
“Policy implications and research needs on Internal Emitters”



**A European Research and Training (R&T) platform
SRA and roadmap**

Pedro Vaz

@ Round table discussion

Group of Experts under Article 31 of the EURATOM Treaty

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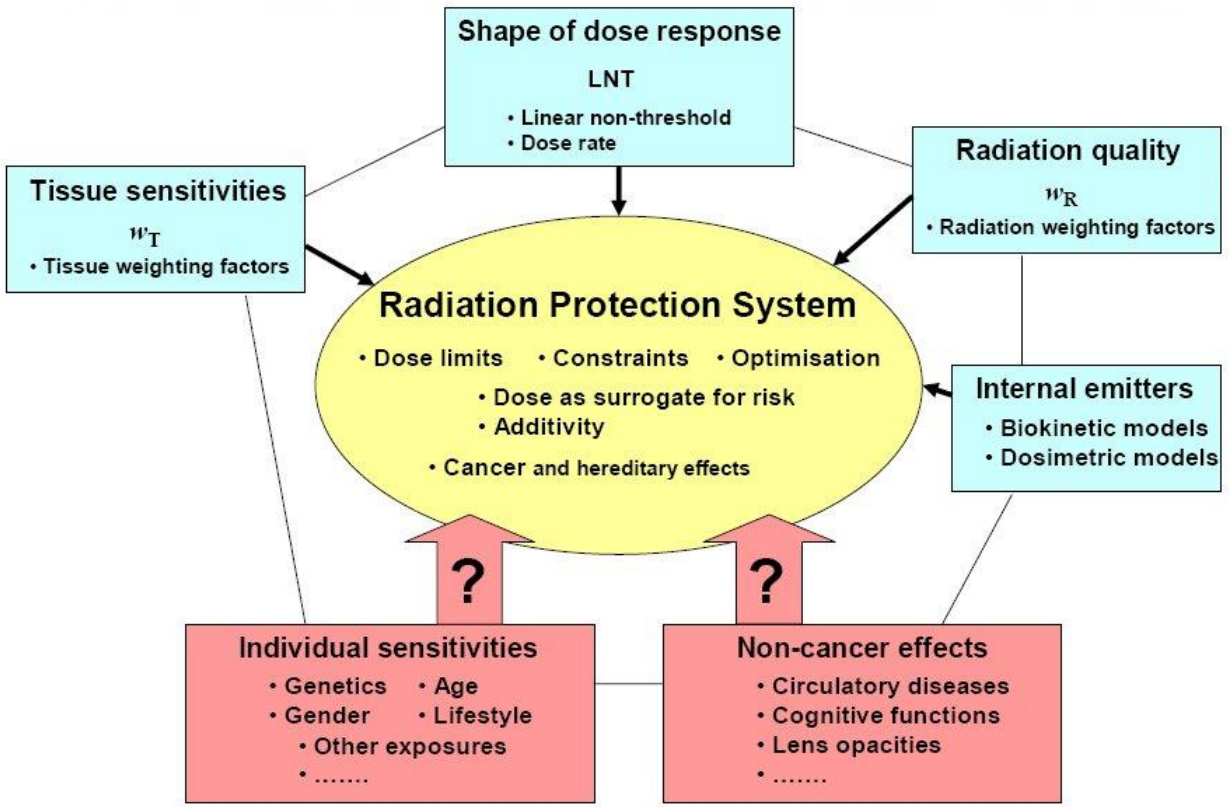
Key policy issues for ionising radiation risk management in an European context

- How robust is the current system of radiation protection and risk assessment, considering its uncertainties?
- How can it be improved for delivering intended levels of protection of the population from occupational, environmental and medical exposures to ionising radiation?
- Some critical topics to be addressed are related to:
 - Risk (risk perception, risk assessment, risk communication)
 - Societal concerns
 - Public health concerns
 - Economic impact of radiation protection “regulations”
 - Uncertainties
 - Etc.

HLEG report (2008)

Over-arching policy question:

How robust is the system of radiation protection and risk assessment?



“Radiation protection standards rely on current knowledge of the risks from radiation exposure. **Any over-, or under-, estimation of these risks could lead either to unnecessary restriction or to a lower level of health protection than intended.**”

Multidisciplinary European Low Dose Initiative

- 2008: The High Level Group (HLEG) report:
 - A vision document on integrative European Low Dose Risk Research for the next few decades, identifying three main types of activities:

- Epidemiological
- Experimental
- Modelling (mathematical + computational)



Launch of
MELODI

- 28/29 September 2009: First MELODI workshop in Stuttgart
- 2009-2010: MELODI Platform (governance, structure)

Involvement
of
stakeholders

- 2010: Launch of DoReMi, EU Network of Excellence on Low Dose Research towards Multidisciplinary Integration

Launch R&D
activities

- October 2010: Foundation of MELODI as a legal entity, with the goal of promoting R&D in the field of low dose effects of ionising radiation
- 18 / 20 October 2010: Second MELODI Workshop in Paris
- 18 November 2010: MELODI statement on a ***“Short- to medium-term research agenda for R&T projects to improve the scientific basis for radiation protection in Europe”***
([http://www.melodi-online.eu/MELODI Statement 2010 11 18.pdf](http://www.melodi-online.eu/MELODI%20Statement%202010%2011%2018.pdf))
- Throughout 2010: Definition of a Strategic Research Agenda (SRA) and roadmap

Involvement
of
stakeholders

Identify and
prioritize
research
needs
topics

Assess
sustainability
and needs of
infrastructures
data- and bio-
banks, etc.

Assess
Education &
Training
needs



- **MELODI Mission**
 - To impulse low dose risk research in Europe through an open and integrative approach through a SRA
 - To create a forum for dialogue with EU institutions and stakeholders
 - To interface with international partners (WHO, IAEA, USA, Japan,...)
- **Strategic Research Agenda (SRA) – Overall aims**
 - Consolidation of the European radiation protection framework in the area of low dose exposure to ionizing radiation
 - Development of a Multidisciplinary European Low Dose Initiative (**the MELODI platform**) , to ensure long term commitment (>20 y) to low dose research in Europe

Uncertainties



- **Uncertainties** still exist and continue to need attention:
 - the shapes of dose response curves for different types of cancers and non-cancer diseases
 - biological effectiveness of different types of radiation
 - sensitivity of different cell types and tissues
 - sensitivity to *in utero irradiation*
 - variations in radiosensitivity between children and adults
 - variations between gender
 - individual radiation sensitivity and predisposition to cancers and certain non-cancer diseases
 - non-targeted effects of radiation
 - radiation quality effects
 - fractionated exposures
 - effects of radionuclides and internal contamination
 - mixed radiation exposures
 - radiation versus, or combined with, chemical toxicity (interactions of radiation with chemical agents)

- Ionising radiation issues

- Types (α , β , γ , protons, neutrons, X-rays, heavy ions)
- Energy distribution and deposition
- Radiation track structure and microdosimetry
- Dose and dose rate
- Dose fractionation
- External exposure
- Internal contamination

MELODI SRA

Key scientific issues



- *The SRA focuses on the three issues identified by HLEG:*
 1. shape of dose-response curve for cancer
 2. individual radiation sensitivity
 3. non-cancer effects

together with the three overarching issues

1. radiation quality
 2. tissue sensitivity
 3. internal emitters
- Key questions:
 - *How robust is the current system of radiation protection and risk assessment?*
 - *How can it be improved?*
 - *What are the areas of greatest uncertainty in radiation research?*
 - *What are the areas of greatest uncertainty in radiation protection?*
 - *Prioritise the underlying scientific questions*

SRA and roadmap

The way forward



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- Prioritize research topics
 - Input from non radiobiological research disciplines such as **toxicology, immunology, inflammatory research, physiology, pathology, genetics, epigenetics, cardiology, neurology, ophthalmology, etc...**
 - Develop multidisciplinary approaches involving **cardiology, neurology, toxicology, dosimetry, radioecology, embryology, bioinformatics** and **biomathematics, pharmacokinetics...**
 - Identification of suitable biomarkers for defined radiation exposures (internal or external)
 - Epidemiological studies: cohorts such as **children exposed to CT scans**, occupationally exposed individuals such as **interventional cardiologists, flight crews, radiation therapy patients** with significant out-of-field exposures (conformational radiotherapy) should be considered and, of course, studied not only for cancer incidence but also the non-cancer conditions of concern.
 - Sustainability and pooling of infrastructures (data and tissue banks, irradiation facilities...)
 - Education and training

MELODI statement

http://www.melodi-online.eu/MELODI_Statement_2010_11_18.pdf

Short- to medium-term research agenda for R&T projects to improve the scientific basis for radiation protection in Europe

MELODI is currently in the process of structuring all these priorities within a Strategic Research Agenda (SRA). In view of the most recent developments, MELODI recommends that short- to medium-term priorities (funding period 2011/2012) should be given to:

- Quantification of the role of ionising radiation in cardio-vascular and cerebro-vascular disease development after low dose (< 500 mSv) irradiation.
- Development of suitable biomarkers for exposure (immediate post radiation as well as long term after exposure), for cellular and tissue effects and for radiation associated leukaemia, solid cancers and non-cancer diseases. The biomarkers should be usable for molecular epidemiological studies of cancer risk below a cumulative dose of 100 mSv and for non-cancer risk studies below 500 mSv, respectively.
- Clarification of the role of effects in target cells and in the tissue environment in a dose range with clear focus on low doses. This includes the development of suitable tissue, organ and animal models for the identification of target cells and the interaction between target cells and tissue environment as well as the utilisation of stem cell approaches.
- Identification and analysis of suitable epidemiological cohorts if available with archived biomaterial to improve low dose radiation risk assessment by reducing uncertainties especially for the age- and gender-dependency of radiation risk and including those uncertainties contributed by exposure assessment. These may include cohorts exposed to internal contaminations.



- “Association” MELODI – legal entity established last October according to the French Law, gathering the following (15) institutions:
 - **Federal Office for Radiation Protection (BfS), Germany**
 - **French Atomic Energy Commission (CEA), France**
 - **Radiation and Nuclear Safety Authority (STUK), Finland**
 - **French Institute for Radiological Protection and Nuclear Safety (IRSN), France**
 - **Health Protection Agency (HPA), United Kingdom**
 - **Istituto Superiore di Sanità (ISS), Italy**
 - **Belgian Nuclear Research Centre (SCK.CEN), Belgium**
 - **Stockholm University - Centre for Radiation Protection Research, Sweden**
 - **Instituto Tecnológico e Nuclear (ITN), Portugal**
 - **The National Institute for Nuclear, Chemical and Biological Protection, Czech Republic**
 - **Research Center for Environmental Health (HMGU), Germany**
 - **National Institute for Public Health and the Environment (RIVM), Netherlands**
 - **Universidad Rovira I Virgili (TEXNIO), Spain**
 - **Kompetenzverbund Strahlenforschung (KVVSF), Germany**
 - **Universidad Autónoma de Madrid, Spain**