The Molecular Mechanisms of Radiation Carcinogenesis

2-week training course
13.04.2015 – 24.04.2015, Helmholtz-Center Munich / Germany

General information:
DoReMi (www.doremi-noe.net) is a Euratom-funded Network-of-Excellence to promote and integrate European research on the risks of exposure to low doses of ionising radiation. In addition, DoReMi facilitates and promotes training and education in support of the research programme within the project. These widely available training opportunities are intended to attract top-level students into the field radiation life-science studies. As part of this initiative, a 2-week training course on “Molecular Mechanisms of Radiation Carcinogenesis” is organised by the Helmholtz-Center Munich and the Technical University Munich. It is open to postgraduate students and to scientists studying biological or medical aspects of ionizing irradiation in laboratories in the European Union.

Scope of the course:
Advanced training by lectures and laboratory practica will provide insight in the molecular processes that are involved in the development of spontaneous and radiation-induced cancer. Due to the importance of secondary, therapy-associated tumors as a side-effect of radiotherapy, basics of radio-oncology practice are also covered.

Our course will place special emphasis on cancers of tissues where there is strong evidence for radiation-induced cancers (e.g. the lymphopoietic system, thyroid, bone, breast). The course will consist of 4 teaching and 1 laboratory units dealing with:

- Basics of cancer, genetic factors and molecular pathways
- Key steps in the malignant transformation of cells
- Experimental models to study radiation carcinogenesis (model organisms, cells)
- Radiation-induced cancers
- Molecular techniques for analysis of radiation-induced changes in the transcriptome, epigenome and proteome.

The course will be completed by a field trip to the radiation oncology facilities of the Technical University medical school.
Preliminary Program of the Course

Unit 1: Basics of cancer (8 hours)
Lecture 1  Histopathology of cancer
Lecture 2  Introduction to history of cancer research, cancer terminology, processes
Lecture 3  Disruption of regulatory pathways in cancer formation
Lecture 4  Apoptosis, DNA repair and cell cycle regulation
Lecture 5  Angiogenesis, metastasis, senescence

Unit 2: Research tools (8 hours)
Lecture 6  Biological models of multistage carcinogenesis
Lecture 7  Mechanisms of individual sensitivity
Lecture 8  Animal models in radiation research
Lecture 9  Modern technologies in cancer research (proteomics, microarrays)
Lecture 10  Deep sequencing and the individual cancer genome

Unit 3: Key issue lectures and tutorials (12 hours)
Symposium:  Radiation Bio-Markers
Tutorial 1  The key questions identified by MELODI / HLEG
Tutorial 2  Cancer stem cells and radiation effects
Tutorial 3  Epigenetics and radiation

Unit 4: Radiation-induced cancers (6 hours)
Lecture 11  Radiation induced thyroid and breast cancer
Lecture 12  Radiation induced lymphoma/leukaemia
Lecture 13  Radiation induced osteosarcoma
Lecture 14  Second cancer after radiotherapy

Unit 5: Laboratory and field trip (16 hours)
Lab 1 will be the use of high throughput screening for mRNA and micro RNA quantification using real time PCR (TaqMan and SybrGreen) in mammalian cells following irradiation.
Lab 2 will use immunohistochemical techniques (immunofluorescence and Western Blotting) to detect radiation-induced alterations in protein expression and epigenetic marks.
Lab 3 will learn basic techniques in anatomical and histological diagnosing laboratory mice.
A field trip to the radiation therapy, radiology and nuclear medicine facilities at Klinikum rechts der Isar (Technical University Munich) will be arranged during the course to illustrate benefits and risks of radiation exposure.

Evening seminar topics
Seminar 1  Genetic risk estimation after radiation exposure
Seminar 2  Radiation exposure and long-term health consequences from radiation accidents: comparison of the Chernobyl accident and the Fukushima disaster
Organisation of the course:

The course is organised by the Helmholtz-Centre Munich (Dr. Michael Rosemann) in collaboration with the Radio-Oncology Department of the Technical University Munich.

Course Faculty:

- M.J. Atkinson (Munich)
- R. Boteva (Sofia)
- K.R. Trott (London/Pavia)
- I. Gonzalez-Vasconcellos (La Coruna)
- R. Coppes (Groningen)
- I. Hoefig (Munich)
- C. Mothersill (Hamilton, Ontario)
- L. Manti (Naples)
- A. Ivashkevich (Melbourne)
- Z. Barjaktarovic (Munich)
- U. Kulka (Munich)
- S. Moertl (Munich)
- R. Rad (Munich)
- N. Anastasov (Munich)
- G. Keller (Munich)
- M. Eidemueller (Munich)
- A. Saran (Rom)
- K. Unger (Munich)
- N. Pellegata (Munich)
- O. Azimzadeh (Munich)
- J. Wilkins (Munich)
- R. Kappler (Munich)
- G. Multhoff (Munich)
- W. Mueller (Essen)
- T. Schmid (Munich)
- M. Rosemann (Munich)
- H. Zitzelsberger (Munich)

The course is open to any postgraduate student or scientist working in an EU academic Institution. Participants from DoReMi member institution will get free accommodation in a shared 2 bed rooms (for single-bed rooms an extra 20 € will be charged). Public transport and travel fees to the site visits will be covered. There is no course fee. A certificate of attendance will be issued to each participant at the end of the course.

People wishing to apply should send an e-mail to rosemann@helmholtz-muenchen.de including:

1. A letter of application
2. A CV with a short description of the scientific career
3. A supporting letter from the supervisor/head of laboratory (only for PhD students)

The deadline for applications is February 28th 2015. Information confirming the acceptance as course participant will be sent by March 13th 2015.

Updated information on the course is available at http://www.helmholtz-muenchen.de/isb/forschung/plattformen/doremi-training/training/index.html

Please note, that due to limitations at laboratory space there is a maximum number of 12 participants.