



Relation between key questions and education and training

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9 key questions from TRA 1st version 2010

1. What is the dependence on energy deposition?
2. What is the dependence on dose rate?
3. What are the tissue sensitivities?
4. What is the modification of risk by genetic and epigenetic factors and gender?
5. What is the effect of age on risk?
6. What is the effect of lifestyle and/or other exposures on risk?
7. What is the effect of physiological state?
8. Is there a hereditary component in risk?
9. What is the role of non-targeted effects in health risk?



Short course topics

- DoReMi workshop on data interpretation and uncertainty analysis for the combined low dose radiation research disciplines. 1-5 September 2014. PHE, UK
- Overview of uncertainty analysis for low dose research in the following topics, with a specific focus on low doses: epidemiology; radiation biology; biological dosimetry; basic stats; modelling (including internal dosimetry); non-cancer effects: cardiology; cataracts; non-targeted effects.
- Modelling radiation effects from initial physical events, UNIPV, Pavia, Italy.
- The course will introduce students to mechanisms and theoretical modelling approaches relative to the physical, chemical and biological effects of radiation at sub-cellular, cellular, and organism level.
- Radiation epidemiology and dosimetry, HMGU, Neuherberg, Germany.
- Elucidation of the health effects of low, moderate and high radiation doses by epidemiological methods in suitable cohorts. Particular emphasis will be given to the methods and uncertainties of dose reconstruction from external and internal radiation exposure, the strength and weakness of different study designs, the analysis of competing risk factors and of individual susceptibility including molecular epidemiology methods.



- SysRadBio101: An introduction to systems biology for radiation protection, HMGU, Neuherberg, Germany.
- The first phase will be introductory lectures from invited experts in the field, who will show how systems approaches benefit other fields. The second phase will look at the available methodology and study design, whilst the final phase will focus on the relevance for the topics of the three DoReMi RTD Work Packages.
- Molecular Consequences of low dose and low dose-rate exposures: impact of individual susceptibility on outcome and biomarker development. IC/CEA, Paris, France
- Review the molecular consequences of low dose and low dose-rate exposures to ionizing radiation from the generation of oxidative stress and damage at the macromolecular level to more long-term consequences such as mutation induction and genetic instability taking into account the over-arching theme of individual susceptibility at each stage through lectures and practical sessions.
- Molecular radiation carcinogenesis. HMGU, Neuherberg, Germany.
- Basics of cancer (multistep genetic alterations)
- Research tools (gene mapping, mutational mechanisms, analysis of genetic, epigenetic and proteome changes, cellular pathway analysis and system radiation biology)
- Radiation-induced neoplasia - from DNA damage to malignant disease
- Cellular processes relevant during carcinogenesis (cell cycle regulation, differentiation, apoptosis, DNA repair)
- Risk for secondary cancers in patients following radiotherapy
- Genetic factors in radiation carcinogenesis – Their role in individual risk prediction
- Molecular techniques for analysis of radiation-induced changes in the transcriptome, epigenome and proteome.



- Radiation-induced effects with particular emphasis on genetics, development, teratology, cognition as well as space-related health issues. SCK-CEN, Mol, Belgium.
 - The course will be mainly devoted to the study of the developmental and genetic effects of radiation as well as of space health effects. Developmental effects may include embryonic death, growth retardation and induction of malformations, mental retardation and cognitive effects, depending on the dose and developmental stage at which irradiation occurred. Additionally, irradiation during pregnancy might be responsible for childhood cancer. Irradiation of the germ cells may lead to genetic diseases in the progeny, which may be related to the particular sensitivity of the different germ cell stages and the genetic background of irradiated individuals.
- Cellular effects of low doses and low dose-rates with focus on DNA damage and stress response. SU, Stockholm, Sweden.
 - The aim of the course is to acquaint students with the state of the art of cellular effects of low doses and low dose-rates and methods used to detect such phenomena as adaptive response and bystander effect.
- Interdisciplinary radiation research focussing on radiation protection. BfS, Neuherberg, Germany.
 - The course will introduce students and scientists, also with non-radiation background to various disciplines contributing to radiation research. New emerging disciplines like molecular epidemiology (incl. biobanking) bridging biology and epidemiology or approaches integrating molecular biology with micro- and nano-physics will be introduced.



- TIETO Non-cancer effects of low dose radiation. HMGU, Neuherburg Germany
 - Cardiovascular and cerebrovascular diseases; neurocognitive and neurodegenerative disorders; eye disease (cataract, retinopathy); immunological disorders; developmental and endocrine disorders
- Assessing Risk to Man and Environment: Environmental Radiobiology (5 ECTS accredited course) UMB, Oslo, Norway
 - An overview of the fundamental principles of radiobiology, but within the context of effects on non-human biota. As such, the course will cover both the history and the state-of-the-art of our knowledge on the biological effects of radiation on humans, but concentrate specifically on those issues and applications of most relevance for other organisms.



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Modelling radiation effects from initial physical events, UNIPV, Pavia, Italy.

2. What is the dependence on dose rate?

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Molecular Consequences of low dose and low dose-rate exposures: impact of individual susceptibility on outcome and biomarker development. IC/CEA, Paris, France



3. What are the tissue sensitivities?

- Radiation-induced effects with particular emphasis on genetics, development, teratology, cognition as well as space-related health issues. SCK-CEN, Mol, Belgium.
- TIETO Non-cancer effects of low dose radiation. HMGU, Neuherburg Germany

4. What is the modification of risk by genetic and epigenetic factors and gender?

- Radiation-induced effects with particular emphasis on genetics, development, teratology, cognition as well as space-related health issues. SCK-CEN, Mol, Belgium.
- Molecular radiation carcinogenesis. HMGU, Neuherberg, Germany.
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Questions derived from TRA versions 1 and 2: WP3 (Education & Training)

Paraphrased:

Can we provide a sustainable structure to manage and support E&T for low-dose research?

(Yes – through the MELODI E&T WG and CONCERT)

How can we integrate existing expertise?

(Through CONCERT)

How can we get feedback to ensure we are promoting the right E&T?

(Through the annual E&T Forum)



For discussion:

What is the role of E&T in DoReMi - MELODI?

- E&T of the next generation of researchers
- Dissemination of new work to the research community
- Development of new areas of expertise, technologies, disciplines (omics, bioinformatics, . . .)
- Development of awareness and use of infrastructures



What is the message for E&T from the TRA?

- New topics?
- New event format?
- More top-down organisation rather than calls to partners for proposals?
- New initiatives?



Thank you