Faculty of Biomedical Engineering CTU

Dean prof. MUDr. Jozef Rosina, Ph.D.
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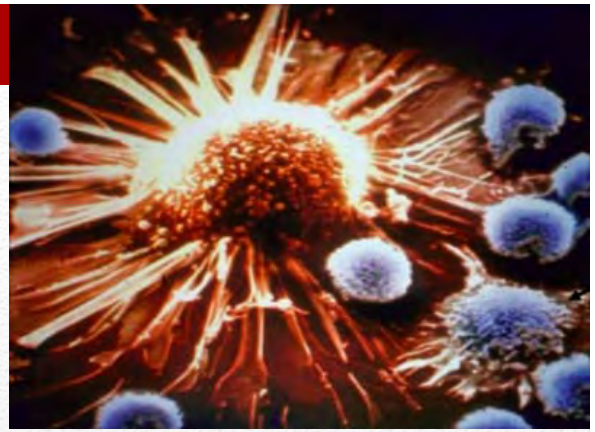
The Faculty offers an interdisciplinary education on BSc, MSc and PhD levels and educates new professionals and specialists in the most important fields of biomedical and clinical engineering. It also provides conditions for research and scientific work. The FBME cooperates with all other faculties of the Czech Technical University, with Academy of Science CR and several medical institutions in the Czech Republic. It comprises four teaching departments located at Kladno (Department of Biomedical Technology, Department of Biomedical Informatics, Department of Natural Science and Department of Health Care Disciplines and Population Protection



Newly established

Immunological laboratory

at the Department of Health Care Disciplines and Population Protection

Head: Anna Fišerová, M.D., PhD

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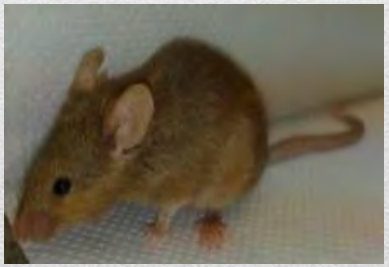
- The laboratory is situated in Prague in NIPH with the SPF animal facility and laboratory equipped for tissue cultures and immunological assays
- Closely collaborates with Radio-oncology clinics of Faculty hospitals, Proton therapy center in Prague, and SME (Apigenex)
- Core facilities: Irradiation of small animals, confocal microscopy, flow cytometry, cell sorting, molecular biology, analysis of gut microbial flora

Radiobiological experiment on mouse models with different radio-sensitivity

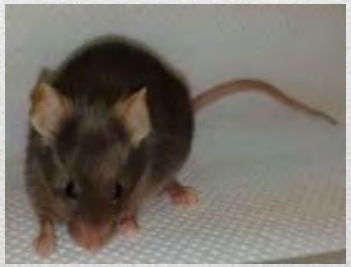
C57BL/6

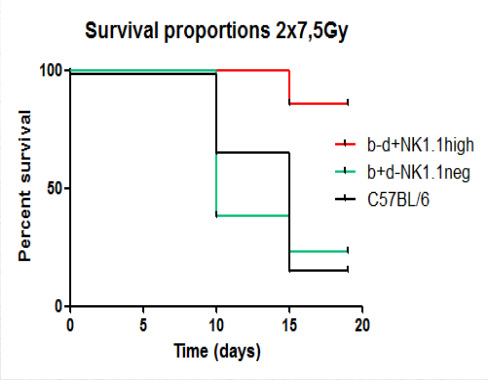
Balb/c

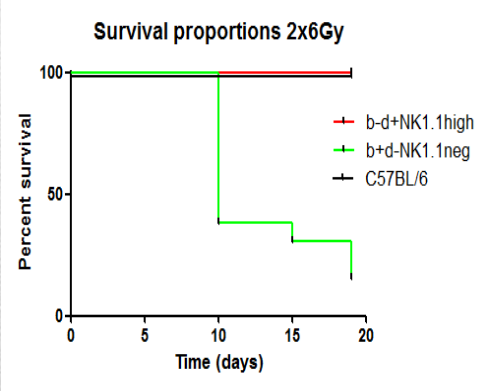
H2-Db+d-/NK1.1neg



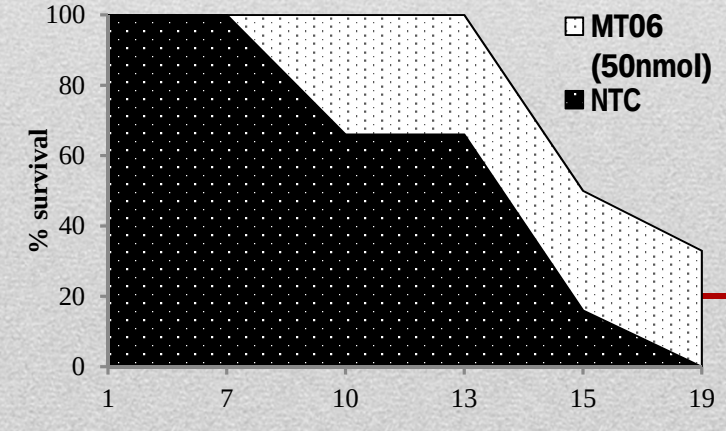
H2-Db-d+/NK1.1high







Radioprotectant applied to BL6 mice 24h before IR (2x7.5 Gy)



Methodological approaches

in vitro and *ex vivo* assays, *in vivo* experimental models and clinical specimens of pacients and healthy donors.

(i) Functional immunological assays: NK cell mediated cytotoxicity, intracelular cytokine synthesis, antibody formation, multicolor flow cytometry, cell purification;

(ii) Cell cycle analysis (proliferation - apoptosis), phenotype and morphology of immune, tumor, and neural cells by confocal microscopy, FACS

(iii) Biochemical methods (WB, ELISA, CBA), cell signaling pathways;

(iv) The proposed work will concentrate to monitoring of immune changes as one of the most sensitive parameter of RT toxicity in cancer patients undergoing radiotherapy (3DCRT, IMRT, brachytherapy, proton therapy) and diagnostic irradiation low dose exposure.

(v) Experimental animal models

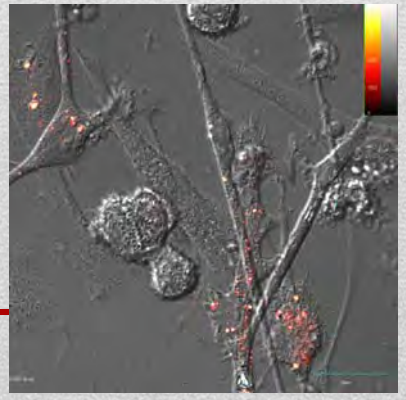
Research topic

- Analysis of pacients immune status prior, during and after therapy suffering by:
  - cancer (e.g. prostate, colorectal Ca)
  - autoimmune diseases (MS, RA)

- Immunological research on animal models of
  - cancer (transplanted or chemically induced) and their therapy (RT, CT, HT, IT)
  - autoimmunity (EAE, CIA)
- immunoadjuvants with radioprotective feature inducing post-irradiation recovery of hematopoietic functions in mice
  - nor-muramyl-lipo-glycopeptides
  - Threhalose dimycolate derivatives

- Immune response to nanoparticles

- Neuroimmunological research



Research team

Anna Fiserova, M.D., PhD – Head of Immunological Laboratory at the Department of Health Care Disciplines and Population Protection, Specialization- immune response to cancer, stress, and therapeutic intervention (radio- chemo- and immunotherapy), animal experimental models

prof. Jozef Rosina, M.D., PhD - Dean of CTU FBME, Specialization- clinical and experimental biophysics, nuclear medicine, biomedical engineering, radiobiology

prof. Leos Navratil, M.D., PhD. – Specialization-: diagnosing and treating the effects of radiation sickness, the role of radiobiology in disaster medicine, mechanisms of effects and protection of the population against ionizing radiation damage in medicine and industry

Zdenek Hon, MSc, PhD. –. Specialization- densely ionizing radiation, biodosimetry, evaluation of radiation risk, included in database of specialists of nuclear, biological chemical defence

Stanislav Bradka, M.D., PhD. – Director of National Institute for Nuclear, Chemical and Biological Protection of the Czech Republic. Specialization- specialist for CBRNE their identification, decontamination, and human defence

Ing. David Chvátil – Head of Microtron Laboratory INP ASCR. Specialization- specialist for irradiation on microtron MT-25

Dr. Ivana Krausová, PhD – INP ASCR, Specialization -PAA analysis of elements in biological samples

Ing Marie Davídková PhD-Dept. Dosimetry and Application of Ionizing Radiation , FNSPE CTU

Thank you for your attention

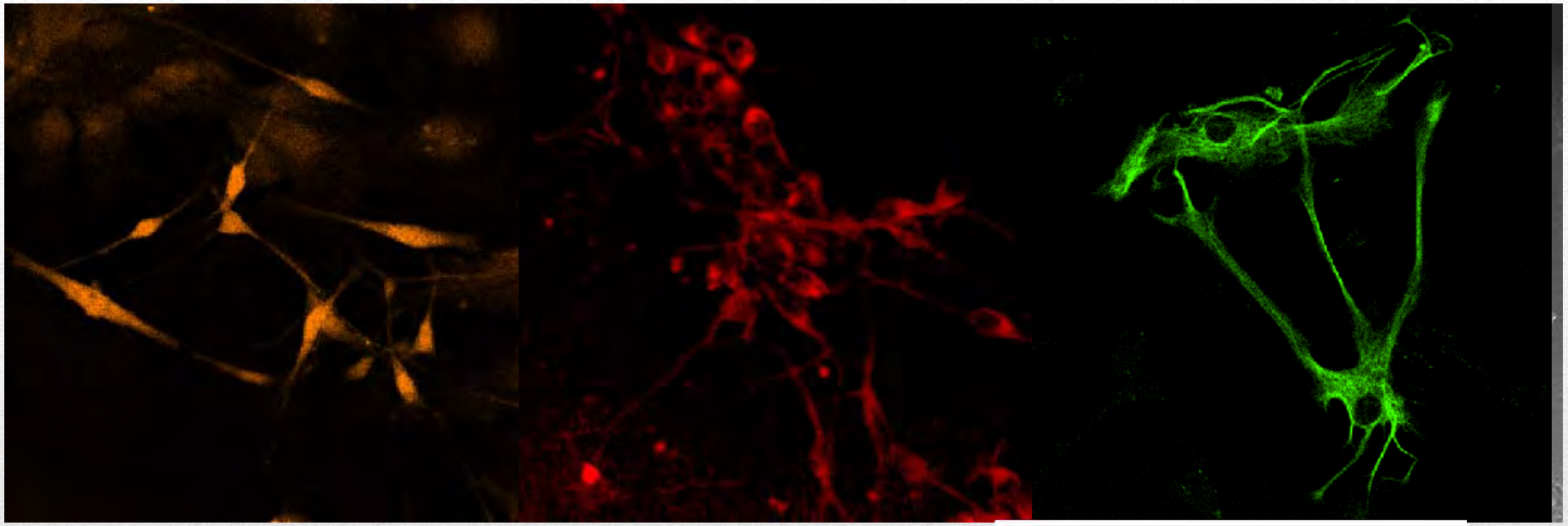
LTP of SÚRO

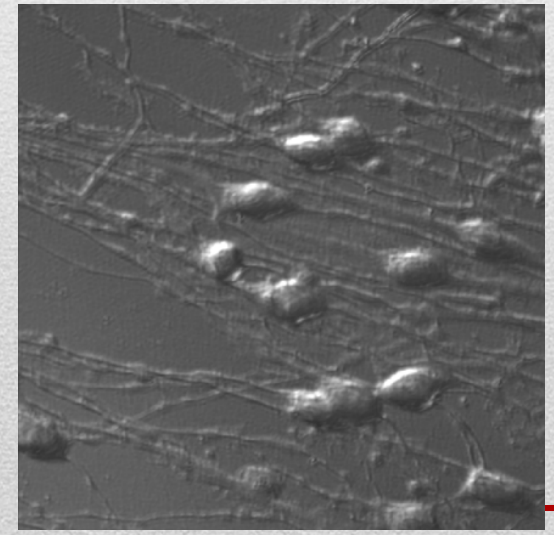
Státní ústav radiační ochrany, v. v. i.
National Radiation Protection Institute

Basic and applied research projects:

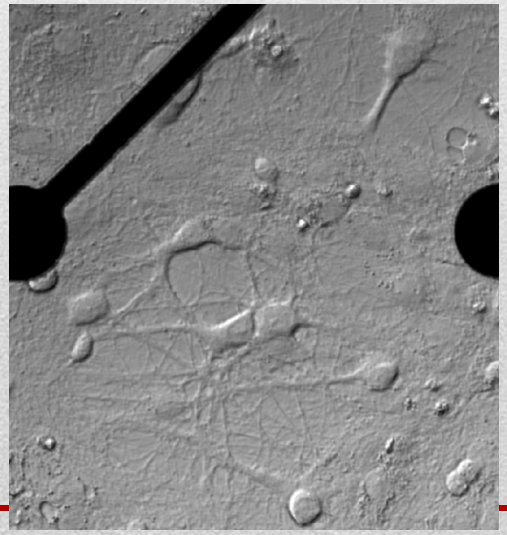
1. GA14-10100S Utilization of novel mouse strains for investigation of the NK cell regulatory role in development and therapy of cancer
2. GA310/06/0477 NK and NKT cells in the development and pathogenesis of RA
3. IGA MZČR NR/9106 NK and NKT cells in the pathogenesis of primary idiopathic PM/DM
4. GAUK109908/2008 Effects of radiotherapy for prostate cancer on bladder, rectum, and the immune system depending on the radiation dose
5. DINAMO FP7 KBBE 245122 Development of diamond intracellular nanoprobes for oncogen transformation dynamics monitoring in living cells
6. NANOINTEGRATION CZ.1.07/2.3.00/20.0306 Integration of the team for research and development of new principles of nanotechnology in biomedicine for education and medical practice
7. EE2.4.31.0224 Population protection and crisis management and emergencies
8. TA02010760 Development of new generation of antitumor immunotherapeutics
9. 2A-1TP1/055 Development of PET-radiodiagnostics for imaging in oncology and neurology
10. FT-TA5/136 System for finding biologically active substances. Focused combinatorial libraries
11. FT-TA2/054 Discovery libraries of chemical compounds
12. GA205/09/0171 Exposure to cosmic radiation in the vicinity of earth: Effect of space weather and the implications for radiation protection
13. GBP108/12/G108 Preparation, modification and characterization of materials by radiation
14. GA205/09/0171 Optimization of radiation protection of Aircrew

Oligodendrocytes **Neurons** **Astrocytes**

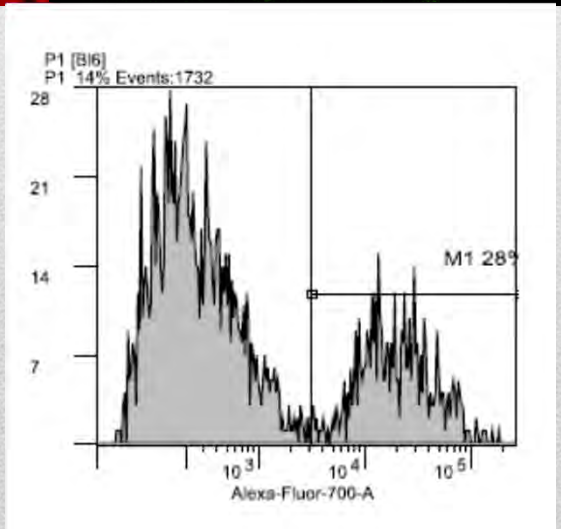




Neurons



Neurons on MEA chambers



CD11b+ microglia in 16 day culture from the brain of newborn (P0-1) mice