MELODI

A European Research Initiative on Effects of Ionizing Radiation

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Contents

• Establishment and activities of MELODI
• DoReMi Network of Excellence
• Other European RP research platforms and interaction with MELODI
• Next steps in Horizon 2020
• Conclusions
MELODI
Multidisciplinary European Low Dose Initiative
Open RTD platform guiding priorities in low dose research in Europe

DoReMi
Low Dose Research towards Multidisciplinary integration
Network of Excellence 2010-2015
Why are we interested in low doses?

• Everybody is exposed to low doses
  – Environmental
  – Medical diagnostics
  – Occupational

• What is a low dose in RP context?
  < 100-200 mGy of low-LET radiation

• Risks of high doses are fairly well known but there is uncertainty on low dose effects
Background

• Decline of resources across Europe (human, research infrastructures)
• Small groups, fragmented research
• Arising new issues and paradigms demand multidisciplinary approaches and new competencies
• Uncertainties remain for low dose risk
• Need to focus on key questions for RP
• No single group, institute, country can solve the scientific issues alone
HLEG Report 2009

See Cordis for EC Report
EUR 23884

www.melodi-online.eu
HLEG recommendations

• Major societal and scientific questions
  – Dose/effect relationship at low dose/low dose rate exposures
  – Individual sensitivity
  – Non cancer health effects
  – Internal exposure; tissue sensitivities; influence of radiation quality

• A need for a Strategic Research Agenda (SRA) and associated priority road map
How robust is the system of radiation protection and risk assessment?
Added value of integration

• From isolated studies, single disciplines and fragmented research towards a multidisciplinary joint program addressing key questions
• Strategic Research Agenda guiding joint activities
• Obtaining critical mass
• Integrating scientific disciplines
• Managing infrastructures
• Managing knowledge
• Training of next generation of scientists
Implementing HLEG recommendations

• The set up of the DoReMi Network of Excellence on low dose research in Euratom FP7, preparing a transitional research agenda, and addressing main scientific questions and cross-cutting issues set by the HLEG
  DoReMi – http://www.doremi-noe.net/

• The formation of the Multidisciplinary European Low Dose Initiative, the MELODI Association
  MELODI – http://www.melodi-online.eu/
Aim of DoReMi Network of Excellence

• To promote sustainable integration of low dose risk research in Europe
• To act as operational tool to establish the MELODI platform
• To address the key policy questions identified by the HLEG Report by research, training and dissemination activities
DoReMi Facts and Figures

• EC funding 13 M€, total 21M€
• 2010-2015 (6 years)
• Started with 12 partners
• 3 competitive calls and 3 internal calls, proposals evaluated by External Advisory Board
• Expansion of project portfolio and inclusion of new partners
• Expected final number of partners: 36
DoReMi Work Packages

WP1 Network coordination

- WP3 Education and Training
- WP4 Infrastructures
- WP5 Shape of Dose Response
- WP6 Individual sensitivities
- WP7 Non-cancer Effects

WP2 Structuring MELODI
DoReMi: step by step integration

Phase 1
Months 0-18
- Establishment of integration plan
  - Strengths and weaknesses
  - Coherent structure
  - Harmonised procedures
  - Best practises
  - Transition plan

Phase 2
Months 19-36
- Consolidation of Integration plan
  - Joint Programme of Activities
  - Application of procedures and best practises
  - Approaches to communication; training knowledge management
  - Infrastructures

Phase 3
Months 37-54
- Creation of permanent entity
  - Clear structure with accountabilities
  - Organised, permanent entity

Phase 4
Months 55-72
- Transition plan for sustainability
  - Permanent management structure
  - Long-term funding plan

Relevant indicators for the measurement of the degree of integration
## DoReMi Infrastructure Program

<table>
<thead>
<tr>
<th>Task</th>
<th>Work</th>
<th>Starting</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Survey of existing facilities for low dose risk research</td>
<td>2010</td>
</tr>
<tr>
<td>4.2</td>
<td>Characterization of infrastructure needs and roadmap of implementation</td>
<td>2010</td>
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<tr>
<td>4.3</td>
<td>Implementation of DoReMi support activities for shared infrastructures</td>
<td>2010</td>
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<tr>
<td>4.4</td>
<td>Development and implementation of access to Infrastructure</td>
<td>2010</td>
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<tr>
<td>4.5</td>
<td>Open Access to the UMB low dose irradiation facility (FIGARO)</td>
<td>2011</td>
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<tr>
<td>4.6</td>
<td>Dose/Dose-rate Radiation Effects in Brain Cancer Risk (DDRE-BrainCancer)</td>
<td>2011</td>
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<tr>
<td>4.7</td>
<td>Low dose/dose rate gamma irradiation facility for in vitro biological systems (LIBIS)</td>
<td>2012</td>
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<tr>
<td>4.8</td>
<td>Integration of STORE into DoReMi as a trustable and viable database and/or pointer to biobanks and ascertain sustainability</td>
<td>2012</td>
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<tr>
<td>4.9</td>
<td>Provision of ion microbeam irradiation facility SNAKE (MicroRAD)</td>
<td>2013</td>
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<tr>
<td>4.10</td>
<td>Laboratory infrastructure for retrospective radon and thoron dosimetry (RETRODOS)</td>
<td>2014</td>
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</tbody>
</table>
## DoReMi Shape of dose response program

<table>
<thead>
<tr>
<th>Task</th>
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<tbody>
<tr>
<td>5.1</td>
<td>Phase – shifts in responses and processes at high/low doses and dose rates</td>
<td>2010</td>
</tr>
<tr>
<td>5.1.1</td>
<td>Low dose Gene Expression signature (LoGiC)</td>
<td></td>
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<tr>
<td>5.2</td>
<td>Assessing the relative contribution of targeted (DNA), non-targeted and systemic processes to radiation carcinogenesis</td>
<td>2010</td>
</tr>
<tr>
<td>5.2.1</td>
<td>Modulation of Inflammation by low and moderate dose Ionising Radiation (ModInIR)</td>
<td>2011</td>
</tr>
<tr>
<td>5.3</td>
<td>The dynamics of pre-neoplastic change and clonal development</td>
<td>2010</td>
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<tr>
<td>5.4</td>
<td>Mathematical models to link experimental findings and epidemiological data</td>
<td>2010</td>
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<tr>
<td>5.5</td>
<td>Assessing the risk from internal exposures</td>
<td>2010</td>
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<tr>
<td>5.5.1</td>
<td>Internal Emitters in Uranium Miners (INTEMITUM)</td>
<td>2013</td>
</tr>
<tr>
<td>5.5.2</td>
<td>Assembly of internal radiation dose for UKAEA and AWE epidemiology cohorts (AIRDoseUK)</td>
<td>2013</td>
</tr>
<tr>
<td>5.6</td>
<td>Track structures and initial events: an integrated approach to assess the issue of radiation quality dependence (INITIUM)</td>
<td>2012</td>
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<tr>
<td>5.7</td>
<td>Induction and facilitation of chromothripsis by low dose ionizing radiation (In-FaCT-IR)</td>
<td>2013</td>
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<tr>
<td>5.8</td>
<td>Concerted Action for an Integrated (biology-dosimetry-epidemiology) Research project on Occupational Uranium Exposure (CURE)</td>
<td>2013</td>
</tr>
<tr>
<td>5.9</td>
<td>Low dose radiation-induced non-targeter effects in vivo: the role of microvesicles in signal transduction (Rad-Mvivo)</td>
<td>2014</td>
</tr>
<tr>
<td>5.10</td>
<td>Effects of Chronic LOw-dose Gamma Irradiation on GAstrointestinal Tumorigenesis (CLOGICAT)</td>
<td>2014</td>
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</tbody>
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## DoReMi Individual sensitivity program

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<thead>
<tr>
<th>Task</th>
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<tbody>
<tr>
<td>6.1</td>
<td>Molecular epidemiological studies to address the role of individual genetic variation in determining susceptibility to low doses</td>
<td>2010</td>
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<tr>
<td>6.2</td>
<td>Identification of genetic modifiers of individual cancer susceptibility and their mechanisms of action</td>
<td>2010</td>
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<tr>
<td>6.3</td>
<td>Modelling of the effects on risk prediction models due to changes in biological processes influenced by genetic variability</td>
<td>2010</td>
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<tr>
<td>6.4</td>
<td>The effect of genetic modifiers on carcinogenesis following low dose rate exposure</td>
<td>2010</td>
</tr>
<tr>
<td>6.5</td>
<td>Contribution of genetic and epigenetic mechanisms that indirectly influence susceptibility to radiation-induced cancer</td>
<td>2010</td>
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<tr>
<td>6.6</td>
<td>Implementation of the DoReMi strategy for a large scale molecular epidemiological study to quantify genetic contribution to individual susceptibility</td>
<td>2010</td>
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<tr>
<td>6.7</td>
<td>Planning expansion of research portfolio</td>
<td>2010</td>
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<tr>
<td>6.8</td>
<td>Predicting individual radiation sensitivity with Raman microspectroscopy (PRISM)</td>
<td>2011</td>
</tr>
<tr>
<td>6.9</td>
<td>Integrating radiation biomarker into epidemiology of post-Chernobyl thyroid cancer from Belarus (INT-Thyr)</td>
<td>2012</td>
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<tr>
<td>6.10</td>
<td>Characterization of DNA lesions in the nuclear ultrastructure of differentiated and tissue-specific stem cells after protracted low-dose radiation (Zif-TEM)</td>
<td>2013</td>
</tr>
<tr>
<td>6.11</td>
<td>Mechanism of low dose response to ionizing radiation and its significance in radiation protection (RADSENS)</td>
<td>2013</td>
</tr>
</tbody>
</table>
### DoReMi Non-cancer effects program

<table>
<thead>
<tr>
<th>Task</th>
<th>Work</th>
<th>Starting</th>
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</thead>
<tbody>
<tr>
<td>7.1</td>
<td>Structuring the research effort on non-cancer effects according to the HLEG roadmap: organisation of consultation/exploratory meetings and funding integrative RTD projects</td>
<td>2010</td>
</tr>
<tr>
<td>7.2</td>
<td>Preparation of a pilot study to conduct molecular epidemiology studies in vascular radiation damage</td>
<td>2010</td>
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<tr>
<td>7.3</td>
<td>Feasibility study towards a systems biology approach of radiation response of the endothelium</td>
<td>2010</td>
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<tr>
<td>7.4</td>
<td>Pilot epidemiological study of lens opacities among a cohort of interventional radiologists and cardiologists</td>
<td>2010</td>
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<tr>
<td>7.4.1</td>
<td><strong>Lens opacities: Methodology implementation (ELDO)</strong></td>
<td>2012</td>
</tr>
<tr>
<td>7.5</td>
<td>Pilot study of external irradiation versus internal contamination effects on neurogenesis</td>
<td>2010</td>
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<tr>
<td>7.6</td>
<td>Study on contribution of low dose X-radiation in induction of anti-inflammation</td>
<td>2010</td>
</tr>
<tr>
<td>7.7</td>
<td><strong>Low dose Gene Expression signature and its impact on Cardiovascular disease (LoGiC)</strong></td>
<td>2011</td>
</tr>
<tr>
<td>7.8</td>
<td><strong>Study on contribution of low dose X-radiation in induction of cataractogenesis and influencing genetic and cell communication factors (LDR-OPTI-GEN)</strong></td>
<td>2013</td>
</tr>
<tr>
<td>7.9</td>
<td><strong>Low and moderate dose radiation effects on brain microvascular pericytes: epigenetic mechanisms and functional consequences (PERIRAD)</strong></td>
<td>2013</td>
</tr>
<tr>
<td>7.10</td>
<td><strong>Influence of a chronic LD and LDR exposure onto the development of Parkinson symptoms in genetically predisposed Pitx3-EYL/EYL Ogg1/-/- mouse mutant (OSTINATO)</strong></td>
<td>2013</td>
</tr>
<tr>
<td>7.11</td>
<td>Epidemiological pilot study on radiation-induced cataract in interventional cardiology (EVAMET)</td>
<td>2014</td>
</tr>
<tr>
<td>7.12</td>
<td><strong>Effect of low doses of low-LET radiation on impaired vascular endothelium (ELDORENDO)</strong></td>
<td>2014</td>
</tr>
<tr>
<td>7.13</td>
<td><strong>Low-dose ionizing radiation-induced cataracts in the mouse: invivo and invitro studies (RadCat)</strong></td>
<td>2014</td>
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The MELODI Association

• Legal entity: non profit Association under French law

• Statutory mission:
  – Art II: « The purpose of the MELODI Association is to constitute a European Research Platform in the field of low-dose exposure to ionizing radiation and of radiation protection from such exposure aiming for a progressive integration of related national and European activities…/… MELODI defines priority scientific goals and implements research. »

• Membership rules:
  – Founding members, with national role for RP R&D, committed to R&D integration,
  – Ordinary members, contributing to MELODI work
The European Union: 500 million people, 28 Member States

24 official languages
30 MELODI members in Europe

- 11 countries with « founding members »
- 6 countries with « ordinary members » only
- 11 Member States still without MELODI members
MELODI Structure
Multidisciplinary European Low Dose Initiative

- **EC**
- **Alliance**
  - NERIS
  - EURADOS
  - EUTERP
  ...

- **GA / Board**
- **Scientific Committee**
- **Working Groups**
- **Members**

- Integrative actions
- Joint research projects

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- **International organisations:**
  - HERCA, UNSCEAR, ICRP

- **Other low-dose R&D programmes**
  (USA,...)

- **WG: SRA, E&T, Infrastructures ..
  + Joint groups with other RP R&D platforms**

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**R&D operational activities**
MELODI activities (1)

In the area of low dose risks

- SRA, R&D priorities and roadmap
- Scientific opinions
- MELODI Award
- MELODI open workshops
- Organising open RTD Calls (OPERRA WP3)
- European and national R&D integration strategy
- Education and training strategy and coordination
- Infrastructures strategy and coordination
Acting together with other RP research associations

- MoU has been signed between ALLIANCE, NERIS, EURADOS and MELODI in December 2013;
- MELODI is progressing to establish an MoU with the medical field
- Through OPERRA FP7: establishment of coherence of European R&D programs in response to priority RP needs (low dose effects, environmental protection, emergency preparedness, dosimetry, medical domain, E&T).
- OPERRA acts as a prototype joint programming instrument to prepare the RP for Horizon 2020
- Operational support to other EU FP7 projects: CO-CHER, COMET
Similar evolution in other areas of radiation protection R&D

• Environmental issues: the future of European radioecology
  – *European Radioecology ALLIANCE / STAR NoE / COMET*
    EC-funded project

• Emergency preparedness and response: a renewed priority after Fukushima
  – *NERIS / PREPARE* EC-funded project

• Dosimetry: metrology as a key research resource and instrument for optimisation of exposures
  – *EURADOS*
Integrating European Radiation Protection Research
Countries involved in the ALLIANCE:
8 organisations from 8 countries
Countries involved in the NERIS Platform:
49 organisations from 24 countries

+ Taiwan
EURATOM H2020 Budget

DG-RTD indirect actions
- Fusion
  - €709 M

DG-RTD indirect actions
- Fission & Radiation Protection
  - €355 M

DG-JRC direct actions
- Nuclear-related activities
  - €725 M

Euratom H2020 (2014-18) = €1789 M

... having ITER Construction = €2573 M inside MFF but outside H2020
1. Excellent science
   1. European Research Council
   2. Future and Emerging Technologies
   3. Marie Curie actions
   4. Research infrastructures

2. Industrial leadership
   1. Leadership in enabling and industrial technologies
   2. Access to risk finance
   3. Innovation in SMEs

Find out more at   www.ec.europa.eu/research/horizon2020
3. Societal challenges

1. Health, demographic change and wellbeing
2. Food security, sustainable agriculture
3. Secure, clean and efficient energy
4. Smart, green and integrated transport
5. Climate action, resource efficiency and raw materials
6. Inclusive, innovative and secure societies

EC Proposal 80 Bi€....
...... 71 Bi€
Council approval on 28 June 2013

Find out more at  www.ec.europa.eu/research/horizon2020

• European Joint Programme
• Integrating national programmes

• Builds on SRAs of MELODI, ALLIANCE and NERIS and making use of expertise in dosimetry (EURADOS) and medical use of radiation

• Expected Impact: Better integrating of the radiation protection scientific community at EU level, leading to a better coordination of research efforts and the provision of more consolidated and robust science-based policy recommendations to decision makers in this area. In the long term, these efforts will translate into additional or improved practical measures in view of the effective protection of people and the environment.

• EC funding 20-21 M€
Addressing the first H2020 call

• At present, MELODI and sister platforms form a reliable and open instrument to progress towards European research integration

• With EC and Member States support, the next step will be addressing the H2020 EJP proposal, gathering national R&D bodies committed to integration

• MELODI will act as an integrative platform, supported by the other European R&D RP structures
Multidisciplinary European LOw Dose Initiative

- HLEG Report (2009)
- Association with 15 founding members (2010)
- Strategic Research Agenda, SRA (2011)
- EC proposes MELODI to take lead (2012)
- Horizon2020: Call opened for European Joint Program

www.melodi-online.eu
European RP research platforms

On-going Euratom projects in RP area (2014)
Further information

www.melodi-online.eu
www.doremi-noe.net
www.er-alliance.org
www.star-radioecology.org
www.eu-neris.net
www.eurados.org