanisms of resistance to current therapies or identify new targets for therapy. We are testing a large collection of drugs to discover new effective therapies and use modern genomic approaches to reveal the mechanisms.

contact: michal.smida@ceitec.muni.cz

Core Facility: Nanobiotechnology

Are you tempted to look at a DNA molecule to see if it really has the structure of a helix; to build a model of the heart and test new drugs on it; to help patients with arthritis, or to improve joint implants to make them more acceptable to patients; or to build a model of the cell membrane to study the processes at this cell boundary? Are you fascinated by artificial intelligence, which can help us process large amounts of data to gain new insights and information about the objects we study, or by computer image processing, which allows us to capture more detail and quality images? Our lab would love to get you involved. Let's look beyond the microworld together.

contact: jan.pribyl@ceitec.muni.cz

Core Facility: Bioinformatics

Join us at our core facility and discover the excitement of bioinformatics as you dive into the labyrinth of the genetic code using your computer skills to analyze data from Next-Generation Sequencing (NGS). Apply your theoretical knowledge of informatics and mathematics in practical situations and get involved in important molecular medicine projects with a direct impact on patient health.

contact: vojtech.bystry@ceitec.muni.cz

For organising your internship, please contact group leader/facility head or contact person of your choice directly. For general inquiries, please don't hesitate to contact our Science and Innovations Support Department: mobility@ceitec.muni.cz

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Pavel Plevka: Structural Virology

Our objective is to understand the mechanisms that enable viruses to reproduce. We study the structure of viral particles and how viruses utilize the resources of infected cells to ensure the production of viral offspring. We use molecular biology methods, fluorescent light sheet microscopy, and cryo-electron microscopy and tomography for our work. The main viruses of our interest are (1) Picornaviruses - a large group of viruses that cause many diseases, from the common cold to encephalitis. (2) Bee viruses that cause colony collapse. (3) Bacteriophages that can be used as an alternative to antibiotics to treat infections caused by Staphylococcus aureus (golden staphylococcus) and Pseudomonas aeruginosa. In our group, students can learn genetic engineering techniques, work with bacteria and tissue cultures, grow and purify viruses in BSL2 and BSL3 laboratories, and work with a fluorescent light sheet microscope and electron microscopes.

contact: pavel.plevka@ceitec.muni.cz

Helene Robert Boisivon: Hormonal Crosstalk in Plant Development

Seed production of crops is essential for the production of many foodstuffs. Our research seeks to understand aspects that influence seed production. We are interested in how plants respond to different environmental conditions in which they grow and how these changes in conditions translate into changes in regulation at the cellular and molecular levels. We are trying to identify genes that could help improve plant production at high temperatures. In particular, we work with the model plant ***Arabidopsis thaliana*** and the agriculturally important oilseed rape, but we also use tomatoes or almond trees.

contact: katerina.macova@ceitec.muni.cz

Radek Marek: Structure of Biosystems and Molecular Materials

The subject of our research is new forms of platinum and ruthenium compounds with anticancer activity. We start from metallo-drugs used in medicine, which we further chemically modify, and then study their combinations with systems containing in their molecular structure cavities in which the drug can be encapsulated. The resulting system does not affect healthy cells during its action in the human body and thus offers the possibility of limiting the unwanted side effects that accompany conventional anticancer treatment.

contact: radek.marek@ceitec.muni.cz

Zbynek Zdrahal: Proteomics

In our laboratory, we develop methods of proteomic analysis using mass spectrometry, mainly techniques for analysis of post-translational modifications of proteins (methylation, acetylation of histones, glycosylation, phosphorylation). As part of our cooperation, we provide a wide range of proteomic applications for colleagues from the Czech Republic and abroad. Our results help extend their understanding of the basis of cellular processes or meet the goals of their applied research. Get in touch and learn more.

contact: zbynek.zdrahal@ceitec.muni.cz

Konstantinos Tripsianes: Protein-DNA Interactions

Get ready to study proteins, the working molecules that perform a diverse range of functions for the cell. In the Tripsianes group, we combine biochemistry, biophysics and structural biology to produce and characterise the components of the WNT signalling pathway, which is important mainly in the development and regeneration of organisms. What do these proteins look like? Do they change appearance? Are they stiff or moving all the time? With whom do they stick around? Come and join us to test hypotheses and find answers that can advance knowledge in the WNT field.

contact: simona.dzurendova@ceitec.muni.cz

Dalibor Blazek: Inherited Diseases - Transcriptional Regulation

Our lab studies regulation of gene expression, i.e. how genes are transcribed into mRNA. Two proteins, cyclin-dependent kinases 11 (CDK11) and 12 (CDK12) play crucial roles in this process and they are often altered in various forms of cancers. We apply up-to-date methods of molecular biology, biochemistry, chemical biology and bioinformatics to understand molecular mechanisms of these proteins in normal and cancer cells. We also utilize this knowledge in design of novel anti-tumor strategies.

contact: dalibor.blazek@ceitec.muni.cz

Robert Vacha: Interaction Protein-Protein and Protein-Membrane

We are developing new peptides/proteins that can be used to treat infections, including those caused by antibiotic-resistant bacteria. Using computer simulations, we are revealing mechanisms how peptides can kill bacteria such as formation of holes in bacterial membranes or by carrying drugs. Based on the results, we are designing new peptides that we are experimentally validating in our lab, including toxicity and antibacterial activity.

contact: robert.vacha@ceitec.muni.cz

Stepanka Vanacova: RNA Quality Control

Are you curious about the powers of an RNA molecule in human cells? Do you want to participate in discovering new mechanisms that ensure the proper functioning of our cells? Do you want to learn how to genetically modify human cells using CRISPR-Cas9, prepare fluorescent proteins or identify yet unknown secrets of RNA? Get in touch with us. We are an international team of students and postdocs tackling diverse aspects of RNA biology.

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Gabriel Demo: Structural Biology of Coupled Transcription-Translation

We are focused on transcription and translation processes in bacteria and humans. Our mainstream approach is structural biology, especially cryo-electron microscopy, to determine structures of RNA polymerase and ribosome complexes at multiple stages ranging from initiation to termination. Moreover, we apply cryo-electron tomography to investigate directly in human cells how ribosomes (translation processes) are affected due to viral infections, mainly focusing on poxviruses (small pox).

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Marek Mraz: Microenvironment of Immune Cells

We are studying leukemias and lymphomas arising from B cells of the immune system. Using in vitro models, next generation sequencing and samples from patients treated at the neighboring University Hospital, we decipher the molecular mechanisms regulating the onset and progression of these diseases and develop treatment strategies and diagnostic tools (several patents). For example, we have shown that non-coding RNAs play an essential role in leukemias/lymphomas and described novel mechanisms of therapy resistance.

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