Department of Medical Biology and Genetics

Department of Medical Biology and Genetics provides courses of basic subject Medical Biology in all study programs and in both Czech and English languages. In addition to teaching and educational activities, the main tasks of the Department include scientific research activities. These focus on basic and translational research in the field of cell, molecular biology and genetics, traditionally using in vitro/ex vivo models (cell cultures 2D and 3D formats) since the Department is one of the pioneers of these methods in the Czech Republic. In addition, recently, the mentioned methods have been expanded to include in vivo models (nude mouse) too. The main focus of research projects is based on traditionally studied topics related to mechanisms of stress responses of cellular systems to selected xenobiotics as well as micronutrients (zinc, selenium). The main current area of interest is the research of selected phenotypic properties of cancer cells (melanoma, glioblastoma, pancreatic cancer) related to the aggressive nature of these tumors, their spread and resistance. The research uses a full spectrum of methodological approaches including mainly advanced morphometric and cytometric approaches, including time-lapse studies performed on living cells, which are unique within the entire medical faculty in Hradec Kralove.

Main research topics

- Mechanisms of stress response to exposure to selected xenobiotics and micronutrients (study of specific signaling pathways and spectrum of cellular responses - death, senescence, autophagy).
  Prof. PharmDr. Emil Rudolf, Ph.D
- Study of STAT3 signaling as a mechanism of resistance as well as the target of intervention in tumor cells (glioblastoma, pancreatic cancer).).
  RNDr. Veronika Skarková, Ph.D. , Prof. PharmDr. Emil Rudolf, Ph.D.

Equipment

- morphological and cytometric laboratory - motorized fluorescence microscope Nikon Eclipse N1, advanced ImageXpress Micro XLS cytometer enabling analysis and long-term monitoring of morphological and molecular changes in the studied cell system
- cell culture laboratory enabling the derivation and cultivation of cell systems
  in vitro/ex vivo, in 2D and in 3D models, including a wide range of cellular and biochemical analyses (spectrofluorimeter TECAN, XCelligence RTCA DP)
- functional laboratory for genetic and molecular analysis via DNA, RNA or protein expression and intervention(PCR including quantitative - Light cycler Roche 96, Nanodrop, Azure C600 detection system

Scientific research groups

All academic staff of the department, including undergraduate and postgraduate students, are involved in the specified scientific research topics. At the same time, they also participate in and collaborate on projects and scientific tasks solved by other departments within the Faculty of Medicine in Hradec Králové, Hradec Králové University Hospital and other extramural domestic and foreign institutions.