



Bundesamt für Strahlenschutz



Two-week course on

## **INTERDISCIPLINARY RADIATION RESEARCH FOCUSSING ON LOW DOSES**

**16. – 27. April 2012**

**German Federal Office for Radiation Protection (BfS)**

**Munich, Germany**

### **General information:**

DoReMi ([www.doremi-noe.net](http://www.doremi-noe.net)) is a Euratom-funded Network of Excellence set up to promote and integrate European research into 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, and also makes more widely available training opportunities in order to help attract top-level students into the field.

As part of this initiative, a short course of two weeks duration on **"Interdisciplinary Radiation Research Focussing on Low Doses"** is organised by the Federal Office for Radiation Protection (BfS) in Germany. It is open to postgraduate students and to scientists working in the European Union, who are interested in radiation research.

The course will introduce students and researchers, also with non-radiation background, to various disciplines contributing to radiation research. Insights to physical, chemical, biological and epidemiological fundamentals in radiation research will be provided. These basic principles will be completed by introducing interdisciplinary approaches like molecular epidemiology, biobanking and experiments integrating molecular biology and micro- and nanophysics. In addition to the theoretical lectures practical assays to prove radiation effects will be performed. This laboratory part will focus on some well established biological assays to prove cellular damage and its repair after in vitro irradiation. The participants will have the opportunity to accomplish the gamma H2AX assay, comet assay and various cytogenetic assays (chromosome aberrations, micronuclei, FISH analysis, multicolour FISH). Additionally, radioactive decay will be traced in the environment, in food products and in the human body with various physical approaches. In completion to this basic introduction to radiation research disciplines, the need for research in the low dose area will be illustrated. Therefore, a general review of current medical, occupational and environmental radiation exposure situations will be provided and national and international approaches in the field of radiation protection will be introduced.

The course will help to understand and connect fundamental radiation reactions, within different research disciplines like physics, biology and epidemiology. It will help to sensitize

for the feasibility, potential and limitations of experimental assays and the need for implementation of multidisciplinary research approaches in the low dose area. The lectures and laboratory sessions will be directed to students and scientists with different backgrounds, showing an interest in radiation research.

### **Information for applicants:**

The course is open to any postgraduate student or scientist working in an EU academic Institution. There is no course fee and limited financial support can be provided in terms of accommodation-allowance. BfS will help to organise lodging possibilities in or near Munich. A certificate of attendance will be issued to each participant at the end of the course.

People wishing to apply should submit the following documents by e-mail to the BfS address [ukulka@bfs.de](mailto:ukulka@bfs.de) with a copy to [VorzimmerSG1@bfs.de](mailto:VorzimmerSG1@bfs.de) and [doremi.training@pv.infn.it](mailto:doremi.training@pv.infn.it):

1. A letter of application
2. A CV with a 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 24<sup>th</sup> 2012. Information confirming the acceptance as course participant will be sent by March 09<sup>th</sup> 2011.

For any scientific or organisation questions related to the course, please contact:

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### **Course description**

Course director is Prof. Wolfgang Weiss, Head of Department "Radiation and Health". All lessons will be given by experienced scientists from the BfS and by guest lecturers from the PTB (Physical Technical Federal Office, Department "Fundamentals of Dosimetry");

Course programm: "Interdisciplinary Radiation Research Focussing on Low Doses"

Day	General Topic	Content	[h]
16. April	<b>Introduction to Radiation Research</b>	Introduction to BfS. Radiation sources (natural and man-made radiation); Outline of different research disciplines;	2
	<b>Radiation Physics I</b>	Physical basics of radioactivity and ionizing radiation: instability and decay of the atomic nuclei, origin of radionuclides, nature & characteristics of different types of radiation, interaction with matter;	2
	<b>Radiation Biology I</b>	Radiation effects in biological systems: damage on the molecular and cellular level;	2
	<b>Tutorial</b>	Questionnaire to deepen the days topics	1
	<i>Informal "Get Together"</i>		
17. April	<b>Radiation Physics II</b>	Physical characteristics of different types of ionizing radiation, different dose concepts (absorbed dose, equivalent dose, effective dose). Basic principles of dose calculation for different exposure situations (external and internal exposure).	2
	<b>Radiation Biology II</b>	Radiation induced damage on tissue- to population-level; Different type of radiation damage: stochastic / tissue effects, targeted and non targeted effects, non-cancer effects;	2
	<b>Parallel laboratory session: Radiation Physics</b>	<u>Group 1:</u> Tracing radioactivity in food products (gamma-emitting radionuclides; measurement geometry: Beaker geometry; type of detectors: High-purity germanium (HPGe) detector, NaI scintillation) <u>Group 2:</u> Tracing radioactivity in the environment (alpha-, beta-, gamma-radiation) <u>Group 3:</u> Tracing radioactivity in the human body (whole body counter, lung measurement)	2
	<b>Tutorial</b>	Questionnaire to deepen the days topics	1
18. April	<b>Radiation Physics III</b>	Microdosimetry: Introduction to the concepts of microdosimeters and the basics of microdosimetric tissue equivalent detectors	2
	<b>Radiation Epidemiology I</b>	Study design, measures of occurrence, of exposure and disease, measures of risk	2
	<b>Parallel laboratory session: Radiation Physics</b>	<u>Group 2:</u> Tracing radioactivity in food products <u>Group 3:</u> Tracing radioactivity in the environment <u>Group 1:</u> Tracing radioactivity in the human body	2
	<b>Tutorial</b>	Questionnaire to deepen the days topics	1

<b>19. April</b>	<b>Radiation Physics IV</b>	Nanodosimetry: Nanodosimetric concepts for the characterisation of track structures, Monte Carlo simulations and detection principles	<b>2</b>
	<b>Radiation Epidemiology II</b>	Confounding, Selection Bias, Information Bias, Chance, Causality	<b>2</b>
	<b>Parallel laboratory session: Radiation Physics</b>	<u>Group 3:</u> Tracing radioactivity in food products <u>Group 1:</u> Tracing radioactivity in the environment <u>Group 2:</u> Tracing radioactivity in the human body	<b>2</b>
	<b>Tutorial</b>	Questionnaire to deepen the days topics	<b>1</b>
<b>20. April</b>	<b>Radiation Epidemiology III</b>	Paper discussion: Selected radiation epidemiological study	<b>2</b>
	<b>Radiation Epidemiology IV</b>	Radiation and cancer site specific risk: Overview on cancer site specific radiation risks as known from epidemiological studies.	<b>2</b>
	<b>Molecular Epidemiology</b>	Link between epidemiological studies and biological radiation research including -omics methods and biobanks;	<b>2</b>
	<b>Tutorial</b>	Questionnaire to deepen the days topics	<b>1</b>
<b>21. April (Saturday) at own disposal</b>			
<b>22. April (Sunday)</b>			
<b>Excursion</b> <b>(destination to be decided)</b>			
<b>23. April</b>	<b>Methods in Radiation Biology:</b>	Introduction to cell survival assays and Comet assay; Introduction to laboratory safety;	<b>2</b>
	<b>Laboratory session: Methods in Radiation Biology</b>	<u>Group 1:</u> Gamma H2AX assay and Comet assay ( <i>day 1</i> ) <u>Group 2:</u> Cytogenetic methods ( <i>day 1</i> ): dicentric chromosome assay, FISH-translocation assay, micronucleus assay	<b>5</b>
<b>24. April</b>	<b>Applied Radiation Research</b>	The need for low dose radiation research due to existing uncertainties; association and influence on radiation protection (medical, occupational and environmental exposure to ionising radiation)	<b>2</b>
	<b>Parallel laboratory session: Methods in Radiation Biology</b>	<u>Group 1:</u> Gamma H2AX assay and Comet assay ( <i>day 2</i> ) <u>Group 2:</u> Cytogenetic methods ( <i>day 2</i> ): dicentric chromosome assay, FISH-translocation assay, micronucleus assay	<b>5</b>

25. April	Practical demonstration	<u>Group 1:</u> m-FISH analysis <u>Group 2:</u> Proteomics	2
	Parallel laboratory session:  <b>Methods in Radiation Biology</b>	<u>Group 1:</u> Cytogenetic methods ( <i>day 1</i> ): dicentric chromosome assay, FISH-translocation assay micronucleus assay  <u>Group 2:</u> Gamma H2AX assay and Comet assay ( <i>day 1</i> )	5
26. April	Practical demonstration	<u>Group 1:</u> Proteomics <u>Group 2:</u> m-FISH analysis	2
	Parallel laboratory session:  <b>Methods in Radiation Biology</b>	<u>Group 1:</u> Cytogenetic methods ( <i>day 1</i> ): dicentric chromosome assay, FISH-translocation assay micronucleus assay  <u>Group 2:</u> Gamma H2AX assay and Comet assay ( <i>day 1</i> )	5
27. April	Laboratory session	Finalising the biological assays	3
	Practical demonstration: Accident preparedness	Surveillance of radioactivity in the environment	1
	Tutorial, test and conclusion		3
<b>TOTAL (per student)</b>			<b>70 h</b>