EURADOS Strategic Research Agenda

MELODI
Brussels, Belgium
October 8th, 2013

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History of EURADOS (European Radiation Dosimetry Group)

• Founded in 1981 by scientists involved in contracts with the EC

• Aim: To promote European research, development and cooperation in dosimetry
  • Collection, evaluation and dissemination of information on research in dosimetry
  • Co-ordination of ongoing research projects
  • Preparation of future programmes

• Financial support from EC
  • General support in the first years
  • Later (only) dedicated support for projects

• In 2001 registered in the Netherlands, constitution set up

• 2004 – 2008: Last EC project

• In 2008 registered in Germany as “e.V.” (registered society)

• Since 2008: self-sustained network with regular income
EURADOS (as of October 2013)

- **EURADOS General Assembly**
  59 Voting Members (institutions) represented by designated individuals

- **EURADOS Board of Officers**
  Chair: H. Schumacher (PTB, Germany)
  Vice-Chair: E. Fantuzzi (ENEA, Italy)
  Secretary: F. Vanhavere (SCK-CEN, Belgium)
  Treasurer: J. Alves (IST, Portugal)

- **EURADOS Council**
EURADOS (as of October 2013)

• **Associate Members**
  Almost 300 active scientists contributing to the overall EURADOS objectives

• **Eight EURADOS Working Groups**
  - Harmonization of Individual Monitoring (J. Alves, Portugal)
  - Environmental Dosimetry (S. Neumaier, Germany)
  - Computational Dosimetry (R. Tanner, UK)
  - Internal Dosimetry (M.A. Lopez, Spain)
  - Medical Dosimetry (R. Harrison, UK)
  - Retrospective Dosimetry (C. Woda, Germany)
  - High-Energy Dosimetry (W. Rühm, Germany)
  - Medical ALARA Network (Z. Knezevic, Croatia)
EURADIOS Visibility - www.eurados.org

Website and newsletter (almost 900 subscribers)

EURADIOS Reports

- EURADIOS Intercomparison 2012-01
  - Braunshweig, January 2012
  - T. W. M. Grimbergen, M. Figel, A. M. Rijken, H. Stadtmann and A. F. McWhan

- EURADIOS Intercomparison 2012-02
  - Braunshweig, April 2012
  - T. W. M. Grimbergen, M. Figel, A. M. Rijken, H. Stadtmann and A. F. McWhan

- EURADIOS Intercomparison 2012-03
  - Braunshweig, May 2012
  - T. W. M. Grimbergen, M. Figel, A. M. Rijken, H. Stadtmann and A. F. McWhan

- ORAMED: Optimization of Radiation Protection of Medical Staff

- Comparison of Codes Assessing Radiation Exposure of Aircraft Crew due to Galactic Cosmic Radiation
  - Bottscher, B., Beck, M., Latour, V., Mares, D., Matthias, W., Ruhrm, F., Witzemann

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EURADOS Annual Meetings

Include General Assembly, Council Meeting, WG Meetings, Workshop, Winterschool
<table>
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<tr>
<th>Winter Schools</th>
<th>Workshops with Proceedings ¹)</th>
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<tr>
<td>“Refreshment courses” on topics relevant to radiation dosimetry</td>
<td>Related to research topics where EURADOS Working Groups are involved</td>
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<tr>
<td>• Status and Future Perspectives of Computational Micro- and Nanodosimetry (AM2013)</td>
<td>• Dosimetry for second cancer risk estimation in radiotherapy (AM2012)</td>
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<td>• Radiation Protection for Medical Staff (AM2011)</td>
<td>• Accelerator radiation protection and shielding (AM2010)</td>
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<td>• Radiological Emergencies – Internal exposures (AM2010)</td>
<td>• Cosmic Radiation and Aircrew Exposure (AM2009)</td>
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<td>• Low-Dose Radiation Effects (AM2009)</td>
<td>• Dosimetric Issues in the Medical Use of Ionizing Radiation (AM2008)</td>
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<td>• Retrospective Dosimetry (AM2008)</td>
<td>• Characterization of Workplaces for the Assessment of the Doses to Individuals (AM2007)</td>
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<td>• Uncertainties in Radiation Dosimetry (AM2007)</td>
<td>¹) 2004-2010: in RPD; 2012: in Rad Meas</td>
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EURADOS Strategic Research Agenda – History and Current Status

- **July 2012, Paris, Council Meeting**
  Discussion of OPERRA; Decision to participate in MELODI2012 (Helsinki)

- **October 2012 (after MELODI 2012)**
  Council initiates SRA discussion and stimulates input from Working Groups

- **February 2013, Barcelona, Council Meeting**
  SRA Editorial Group established:
  W. Rühm (Chair), E. Fantuzzi, R. Harrison, H. Schuhmacher, F. Vanhavere

- **July 2013, Berlin, Council Meeting**
  Discussion of collected material and future actions

- **August 2013**: Webconference of Editorial Group

- **September 2013**: Editorial Group compiles a first list of key stakeholders

- **October 2013**: Draft version of SRA presented at MELODI2013, Brussels, Belgium
European Radiation Dosimetry Group
Visions on Dosimetry for the Next 20 Years

EURADOS Editorial Group on Developing a Strategic Research Agenda

W. Rühm¹, E. Fantuzzi², R. Harrison³, H. Schuhmacher⁴, F. Vanhavere⁵

With input from the following individuals:

L. Ainsburry (PHE, UK), J. Alves (IST, Portugal), D. Bartlett (former PHE, UK), I. Balásházy (MTA EK, Hungary), E. Blanchardon (IRSN, France), J.F. Bottollier-Depois (IRSN, France), B. Breustedt (KIT, Germany), D. Broggio (IRSN, France), E. Carinou (GAEC, Greece), C.M. Castellani (ENEA, Italy), V. Chumak (RPI, Ukraine), I. Ciraj-Bjelac (Vinca, Serbia), I. Clairand (IRSN, France), A. Desbrée (IRSN, France), J. Domienik (NIOM, Poland), G. Etherington (PHE, UK), P. Fattibene (ISS, Italy), D. Franck (IRSN, France), A. Giussani (BfS, Germany), M. Ginjaume (UPC, Spain), H. jarvinnen (STUK, Finland), Z. Knezevic (RBI, Croatia), R. Kopec (IFJ, Poland), A. Kuchinska (Szedar, Poland), W. Li (HMGU, Germany), M. A. Lopez (CIEMAT, Spain), F. Malchair (CHU Liège, Belgium), S. Neumeier (PTB, Germany), D. Nosske (BfS, Germany), L. Novak (NRPI, Czech Republic), H. Rabus (PTB, Germany), K. Rothkamm (PHE, UK), T. Siskonen (STUK, Finland), A. Trianni (AOUSMM, Italy), T. Vrba (TU-Prague, Czech republic). C. Woda (HMGU, Germany)

List not yet complete!
Absorbed dose does not always provide an adequately detailed description of an irradiation, to allow predicting biological consequences, in particular when the dose to a tissue is inhomogenous.

Therefore, the present system of limiting and operational quantities in radiation protection dosimetry needs improvement.

This **Vision** includes **5 Challenges**

- Better understand space/time correlations of radiation interaction events
- Establish correlations between track structure and radiation damage
- Update estimates of RBE and Quality Factor
- Update operational quantities for external exposure
- Better understand biokinetics of internal emitters

**Towards a Quantification of Radiation Quality by Nanodosimetry**
H. Rabus – Wednesday, 14:15

**Operational Dose Quantities for External Radiation Exposure - Deficiencies and Options**
D. Bartlett – Wednesday, 14:00

**Dose Distribution of Alpha and Auger-emitters in Lungs and Kidneys and at Cellular Level**
W.B. Li – Wednesday, 14:30
Vision 2 - Towards Improved Radiation Risk Estimates Deduced from Epidemiological Cohorts

The purpose of radio-epidemiological studies is primarily the deduction of risk coefficients

> Effect (y-axis) per dose (x-axis) (slope)
> Dosimetry essential

This Vision includes 3 Challenges

• Improve organ dosimetry relevant for cohorts used in epidemiology (e.g., eye lens, brain, heart arteries and walls, α emitters in lung)

• Explore exposure pathways not yet considered or validated in epidemiology (e.g., residual radioactivity for LSS, SPEs for air crew, out-of-field doses in radiotherapy, …)

• Improve retrospective dosimetry for historical cohorts (e.g., improvement of sensitivity, confounding by other stressors, assessment of internal dose uncertainties)

Eye lens dosimetry: Results from the ELDO Project
L. Struelens – Wednesday, 14:45

Secondary Neutrons in Proton and Ion Therapy
L. Stolarczyk – Wednesday 11:45

Solar Particle Events in Aviation and Space
G. Reitz – Wednesday, 11:15
Radiological emergencies are considered a major challenge of modern societies (e.g. nuclear accidents, terroristic attacks, lost radiation sources)

This Vision includes 3 Challenges

• Rapidly identify individuals with highest doses (e.g., use of daily life materials as dosemeters, protein biomarkers, computational techniques e.g. for urban environments, …)

• Handle a large number of dosimetric samples in a short time (e.g., automatisation of CA scoring, web-based scoring of captured images, networking of laboratories)

• Quantify doses after accidental internal contamination
Modern medical therapy includes a number of diagnostic procedures involving ionizing radiation (X-Ray, CTs, PET, etc.).

Additionally radio-therapy is a major treatment modality in cancer therapy

This **Vision** includes **4 Challenges**

- Improve out-of-field dosimetry for photon and particle therapy (focus on pediatrics) (scattered primary beam, secondary photons and neutrons, imaging procedures; development of suitable detectors and phantoms)

- Optimize dose and risk estimations in interventional radiology (determination of skin doses)

- Establish reliable patient dosimetry in CT examinations (automatic dose mapping and collection of patient doses)

- Improve dosimetry in modern external beam radiotherapy
This **Vision** includes **4 Challenges**

- Implement new ICRP biokinetic models for intake of radionuclides (including how to use ICRP models, differences healthy persons and patients, validation of these models)

- Develop accurate and on-line personal dosimetry for workers (including real-time monitoring of wholebody dose, eye lens, extremities, development of suitable active dosemeters)

- Improve neutron dosimetry techniques (e.g., for high-energy and pulsed neutron fields, including the photon component that is always present; note: a high-energy quasi-monoenergetic neutron reference field will soon be missing in Europe!)

- Include nuclide-specific information in doserate measurements in the environment (e.g., environmental monitoring with suitable spectrometric instrumentation desired)
Additionally, the SRA includes …

Separate Chapter on Training and Education

• Implementation of EC directives and technical recommendations into practice
• Training courses on novel or improved dosimetric methods
• Winter schools, workshops and scientific symposia

Separate Chapter on Harmonisation and Practice

• Intercomparison for dosemeters used in individual monitoring
• Intercomparison for early-warning systems used in environmental monitoring
• Intercomparison for codes and simulations
• Surveys on practical dosimetry (to document quality of dosimetric practices)
Future Roadmap to Develop an SRA

- Sending first version of SRA to EURADOS Voting Members (November 2013)
- Presentation of first SRA version at GA, AM2014, Budapest
- Identification of EURADOS key stakeholders (Council Meeting, February 2014, Budapest)
- Procedure to define research priorities, to be discussed at AM2014, Budapest
- Invitation of key stakeholders to prepare second version of SRA (Spring 2014?)
- Preparation of second version of SRA …
- Presentation of second SRA version at IRPA 2014, Geneva, Switzerland
Conclusions

• EURADOS – Dosimetry Network in Europe
• Self-sustainable
• First Version of SRA developed
• Represents view of EURADOS community
  (but note: many EURADOS members also serve for other institutions/networks)
• Roadmap for further steps defined
• Presentation at General Assembly February 2014
• Followed by involvement of key stakeholders
• Followed by development of priority list
Lessons learned after the MELODI Workshop in Helsinki, Finland, 2012

MELODI: .... To learn from EURADOS .... (Saloma et al., J Radiol Prot, 2013)

EURADOS: .... To learn from MELODI, STAR, NERIS, and develop an SRA

THANK YOU!