



Laboratory of Cell Differentiation

/ Institute of Experimental Biology
/ Faculty of Science / Masaryk University

RESEARCH GROUP CONTACT >>

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THEMATIC RESEARCH FOCUS >

RESEARCH AREA

- » Behaviour of tumor cells
- » Principles of proliferation, differentiation and programmed cell death in cancer cells
- » Testing of anti-cancer drugs

EXCELLENCE

- » Targeting gene functions using DNA manipulation and RNA interference techniques
- » Testing of anti-cancer drugs

MISSION

- » To increase excellence of research and teaching quality
- » To be a renowned educational and research institution, able to offer an international standard of university education as its focus

DEVELOPED TECHNOLOGIES >

CONTENT OF RESEARCH

- » Searching for conditions suppressing proliferation and resuming differentiation and/or programmed cell death of cancer cells
- » Investigating molecular mechanisms of how specific genes can promote and suppress carcinogenesis
- » Investigating cytotoxicity and mechanism of action of anti-cancer drugs

MAIN CAPABILITIES

- » Targeted regulation of gene expression (both „on“ and „off“)
- » Gene modification and transfer among various cell types
- » Monitoring of gene expression by real-time PCR and DNA microarrays
- » Measuring of cell proliferation, differentiation and programmed cell death by multiple methods
- » Measuring of cell motility and invasiveness in real-time

FIELDS OF RESEARCH RESULTS APPLICATION

- » Drug development
- » Diagnostics and therapy of cancer diseases

ALUMNI PROFILE

Alumni have excellent knowledge of methods of DNA manipulation, gene transfection, RNA interference, cell cultivation, monitoring of gene expression using real-time PCR, immunoblotting and fluorescence microscopy. They are able to design research projects as well as individual experiments independently and present their results in written and oral form.

NUMBER OF RESEARCH POSITIONS >

SENIOR RESEARCH STAFF

4

JUNIOR RESEARCH POSITIONS (INCL. PH.D. STUDENTS)

6



KEY RESEARCH EQUIPMENT ↘

LIST OF DEVICES

- » ELISA (Enzyme-Linked Immunosorbent Assay) (Bio-Tek) reader for detection of antibodies
- » Apparatus for one- and two-dimensional gel electrophoresis (Bio-Rad) for separation of nucleic acid and proteins
- » xCELLigence Real-Time Cell Analyzer (Roche) for detection of various characteristics of living cells, such as, cell motility and invasiveness
- » Thermocycler for real-time PCR (Applied Biosystems) to quantitative expression of specific genes
- » Device (Bio-Rad) for immunoblotting of proteins
- » Deep-freeze (-80oC and -140oC) cabinets (SANYO) for safe long-term storage of cells and other samples and chemicals
- » High-capacity incubators and shakers (New Brunswick) for efficient cultivation of animal and human cells, as well as bacterial cells
- » Centrifuges of various types including a cytocentrifuge (Beckman, Eppendorf) for separation of various cell fractions and molecules
- » UV-crosslinker (Stratagene) for immobilizing the molecules of nucleic acids on filters
- » Bright field and fluorescent microscopes (Nikon) for monitoring of morphology of living cells and detection of specific cell markers in situ,
- » Luminometer (Turner), spectrophotometer (Pharmacia) for measurement of luciferase activity, and optical density, respectively in liquid samples
- » Nucleofector (Amaxa) for efficient transfection of cells,
- » Nanophotometer (Implen) for determination of exact concentration of nucleic acids in liquids of low volume
- » Casy (Roche) for determination of cell number and viability

BUDGET ↘

TOTAL (MIL. CZK/ MIL. EUR)

5.5 / 0.22

PART OF THE TOTAL BUDGET FROM PRIVATE RESOURCES (%)

0

PART OF THE TOTAL BUDGET FROM FOREIGN RESOURCES (%)

0

ACHIEVEMENTS ↘

- » Contribution to understanding the role of specific proteins in the process of carcinogenesis published in a series of articles in international journals
- » Education of undergraduate and postgraduate students in the field of Molecular and Cellular Biology to become valuable members in renowned laboratories in the Czech Republic and abroad (Stanford University, State University of New York at Stony Brook, University of Vienna)

MAIN PROJECTS ↘

2009–2012: The role of c-Myb and Cox-2 proteins in colon carcinogenesis (GA301/09/1115, Czech Science Foundation)

2008–2011: Mechanism of procathepsin D effect on breast cancer cells (IAA501630801, Academy of Sciences of the Czech Republic)

2006–2008: A role of certain transcription factors in the osteoclastic differentiation pathway (GA301/06/0036, Czech Science Foundation)

MAIN COLLABORATING PARTNERS ↘

COLLABORATION WITH ACADEMIC PARTNERS

- » Stanford University (prof. Lipsik, Stanford, US)
- » ENS Lyon (prof. Pierre Jurdic, Lyon, FR)
- » Faculty of Medicine, Masaryk University (Brno, CZ)
- » Institute of Biophysics, Academy of Sciences of the Czech Republic (Brno, CZ)

EXPECTATIONS ↘

REQUIREMENTS

- » Testing of gene function in animal models (metastasis in vivo, knock-out mice)
- » Protein-protein interaction testing
- » Live cell imaging

OFFERS

- » Know-how in the field of gene targeting and cell manipulation,
- » Tests of proliferation, differentiation, apoptosis, cell migration and invasivity in vitro,
- » Cytotoxicity testing of various compounds in cancer cell lines,
- » DNA and RNA manipulation,
- » RNA and protein expression tests

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