The Mandate and Work of ICRP Committee 1 on Radiation Effects

Fourth ICRP Symposium
Second European Radiological Protection Research Week
Paris, France

October 11th, 2017

Werner Rühm, Helmholtz Center Munich, Germany

ICRP Structure

- **Main Commission** (Chair: C Cousins
  Vice-Chair: J Lochard)
- **Scientific Secretariat:** C Clement, H Ogino

- **Committee 1: Radiation Effects** (Chair: W Rühm; Vice chair: A Wojcik; Secr.: J Garnier-Laplace)
  Assesses knowledge on radiation risk relevant for radiological protection
- **Committee 2: Dosimetry** (Chair: J Harrison; Vice chair: F Paquet; Secr.: W Bolch)
  Develops reference models and data, including dose coefficients
- **Committee 3: Medical Exposures** (Chair: N. N.; Vice chair: N. N.; Secr.: M Rehani)
  Develops recommendations to protect patients, staff, and the public
- **Committee 4: Application of Recommend.** (Chair: D Cool, Vice: KA Higley; Secr.: J Lecomte)
  Develops principles and recommendations on radiological protection

ICRP Committee 1: General Topics

The focus of C1 work is on

- Risk of induction of cancer and heritable disease (stochastic effects), and the underlying mechanisms of radiation action.
- Risks, severity, and mechanisms of induction of tissue/organ damage and developmental defects (tissue effects).
- Endpoints considered manifest on various organisation levels such as sub-cellular systems (e.g., DNA), cells, tissues, animals, humans, *and populations*.

The Committee also addresses issues such as high background radiation areas, CT in children, radiation sensitivity and individual susceptibility, sequencing and omics technologies, and the impact of epigenetics on radiological protection.

ICRP Committee 1: Current Membership (as of Oct 2017)

- Members with expertise in biology, genetics, human and veterinary medicine, mathematics and statistics, physics and dosimetry, epidemiology, and radioecology.
- Many of the committee members serve for other international bodies such as UNSCEAR, in their home countries for various national committees, and are involved in the coordination of international radiation research programs.

Werner Rühm (Chair), Germany
Adrzej Wojcik (Vice-Chair), Sweden
Jacqueline Garnier-Lapalce (Secretary), France ***)**

Tamara Azizova, Russia
Wolfgang Dörr, Austria
Kotaro Ozasa, Japan ***)**
Kazuo Sakai, Japan ***)**
Mikhail Sokolnikov, Russia ***)**
Quanfu Sun, China
Gayle Woloschak, USA ***)**

Ranajit Chakraborty, USA
Michael Hauptmann, Netherlands
Preetha Rajaraman, India
Sisko Salomaa, Finland
Dan Stram, USA
Richard Wakeford, UK

***)** *new since 07/2017*

Last C1 Meeting: Nov 2016, Chennai, India; in conjunction with …

Dedicated ICRP C1 Session: 11. Nov. 2016

Introduction, Overview of C1 activities	Rühm W
Risks associated with alpha emitters (TG64)	Laurier D
Issues associated to low dose and low dose rates, DDREF (TG91)	Rühm W
Individual sensitivity to radiation	Rajaraman P
Effective dose as an indicator of risk (TG79)	Wakeford R
Stem cell biology with respect to carcinogenesis (TG75 – closed; ICRP Report 131)	Bouffler S
Panel Discussion	**all present**

And … all members gave talks at the conference

ICRP and radiation biology: The role of science in ICRP recommendations	Clement C
Radiation and CVD: review of epidemiological results	Azizova T
Biologically-based strategies to modify normal tissue radiation effects	Dörr W
Review of studies on medical exposures	Hauptmann M
Results on epidemiological studies among nuclear workers	Laurier D
Ongoing research in radiation protection in Europe	Salomaa S
Overview on studies of High Background Radiation Areas	Wakeford R
Studies of cancer risk associated with natural background radiation in Europe	Wakeford R
DNA damage response to mixed beams of high and low LET radiation	Wojcik A
Discussion	all present

ICRP Committee 1: India 2016

From left to right: Andrzej Wojcik, Richard Wakeford; Simon Bouffler; Wolfgang Dörr; Dominique Laurier; Michael Hauptmann; Preetha Rajaraman; Sisko Salomaa; Werner Rühm; Tamara Azizova; Anna Denisova (interpreter); Chris Clement (Scientific Secretary of ICRP). Missing: Nobuhiko Ban; Ranajit Chakraborty; Dan Stram; Quanfu Sun; Margot Tirmarche.

ICRP Committee 1, Task Group TG64

"Cancer Risk from Alpha Emitters"

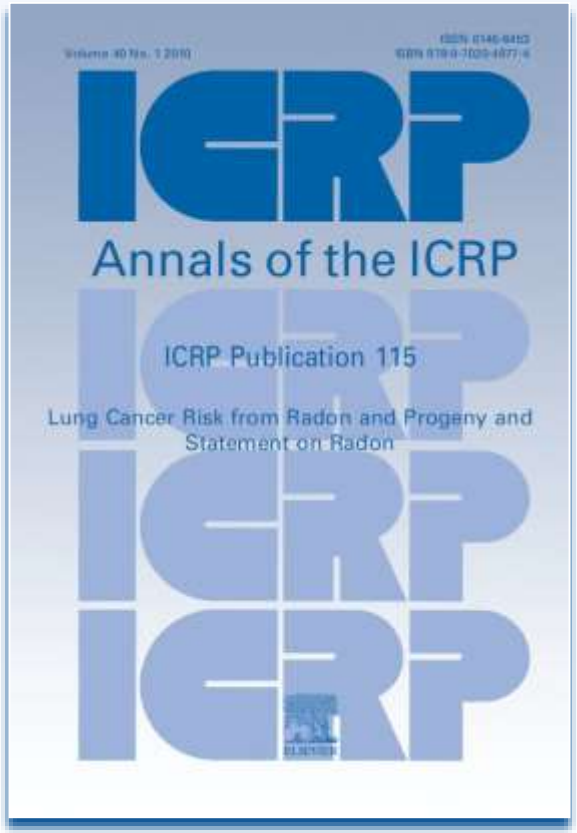
Full Members

M Tirmarche (Chair) (France)
E Blanchardon (France)
B Ellis (USA)
D Laurier (France)
J Marsh (UK)
M Sokolnikov (Russia)
R Wakeford (UK)
I Apostoaei (USA)

Corresponding Members

E Gilbert (USA), J Harrison (UK), S Zhivin (France)

- ICRP Publication 115 (2010) : Lung Cancer Risk from Radon and Progeny and Statement on Radon.
- TG extended to report on potential risks from plutonium, uranium, thorotrast and radium.
- Includes a joint analysis of the Westlake (UK) and Mayak (Russia) plutonium data
- Last meeting: 3-6 July, 2017 in Barcelona, Spain



ICRP Committee 1, Task Group TG102

"Detriment Calculation Methodology"
(Radiation detriment is a concept used to quantify the overall harm to health from stochastic effects of low-level radiation exposure of different parts of the body)

Full Members

N Ban (Chair) (NRA, Japan)
W Dörr (Univ. Vienna, Austria)
D Laurier (IRSN, France)
L Vaillant (CEPN, France)
W Zhang (PHE, UK)

Corresponding Members

S Bouffler (PHE, UK)
E Clero (IRSN, France)
D Cool (EPRI, USA)
N Hamada (CRIEPI, Japan)
J Harrison (PHE, UK)
D Preston (Hirosoft, USA)

- To establish a robust and transparent methodology for calculating radiation detriment.
- Review and reproduce the detriment calculation in Publication 103. Based on this review, possible modification and improvement of the methodology will be discussed.

Recent C1 TG102 activities

- Joint meeting with TG91 in October 2016, in Hiroshima, Japan

ICRP Committee 1 (Radiation Effects), Task Group TG91

"Radiation Risk Inference at Low-dose and Low-dose Rate Exposure for Radiological Protection Purposes: Use of Dose and Dose Rate Effectiveness Factors"

Full Members

W Rühm (Chair) (Germany),
T Azizova (Russia),
S Bouffler (UK), M Little (USA)
R Shore (USA), L Walsh (Switzerland)
G Woloschak (USA)

Corresponding Members

B Grosche (Germany), M Kai (Japan),
K Ozasa (Japan), K Sakai (Lapan),
Q Sun (China), A Gonzales (Argentina, consultant)

Current Situation

- ICRP uses a dose and dose rate effectiveness factor (DDREF) of 2 to extrapolate risk estimates from the atomic bomb survivors to radiation protection scenarios, but …
  - BEIR VII (US) suggests 1.5
  - SSK (Germany) suggests 1
  - UNSCEAR does not use any factor

>> A review of current scientific evidence needed

Including… Review of cellular data, pooling of animal data, meta-analyses of epidemiological data, review of use of biologically-based mechanistic models

- Last meeting: May, 2017 in Vienna, Austria (UNSCEAR secretariat invited)

Recent TG91 Publications on DDREF

- Rühm, W., Woloschak, G. E., Shore, R. E., Azizova, T. V., Grosche, B., Niwa, O., Ono, T., Suzuki, K., Iwasaki, T., Ban, N., Kai, M., Clement, C.H., Bouffler, S., Toma, H., & Hamada, N. (2015) Dose and dose-rate effects of ionizing radiation: a discussion in the light of radiological protection. Radiat Environ Biophys 54: 379-401

- Haley, B., Paunesku, T., Grdina, D.J., Woloschak, G.E. (2015) Animal Mortality Risk Increase Following Low-LET Radiation Exposure is not Linear-Quadratic with Dose. PLOS One, DOI 10.1371/journal.pone.0140989

- Rühm, W., Azizova, T. V., Bouffler, S. D., Little, M. P., Shore, R. E., Walsh, L., & Woloschak, G. E. (2016). Dose-rate effects in radiation biology and radiation protection. Annals of the ICRP, DOI: 0146645316629336.

- Shore, R., Walsh, L., Azizova, T., Rühm, W. (2017) Risk of Solid Cancer in Low-dose and Low Dose-Rate Radiation Epidemiological Studies and the Dose Rate Effectiveness Factor. Int J Radiat Biol, accepted.

- Rühm, W., Eidemüller, M., Kaiser, J.C. (2017) Application of Biologically-Based Models of Radiation-Induced Carcinogenesis to Epidemiological Data. Int J Radiat Biol, DOI: 10.1080/09553002.2017.1310405

- Tran., V., Little, M.P. (2017) Dose and dose rate extrapolation factors for malignant and non-malignant health endpoints after exposure to gamma and neutron radiation. Radiat Environ Biophys, accepted. DOI 10.1007/s00411-017-0707-4

Since 2016: Working Party on Individual Radiosensitivity

P Rajaraman (Chair, India)
A Wojczik (Sweden)
M Hauptmann (Netherlends)
S Bouffler (reviewer)

Since 2016: Working Party on Circulatory Diseases

W Dörr (Chair, Austria)
T Azizova (Russian Federation)
D Laurier (reviewer)

C1 Meeting in Paris, 2017, at this symposium

- Focus on active Task Groups and Working Parties
- Close collaboration with other Committees (meetings with C2, C3, C4)
- Information on work programme of other insititutions
- Information on outcome of most recent research programmes, etc.
- Participation of representatives of SLOs

THANK YOU!