Fachverband für Strahlenschutz e.V.
Für Deutschland und die Schweiz
Mitgliedsgesellschaft der IRPA
International Radiation Protection Association

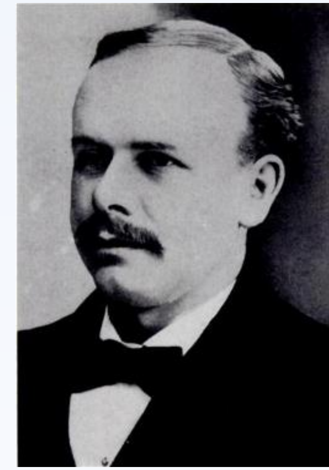
Die Arbeit des Committee 3 (Protection in Medicine) der ICRP und Auswirkungen auf den Deutschen Strahlenschutz

Reinhard Loose
(ICRP Committee 3)

First Published Radiological Protection Advice

In December 1896 Wolfram Fuchs published the first protection advice:

- make the exposure as short as possible
- do not stand within 12 inches (30 cm) of the x-ray tube
- **coat the skin with Vaseline** and leave an extra layer on the area most exposed



1925: 1st International Congress of Radiology (London)

The most pressing issue was quantifying the measurement of radiation

International X-Ray Unit Committee is formed (later renamed International Commission on Radiation Units and Measurements – ICRU)

1928: 2nd International Congress of Radiology (Stockholm)

33 Jahre nach Entdeckung der Röntgenstrahlen

International X-Ray and Radium Protection Committee is formed (later renamed **International Commission on Radiological Protection – ICRP**)

Chair: Rolf Sievert

Radiological Protection in 1928

Focused on <u>occupational exposure in medicine</u>

Concerned with deterministic (threshold) effects

- *"The effects to be guarded against are (a) injuries to **superficial** tissues, (b) derangements of **internal organs** and changes in the **blood**"*

Basic radiological protection advice

- *"An X-ray operator should on no account expose himself unnecessarily to a direct beam of X-rays"*
- *"An operator should place himself as remote as practicable from the X-ray tube*

RP advice expands to include 'limits'

- 1934: daily tolerance dose ~2 R (~20 mSv)
- 1951: weekly permissible dose 0.3 R (~3 mSv) because earlier value *"seems very close to the probable threshold for adverse effects"*
- 1951: *"every effort be made to reduce exposures to all types of ionizing radiations to the lowest possible level"*

Radiological Protection 1950's

Occupational limit ~50 mSv/y, public limit 5 mSv/y

Radiological Protection 1960's

Emerging science

- It is clear that some effects (e.g. cancer induction) are **stochastic**

More sophisticated RP advice is needed

- *The **LNT** assumption "may be incorrect, but ... unlikely to lead to the underestimation of risks"*
- *"any exposure may involve some degree of risk"*
- *"any unnecessary exposure be avoided and that all doses be kept as low as is readily achievable, economic and social consequences being taken into account"* **(ALARA)**

United Nations Scientific Committee on the Effects of Atomic Radiation

UNSCEAR (1955)

27 Staaten **unscear.org**

ICRP INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

Home | News | Consultations | Publications | Downloads | ICRP Symposia | ICRP Activities

icrp.org

(1928)

IAEA International Atomic Energy Agency

RPoP **iaea.org**

(1957)

European Commission EUROPEAN COMMISSION

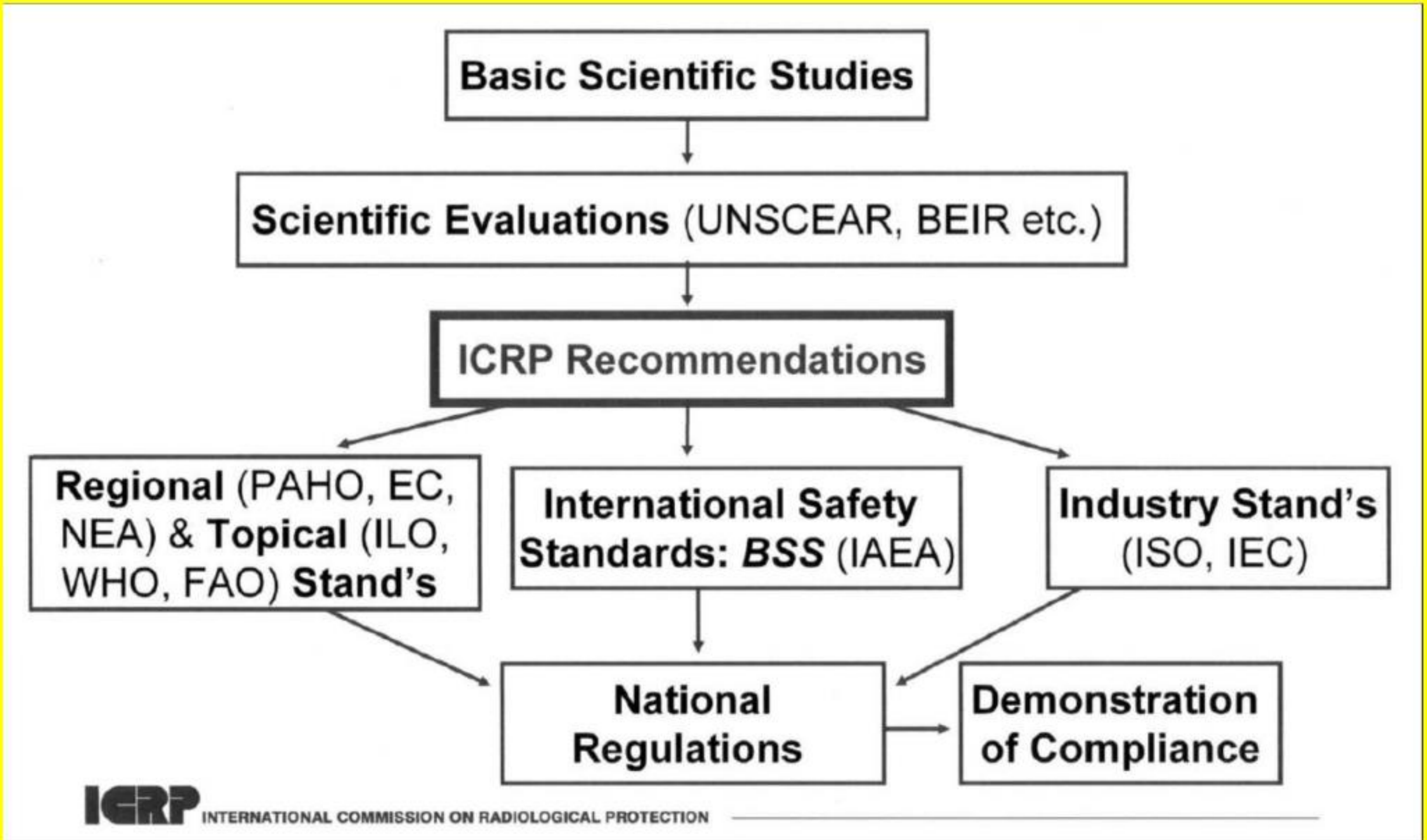
Art. 31

Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit

SSK

DRG Gründung 1905 (Albers-Schönberg)

Das epistomologische und regulatorische System des Strahlenschutzes



- **Relying solely on voluntary contributions** and royalties from the Annals of the ICRP

- **Receiving support from ~30 organisations in ~15 countries** (UK Registered Charity #1166304) Office and Secretary: Ottawa, Canada

- **Independent, international community of experts in radiological protection** ~250 experts in science, policy, and practice from more than 30 countries

Structure

Main Commission

Scientific Secretariat

Committee 1
Effects

Committee 2
Doses

Committee 3
Medicine

Committee 4
Application

TASK GROUPS

(ähnliche Struktur wie SSK)

Chair: Claire Cousins

ICRP Today

Main Commission and Subcommittees

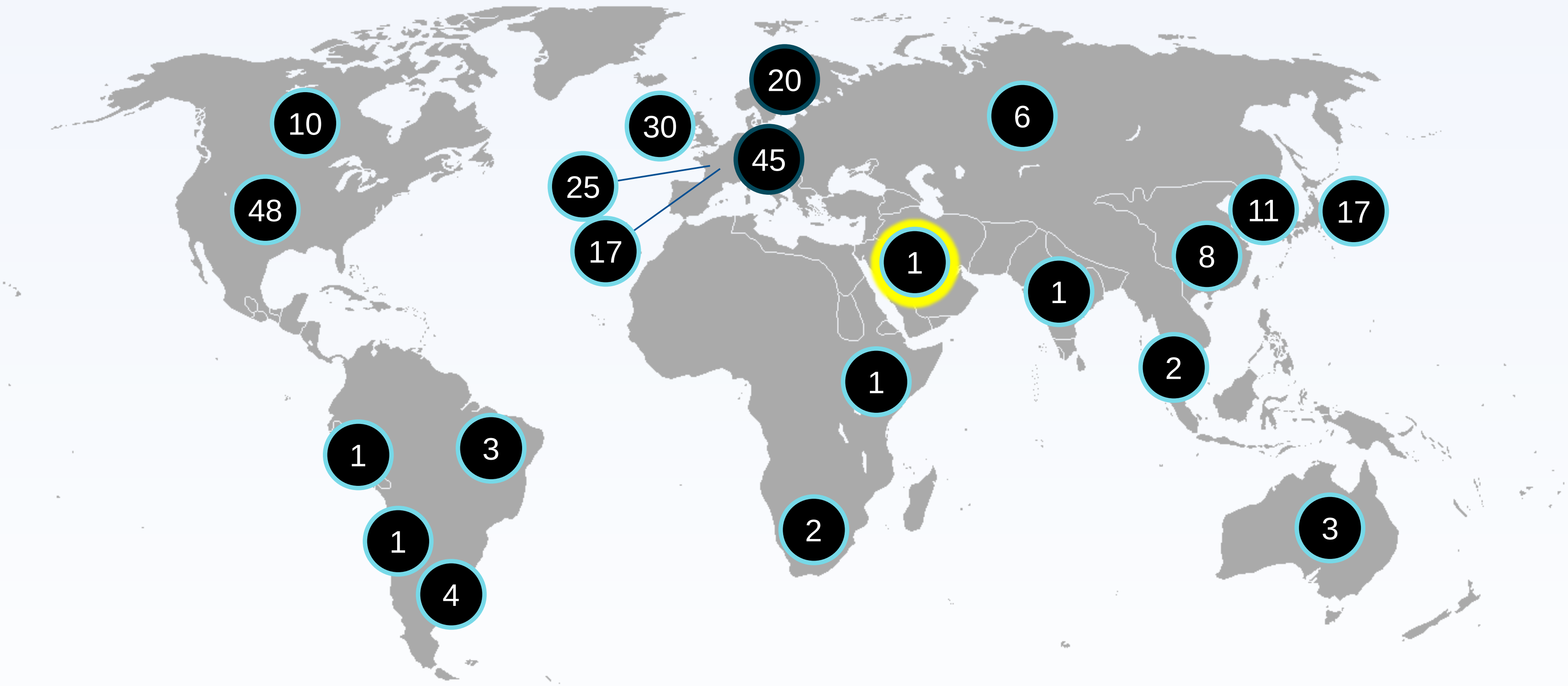
ICRP Main Commission

Chair	**Claire Cousins**	*UK*
Vice-Chair	**Jacques Lochard**	*France*
	Simon Bouffler	*UK*
	Kunwoo Cho	*South Korea*
Committee 3 Chair	**Kimberly Applegate**	*USA*
Committee 4 Chair	**Donald Cool**	*USA*
Committee 2 Chair	**John Harrison**	*UK*
	Michiaki Kai	*Japan*
	Carl-Magnus Larsson	*Australia*
	Dominique Laurier	*France*
	Senlin Liu	*China*
	Sergey Romanov	*Russia*
Committee 1 Chair	**Werner Rühm**	*Germany*
Scientific Secretary	**Christopher Clement**	*Canada*

German Members

- **Werner Rühm** (MC, C1, TG91, TG104)
- **Christian Streffer** (MCE, TG79)
- **Hans-Georg Menzel** (TG79)
- **Augusto Giussani** (C2, TG36, TG95)
- **Reinhard Loose** (C3)
- **Nina Petoussi-Henss** (C2, TG90, TG96, TG103)
- **Alexander Ulanowski** (C2, TG74)
- **Frank Wissmann** (C2)
- **Renate Czarwinski** (TG94)
- **Bernd Grosche** (TG91)
- **Michael Lassmann** (TG100)
- **Dietmar Nosske** (TG36)
- **Gerhard Pröhl** (TG98)
- **Helmut Schlattl** (TG90, TG96)
- **Linda Walsh** (TG91)
- **Maria Zankl** (TG96, TG103)
- **Claudia E. Rübe** (C3)
- **Norbert Bischof** (IEC/TC62 contact)
- **Bernd Lorenz** (ENISS contact)

Membership



256 members from 35 countries

as of 2017 July 21, including liaison organization primary contacts

Formal Relations

Conference of Radiation Control Program Directors, Inc. CRCPD Est. 1968

European ALARA Network

ENISS

NERIS

EURADOS

EUROPEAN RADIOECOLOGY ALLIANCE

HERCA HEADS OF THE EUROPEAN RADIOLOGICAL PROTECTION COMPETENT AUTHORITIES

FORO

IEC TC62 Medical

IEC TC45 Nuclear

industriall global union INWUN

ISOE Information System on Occupational Exposure

IAEA

ICRU

ILO

IRPA

MELODI

NCRP SCIENTIFIC AUTHORITY SINCE 1929 • CONGRESSIONALLY CHARTERED •

NEA Nuclear Energy Agency

UNSCEAR

World Health Organization

World Nuclear Association

ICRP

C1 Radiation Effects

C2 Doses from Radiation Exposure

C3 Radiological Protection in Medicine
and protection in veterinary medicine

C4 Application of the Recommendations

C5 Environment: canceled (task of all committees)

ICRP C3

Members

Chair Kimberly Applegate (USA)

Vice-Chair Colin Martin (UK)

Secretary Madan Rehani (USA)

Jamila Salem Alsuwaidi (UAE)

Lodewijk Van Bladel (Belgium)

Michel Bourguignon (France)

Marie-Claire Cantone (Italy)

Sandor Demeter (Canada)

Makoto Hosono (Japan)

Keon Kang (Korea)

Reinhard Loose (Germany)

Josep Martí-Climent (Spain)

Yantao Niu (China)

William Small (USA)

David Sutton (UK)

Claudia E. Rübe (Germany)

ICRP Task Groups

TG36 **Radiopharmaceuticals**

TG64 Cancer Risk from Alpha Emitters

TG72 RBE and Reference Animals and Plants

TG76 NORM

TG79 **Effective Dose as a Risk Related RP Quantity**

TG89 **Occupational RP in Brachytherapy**

TG90 Age-dependent Dose Coefficients for External Exposures to Environmental Sources

TG91 **Radiation Risk Inference at Low-dose and Low-dose Rate Exposure for Radiological Protection Purposes**

TG92 **Terminology and Definitions**

TG93 Update of Publications 109 and 111

TG94 Ethics of RP

TG95 **Internal Dose Coefficients**

TG97 Surface and Near Surface Disposal

TG98 Contaminated Sites

TG99 Reference Animals and Plants Monographs

TG100 ICRP Reflection Group on NCRP CC1

TG101 **RP in Radiopharmaceutical Therapy**

TG102 Detriment Calculation Methodology

TG103 **Mesh-type Reference Phantoms**

TG104 Integration of Protection of People and of the Environment

TG105 Considering the Environment when Applying the System of RP

TG106 Mobile High Activity Sources

TG107 **Radiological Protection of the Patient in Veterinary Medicine**

TG108 **Optimization in Digital Radiography, Fluoroscopy, and CT in Medicine**

TG109 **Ethics in Radiological Protection for Medical Diagnosis and Treatment**

TG110 Radiological Protection for Occupational and Public Exposure in Veterinary Practice

knapp 50% medizinische Inhalte

Publications expected in 2019

- **Occupational Intakes of Radionuclides: Part 4 (TG95) + data**
  - Consultation completed (Jul–Sep 2016)
  - Publication approved in principle for final publication subject to postal ballot following final QA of data (May 2017 - Lima)
  - Submission of final manuscript (2018 Q4)
  - To be published (2019 Q1)

- **The Use of Effective Dose as a Radiological Protection Quantity: TG79**
  - Consultation completed 2018 Aug
  - To be published (2019 Q3)

- **Radiological Protection in Therapy with Radiopharmaceuticals: TG101**
  - Consultation completed 2018 Sep
  - To be published (2019 Q4)

icrp public consultation -Startp × | ICRPaedia × | ICRP × | +

icrpaedia.org/Main_Page

ICRPÆDIA THE SYSTEM OF RADIOLOGICAL PROTECTION

Search

ICRPÆDIA THE SYSTEM OF RADIOLOGICAL PROTECTION

Welcome to **ICRPædia**, the home for information on The System of Radiological Protection developed by The International Commission on Radiological Protection (ICRP). ICRPædia is the work of ICRP members.

The System of Radiological Protection is the basis of all standards, regulations, and practice of radiological protection world-wide, for the protection of patients, workers, the public, and the environment from ionising radiation.

The definitive reference for the recommendations and guidance of ICRP is the dedicated journal Annals of the ICRP.

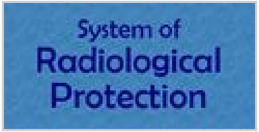
ICRPædia is still in it's infancy, and growing. Come back regularly to see what's new.

Wondering where to start?

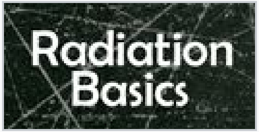
- Dive right in to an overview of The System of
- Go to one of our ICRPædia Guides
- Try a search
- Check out one of the hot topics (below)

You can always come back to this page by clickin
left corner of the page.

Hot Topics on ICRPædia



ICRPædia Guide to the System of Radiological Protection



ICRPædia Guide to the Basics of Ionising Radiation

Radiological Protection in Healthcare

ICRPædia Guide to Radon


Cosmic Radiation in Aviation

ICRP and ICRU hosted a two-day colloquium in Stockholm on 17-18 October 2018

Celebrating our 90th year, we've launched a drive to make the *Annals of the ICRP* free

Free the Annals: Together we did it!

On 15 May 2019, we announced the success of the Free the Annals initiative.

This marks a permanent change to the way the world access Annals of the ICRP. **Once a publication has been available for two years, it will become free to download. This will take effect at the end of 2019, when all of issues up to 2017 (up to ICRP *Publication 137*) will be freely available to download.** Those who need access to the very latest can maintain a subscription or buy individual issues.

Before: 1928 - 1988 => 60 years free download

ICRP 103

Die Empfehlungen der Internationalen Strahlenschutzkommission (ICRP) von 2007

ICRP-Veröffentlichung 103
Verabschiedet im März 2007

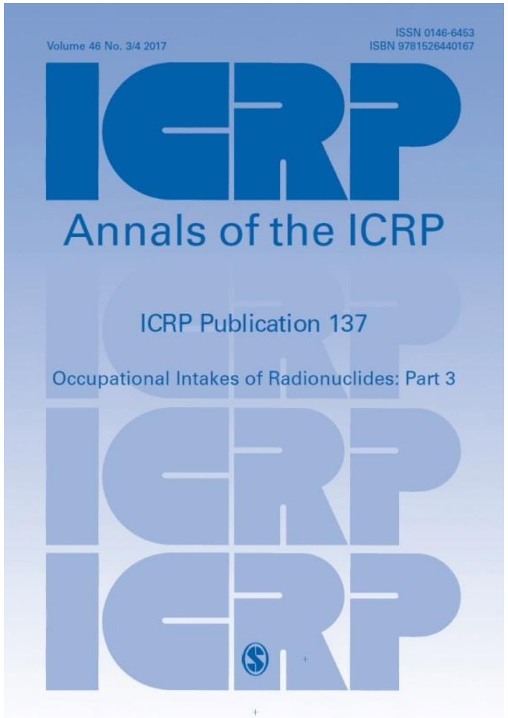
Veröffentlichungen der
Internationalen Strahlenschutzkommission

Deutsche Ausgabe herausgegeben vom Bundesamt für Strahlenschutz

Die neuen Empfehlungen der Internationalen Strahlenschutzkommission wurden am 21. März 2007 in Essen, Deutschland, angenommen, nachdem **acht Jahre** lang weltweit Diskussionen mit Wissenschaftlern, Behörden und Anwendern geführt worden waren.

Vorwort der SSK zur Deutschen Übersetzung der ICRP 103

- Die Empfehlungen sind eine Weiterentwicklung des bisherigen **verfahrensbasierten** Schutzansatzes, der von Tätigkeiten und Interventionen ausging, zu einem Ansatz, der auf der jeweils vorliegenden **Expositionssituation** basiert.
- Der neue Ansatz sieht geplante Expositionssituationen **(z.B. Medizin)** sowie Notfall- und bestehende Expositionssituationen vor.
- Die grundlegenden Prinzipien der **Rechtfertigung** und **Optimierung** des Strahlenschutzes werden betont. Sie sind auf alle diese Situationen anzuwenden.
- Bei allen regulierten Strahlenquellen bleiben die **aktuellen Grenzwerte der effektiven Dosis und der Organdosen** für geplante Expositionssituationen bestehen.
- Der Grundsatz der **Optimierung** des Schutzes wird bekräftigt. Er soll auf alle Expositionssituationen in ähnlicher Weise angewendet werden.
- Die Empfehlungen enthalten auch einen Ansatz, um einen Rahmen für den **Strahlenschutz der Umwelt** zu entwickeln.

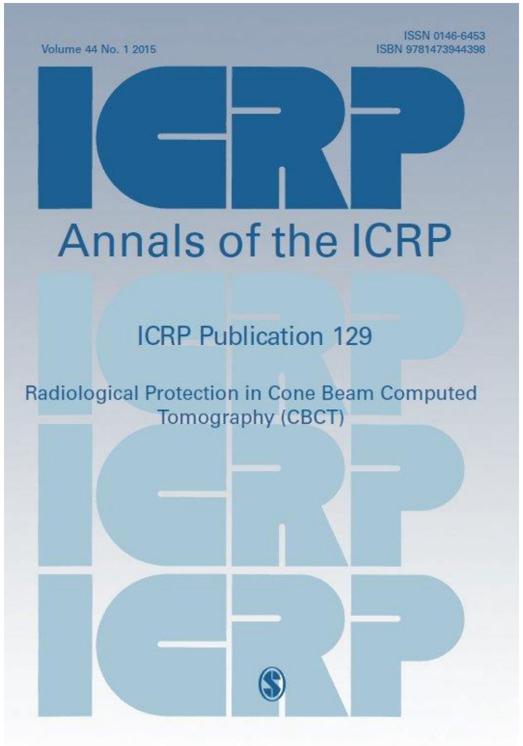


Occupational Intakes of Radionuclides: Part 4
ICRP Publication xx
Consultation closed, to be published 2019 ?

Occupational Intakes of Radionuclides: Part 3
ICRP Publication 137
Ann. ICRP 46(3/4), 2017
F. Paquet, M.R. Bailey, R.W. Leggett, J. Lipsztein, J. Marsh, T.P. Fell, T. Smith, D. Nosske, K.F. Eckerman, V. Berkovski, E. Blanchardon, D. Gregoratto, J.D. Harrison

Occupational Intakes of Radionuclides: Part 2
ICRP Publication 134
Ann. ICRP 45(3/4), 1–352, 2016
F. Paquet, M.R. Bailey, R.W. Leggett, J. Lipsztein, T.P. Fell,T. Smith, D. Nosske, K.F. Eckerman, V. Berkovski, E. Ansoborlo,A. Giussani, W.E. Bolch, J.D. Harrison

Occupational Intakes of Radionuclides: Part 1
ICRP Publication 130
Ann. ICRP 44(2), 2015
F. Paquet, G. Etherington, M.R. Bailey, R.W. Leggett, J. Lipsztein, W. Bolch, K.F. Eckerman, J.D. Harrison



Radiological Protection in Cone Beam Computed Tomography (CBCT)
ICRP Publication 129

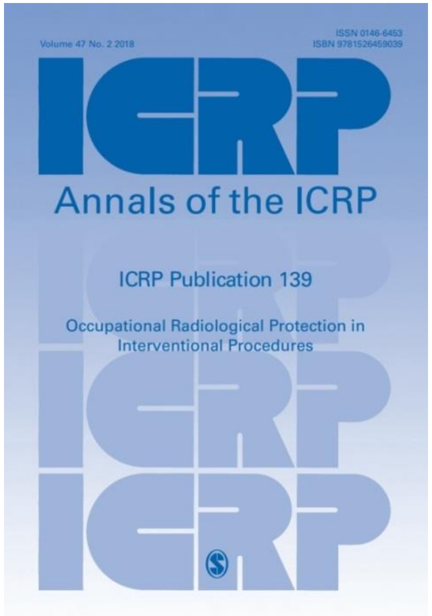
Ann. ICRP 44(1), 2015

M.M. Rehani, R. Gupta, S. Bartling, G.C. Sharp, R. Pauwels, T. Berris, J.M. Boone

SSK:

Cone Beam-Computertomografie (CBCT) und Mammatomosynthese

Verabschiedet in der 277. Sitzung der Strahlenschutzkommission am 02./03.07.2015

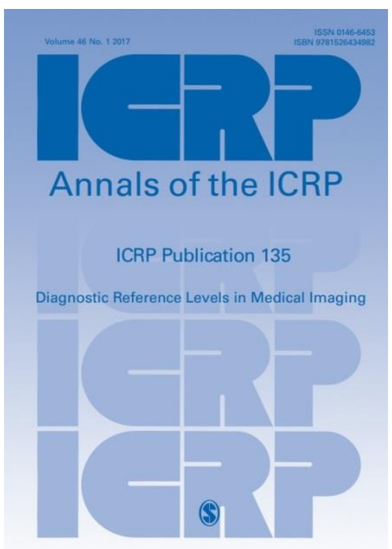


Occupational Radiological Protection in Interventional Procedures
ICRP Publication 139

Ann. ICRP 47(2), 2018

P. Ortiz Lopez, L.T. Dauer, R. Loose, C.J. Martin, D.L. Miller, E. Vaño, M. Doruff, R. Padovani, G. Massera, C. Yoder

Amtliches Dosimeter: über oder unter der Bleischürze?
Zusätzliche Augenlinsendosimetrie?
Patienteninformation über deterministische Risiken
Erkennung von Überexpositionen (Ereignissen)



Diagnostic Reference Levels in Medical Imaging
ICRP Publication 135

Ann. ICRP 46(1), 2017

E. Vaño, D.L. Miller, C.J. Martin, M.M. Rehani, K. Kang, M. Rosenstein, P. Ortiz-Lopez, S. Mattsson, R. Padovani, A. Rogers

Weitere ICRP Publikationen aus dem Bereich Medizin

ICRP Publication 120

Radiological Protection in Cardiology

ICRP Publication 127

Radiological Protection in Ion Beam Radiotherapy

ICRP Publication 121

Radiological Protection in Paediatric Diagnostic and Interventional Radiology

ICRP Publication 128

Radiation Dose to Patients from Radiopharmaceuticals: A Compendium of Current Information Related to Frequently Used Substances

ICRP Publication 126

Radiological Protection against Radon Exposure

Wo finden sich in der Literatur Hinweise auf ICRP, IAEA, UNSCEAR ?

Titel / Abstract / Text	ICRP	IAEA	UNSCEAR
SSK.DE	49x, 3x Medizin, 1x occupational	4x occupational 1x Medizin	6x, 1x Strahlen-risiko
PubMed (alle Zeitschriften)	2262x	1422x	307x
PubMed (Radiology)	6x	1x	0x
PubMed (European Radiology)	5x	1x	0x
PubMed (EJ Nucl. Medicine)	21x	4x	0x
PubMed (RöFo)	14x	0x	0x
PubMed (Nuklearmedizin)	15x	1x	0x

Die letzten 20 ICRP Publikationen

Publication	Title
ICRP 2017 Proceedings	Proceedings of the Fourth International Symposium on the System of Radiological Protection
ICRP Publication 139	Occupational Radiological Protection i
ICRP Publication 138	Ethical Foundations of the System of F
ICRP Publication 137	Occupational Intakes of Radionuclides
ICRP Publication 136	Dose Coefficients for Non-human Biot
ICRP Publication 135	Diagnostic Reference Levels in Medic
ICRP Fukushima Proceedings	Proceedings of the International Works
ICRP Publication 134	Occupational Intakes of Radionuclides: Part 2
ICRP Publication 133	The ICRP Computational Framework for Internal Dose Assessment for Reference Adults: Specific Absorbed Fractions
ICRP Publication 132	Radiological Protection from Cosmic Radiation in Aviation
ICRP 2015 Proceedings	Proceedings of the Third International Symposium on the System of Radiological Protection
ICRP Publication 131	Stem Cell Biology with Respect to Carcinogenesis Aspects of Radiological Protection
ICRP Publication 130	Occupational Intakes of Radionuclides: Part 1
ICRP Publication 129	Radiological Protection in Cone Beam Computed Tomography (CBCT)
ICRP Publication 128	Radiation Dose to Patients from Radiopharmaceuticals: A Compendium of Current Information Related to Frequently Used Substances
ICRP 2013 Proceedings	Proceedings of the Second International Symposium on the System of Radiological Protection
ICRP Publication 127	Radiological Protection in Ion Beam Radiotherapy
ICRP Publication 126	Radiological Protection against Radon Exposure
ICRP Publication 125	Radiological Protection in Security Screening
ICRP Publication 124	Protection of the Environment under Different Exposure Situations
ICRP Publication 123	Assessment of Radiation Exposure of Astronauts in Space
ICRP Publication 122	Radiological Protection in Geological Disposal of Long-lived Solid Radioactive Waste
ICRP Publication 121	Radiological Protection in Paediatric Diagnostic and Interventional Radiology
ICRP Publication 120	Radiological Protection in Cardiology
ICRP 2011 Proceedings	Proceedings of the First ICRP Symposium on the International System of Radiological Protection

Proceedings of the Fourth International Symposium on the System of Radiological Protection, Ann. ICRP 47(3/4), 2018
(ähnlich SSK Klausurtagung oder Art.31 Seminar)

Kommentierungsfenster: 90 Tage

http://www.icrp.org/consultations.asp

Current Consultations

ICRP routinely solicits comments on most draft documents prior to publication, with the exception of those that are basically compilations of computed values such as specific absorbed fraction values or dose conversion factors.

2019-06-17

Radiological Protection of People and the Environment in the Event of a Large Nuclear Accident

Draft Document

Submit your comment before: September 20, 2019

Submit comment | Comments | More info

Completed Consultations

Completed March 1, 2019

Radiation Weighting for Reference Animals and Plants

Draft Document Comments

Completed February 22, 2019

Radiological Protection from Naturally Occurring Radioactive Material (NORM) in Industrial Processes

Draft Document Comments

Completed December 14, 2018

Adult Mesh-type Reference Computational Phantoms

Draft Document Comments

Completed November 9, 2018

Paediatric Reference Computational Phantoms

Draft Document Comments

Completed October 12, 2018

Dose Coefficients for External Exposures to Environmental Sources

Draft Document Comments

Completed September 21, 2018

Radiological Protection in Therapy with Radiopharmaceuticals

Draft Document Comments

Completed August 3, 2018

The Use of Effective Dose as a Radiological Protection Quantity

Draft Document Comments

Completed November 3, 2017

Operational Quantities for External Radiation Exposure

Draft Document Comments

Completed July 21, 2017

Ethical Foundations of the System of Radiological Protection

Draft Document Comments

Comments

	Name	Organisation
View	KANNA MITSUTA	Friends of the Earth Japan
View	toch	none
View	Ichiro Yamaguchi	National Institute of Public Health
View	Patrick Bosold	Self
View	Dr. Alex Rosen	IPPNW Germany
View	Tito Galdo	Mr.
View	Barbara Wefing	None
View	Laura Hanks	none
View	Scott Sklar	The Stella Group, Ltd.
View	Michael Crowden	
View	Robert Travaline	N/A
View	Sandra Couch	Miss
View	Stephen and Robin Newberg	Mr
View	Katherine O'Sullivan	Inwood Preservation
View	Tom Hougham	myself
View	Kevin Rolfes	n/a
View	Jane Danjin	Individual
View	Denise Lytle	n/a
View	Caryn Graves	Beyond Nuclear
View	Stephen Gliva	n/a
View	Sandy Sanders	sandys.art
View	Jim Lykins	none
View	Cindy Folkers	Beyond Nuclear
View	Fumio MATSUDA	Nuclear Regulation Authority, Japan
View	Majia	Individual
View	kosaku yamada	antiwarsenior group
View	Steven M Baker, Ph.D.	Umtanum Enterprise
View	Steven M Baker, Ph.D.	Planning Committee for the international conference 'Applicability of Radiation-Response Models to
View	Alan Fellman, Ph.D., C.H.P.	NV5 Dade Moeller

Friends of the Earth Japan

IPPNW Germany

29 Kommentare

Frist bis 20.9.2019

Inwood Preservation

Beyond Nuclear

Radiological Protection in Therapy with Radiopharmaceuticals

The consultation period ended September 21, 2018

6 Kommentare

Draft Document

Comments

	Name	Organisation
View	Jonathan Gear	EANM Dosimetry Committee
View	Medical Exposure Group - Louise Fraser	Public Health England
View	Mauricio Alvarez	Swedish Radiation Safety Authority
View	Alfred Stewart Whitley	International Society of Radigraphers and Radiological Technologists
View	Staff of IRSN	IRSN (France)
View	Moses F Katumba	University of Botswana

Adult Mesh-type Reference Computational Phantoms

The consultation period ended December 14, 2018

Draft Document

Comments

	Name	Organisation	Date
View	Richard Kramer	Universidade Federal de Pernambuco	Fri Dec 7 20:36:57 UTC+0100 2018

Paediatric Reference Computational Phantoms

The consultation period ended November 9, 2018

Draft Document

Comments

	Name	Organisation	Date
View	Francesco Ria	Carl E. Ravin Advanced Imaging Labs, Duke University Health System, Durham, NC 27710 (USA)	Mon Nov 5 17:59:26 UTC+0100 2018

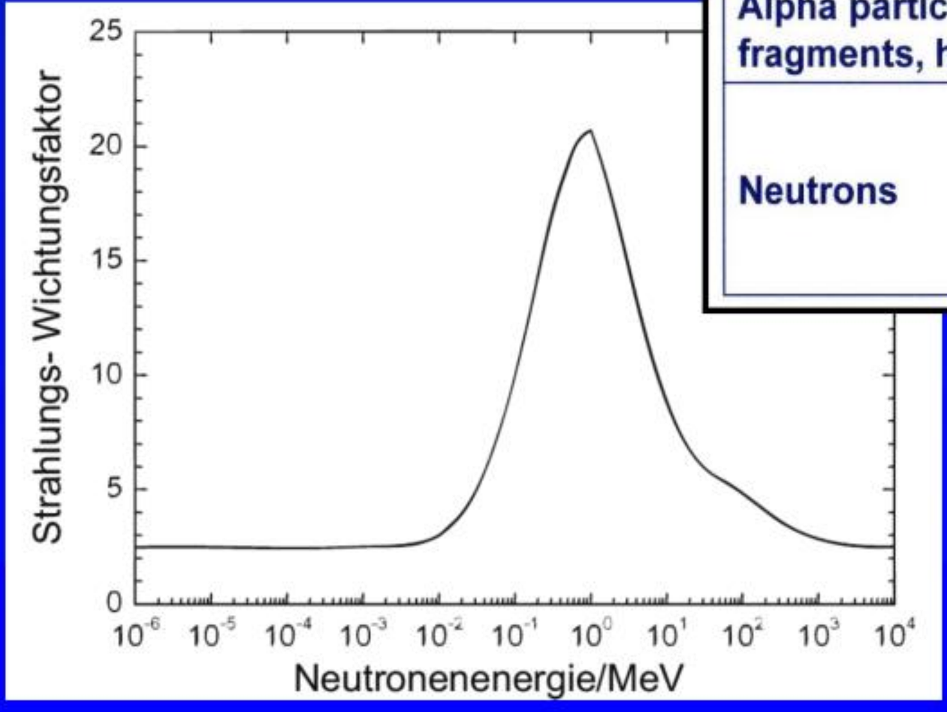
The Use of Effective Dose as a Radiological Protection Quantity

58 Kommentare, davon 6 aus Deutschland

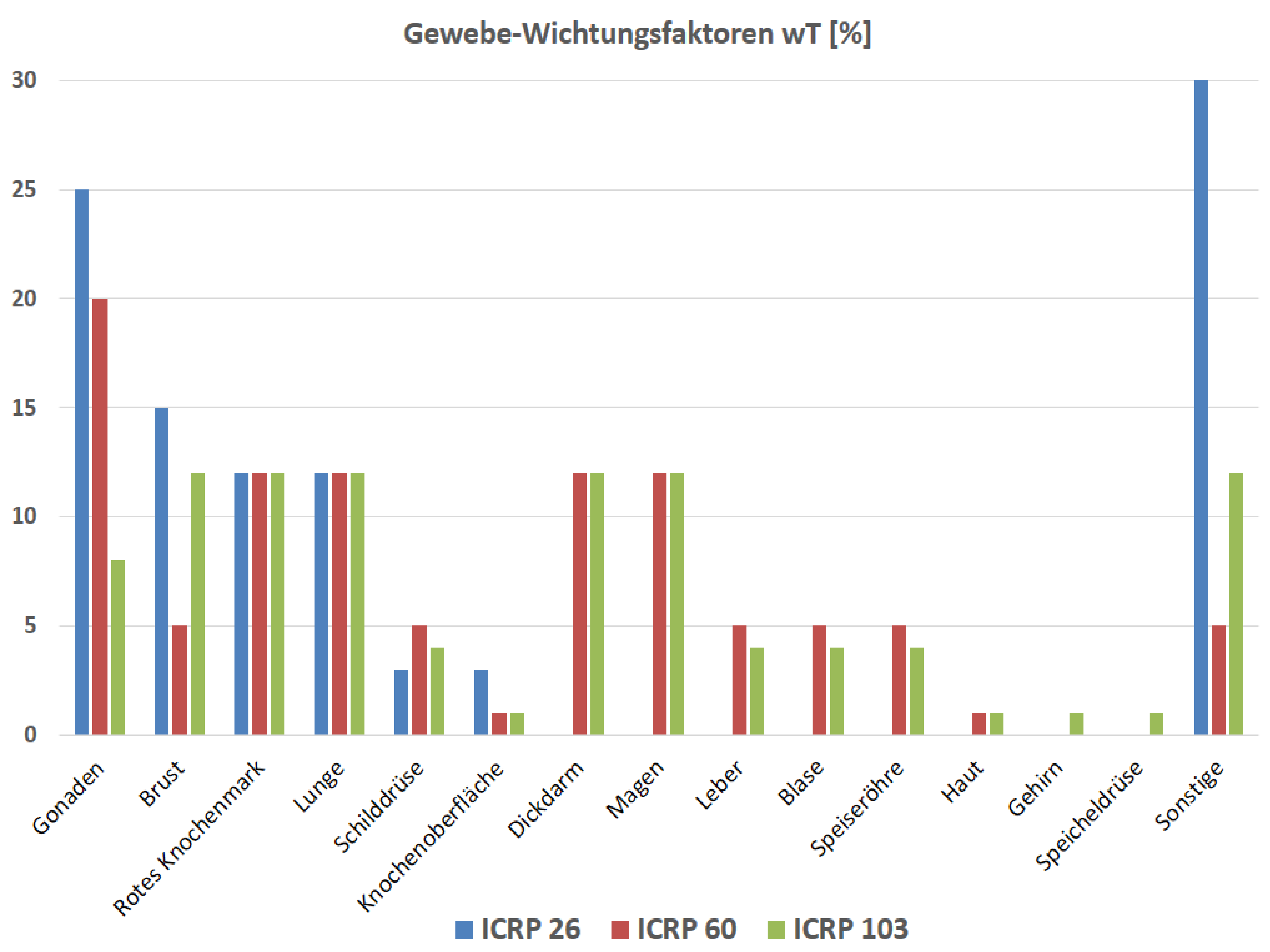
The consultation period ended August 3, 2018

ICRP 103: Neue Strahlungswichtungsfaktoren w_R

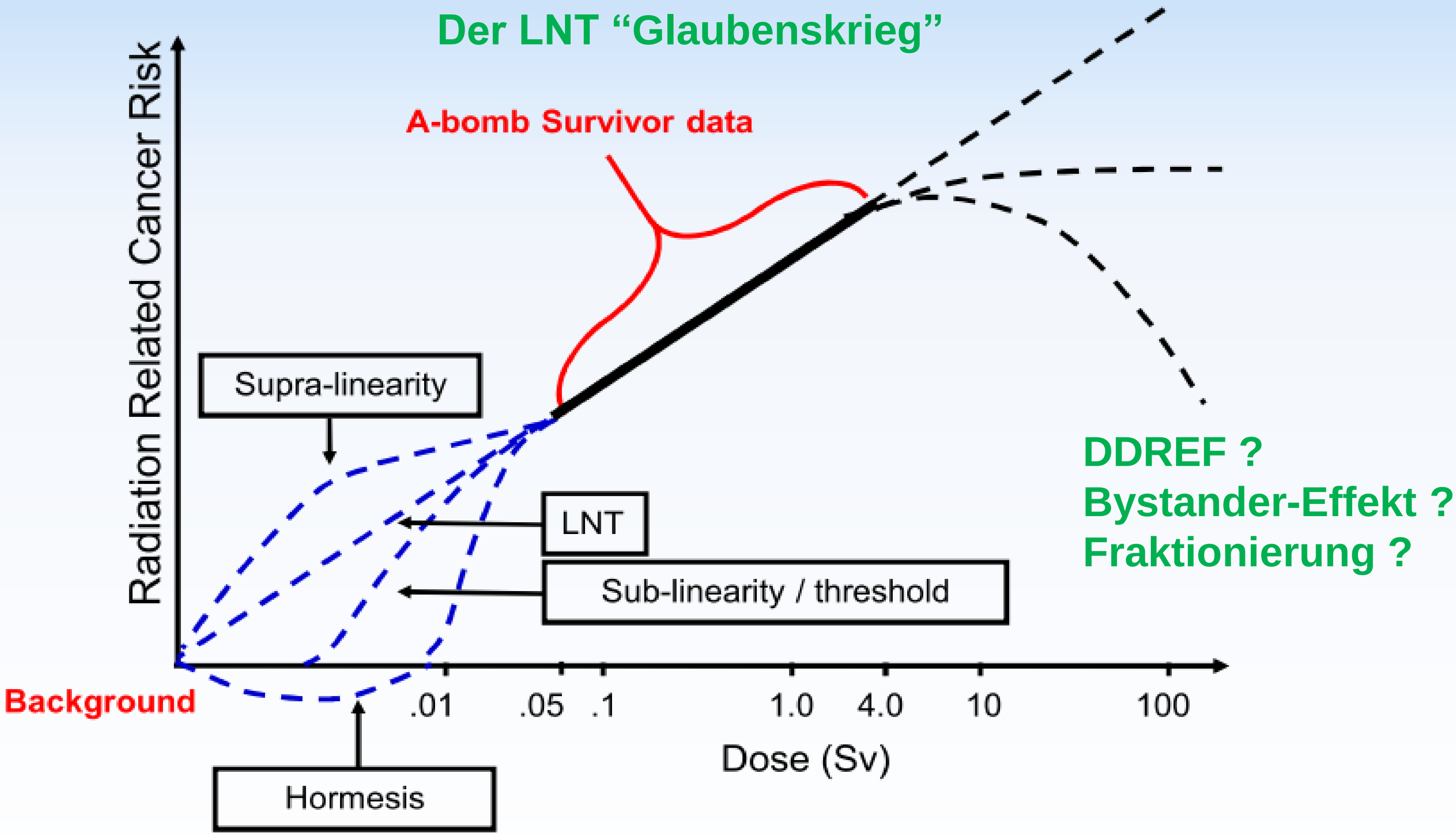
Type and energy range	Publication 60	2007
Photons, all energies	1	1
Electrons and muons, all energies	1	1
Protons	5	2
Alpha particles, fission fragments, heavy nuclei	20	20
Neutrons	Stepwise function	Continuous function <10 keV, 2.5



	Gewebe-Wichtungsfaktoren wT [%]		
	ICRP 26	**ICRP 60**	**ICRP 103**
Gonaden	25	20	8
Brust	15	5	12
Rotes Knochenmark	12	12	12
Lunge	12	12	12
Schilddrüse	3	5	4
Knochenoberfläche	3	1	1
Dickdarm		12	12
Magen		12	12
Leber		5	4
Blase		5	4
Speiseröhre		5	4
Haut		1	1
Gehirn			1
Speicheldrüse			1
Sonstige	30	5	12
Summe	**100**	**100**	**100**


Gewebe-Wichtungsfaktoren wT [%]
30
25
20
15
10
5
0
Gonaden
Brust
Rotes Knochenmark
Lunge
Schilddrüse
Knochenoberfläche
Dickdarm
Magen
Leber
Blase
Speiseröhre
Haut
Gehirn
Speicheldrüse
Sonstige
ICRP 26
ICRP 60
ICRP 103

The dilemma for radiation protection: what is the scientific basis for radiation standards to protect the public from exposures to low levels of ionizing radiation (<0 100 mSv) where there are considerable uncertainties in the epidemiological data.



ICRP INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

Recommendation of the German Commission on Radiological Protection **2014**

Based on current scientific findings, the German Commission on Radiological Protection (Strahlenschutzkommission, SSK) no longer considers justifications for the DDREF used in radiation protection as being sufficient.

ICRP-TG 91: Werner Rühm (Chair C1); Helmholtz Center Munich, Germany

UNSCEAR has recently re-evaluated all the available information using Bayesian techniques and has estimated risk coefficients that are similar to the ICRP estimates using high doses and a DDREF value of 2. However, in their 2006 report the BEIR committee (BEIR VII) also using a Bayesian approach and including animal data recommended a DDREF of 1.5. **2016**

DDREF

ICRP-99 Draft for Public Consultation

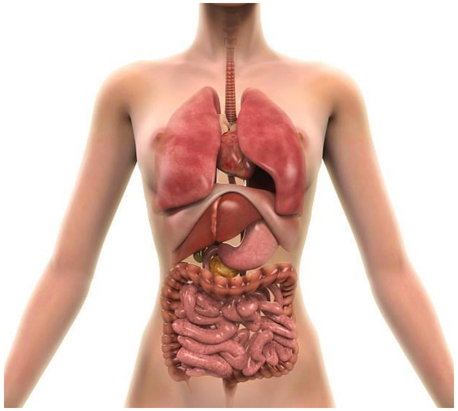
Low-dose Extrapolation of Radiation-related Cancer Risk

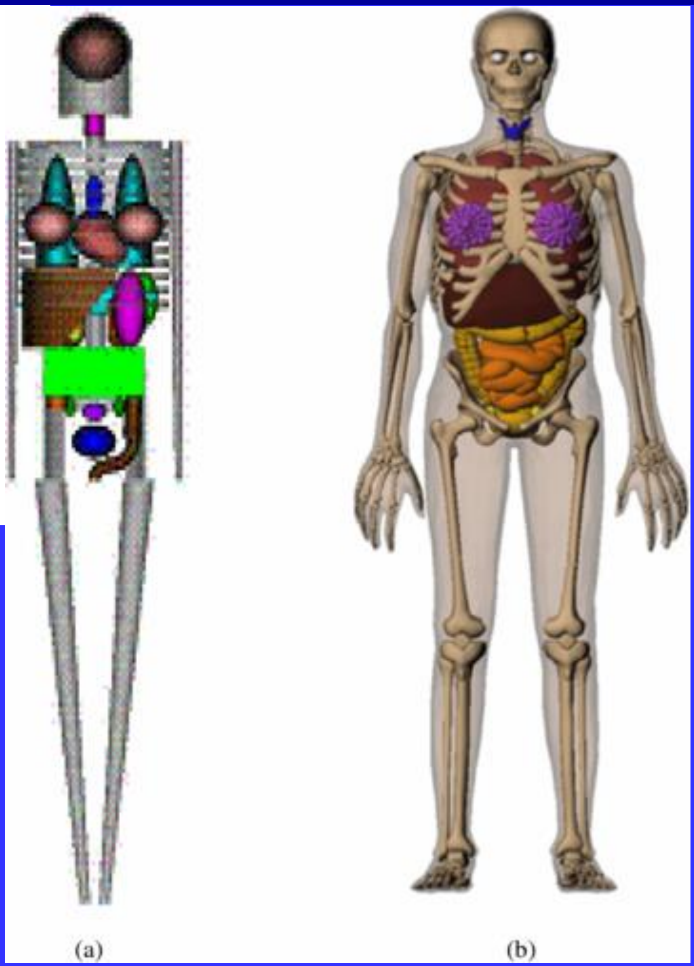
Draft document: Recommendations

Submitted by Lynne Fairobent, AAPM - American Association of Physicists in Medicine
Commenting on behalf of the organisation

. . . the probability of effects at very low doses such as are received from natural background is so small that it may never be possible to prove or disprove the validity of the LNT assumption. Acceptance of LNT is more a matter of conviction than of science;

TG79: Use of effective dose as a radiological protection quantity.

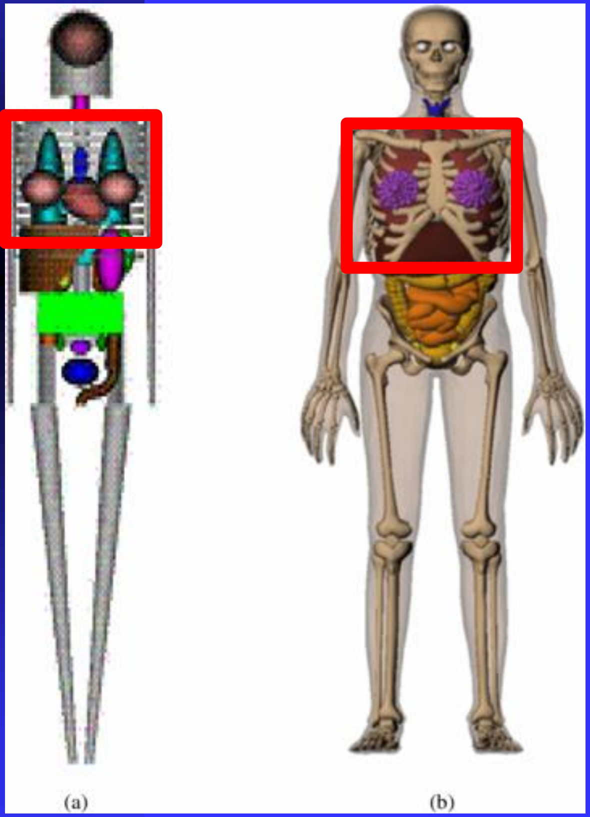




Colin J Martin

Calculation of Effective Dose

Monte Carlo computer simulations are used to enable organ doses to be calculated from external exposures



There are inherent uncertainties in the calculations

- Organ shape and geometry ±40%
- Tissue dose to organs in beam ±15%
- Doses to organs partially in beam ±40%
- **Accuracy of effective dose is to nearest ±50% as relative indicator of risk**

- **Uncertainties in individual organ doses are much greater**

Comments from consultation from every conceivable standpoint!

Comments

- This is an excellent document but clarity may be needed over the examples of justification and optimisation.
- Effective dose should be used in medical practice as an approximate indicator of risk.
- The use of effective dose should be discontinued because it is based on the assumptions of the LNT model and the equivalence of acute and chronic exposures
- Effective dose is useless for justification of radiological practices and will place an excessive burden on clinicians.

Zusammenfassung zur effektiven Dosis:

(C3 meeting Peking, November 2018)

- Die effektive Dosis beschreibt das Strahlenrisiko mit **einer einzigen Dosisgröße**
- Die effektive Dosis ist ein nützlicher Indikator für das Ausmaß einer Schädigung durch eine Exposition, weist jedoch **inhärente Unsicherheiten** auf
- In **Überweisungskriterien** und **Begründungen** können generische Werte der effektiven Dosis verwendet werden, jedoch müssen Alter, Geschlecht und Gesundheit des Patienten berücksichtigt werden
- Die effektive Dosis kann zur Abschätzung eines **Schadensrisikos** in der Forschung, zur Meldung von Vorfällen und zur Dosisabschätzung für helfende Personen verwendet werden
- Die effektive Dosis bietet die beste Option zur Quantifizierung der Dosis in **Erklärungen für Ärzte und die Öffentlichkeit**

Rechtfertigung in der Medizin

Level I: Generelle Rechtfertigung der Anwendung ionisierender Strahlung am Menschen ist gegeben
(wird als gegeben hingenommen und nicht weiter diskutiert)

Level II: Rechtfertigung von Untersuchungsverfahren bei Verdacht oder Vorliegen spezifischer Erkrankungen
Bsp.: Orientierungshilfe, Med. Leitlinien, SOP‘s, medico-legale Anwendung

Level III: Individuelle Rechtfertigung bei einem bestimmten Patienten
=> Optimierung, ggf. Modifikation oder Abweichen von Level II Rechtfertigung

Rechtfertigung in der Medizin

Level II: Rechtfertigung von Untersuchungsverfahren bei Verdacht oder Vorliegen spezifischer Erkrankungen

Wird teilweise von Ärztlichen Stellen fälschlich als individuelle Level III Rechtfertigung interpretiert

Version 2019 von SSK angenommen
Englische Übersetzung fertig
Mobile App in Vorbereitung
HTML Version für klinische IT-Systeme in Vorbereitung

DKG KREBSGESELLSCHAFT — Deutsche Krebshilfe HELFEN. FORSCHEN. INFORMIEREN. — AWMF

Interdisziplinäre S3-Leitlinie für die Früherkennung, Diagnostik, Therapie und Nachsorge des Mammakarzinoms

Langversion 4.0 – Dezember 2017
AWMF-Registernummer: 032-045OL

Rechtfertigung Level II
Orientierungshilfe 2019

C. Wirbelsäule

Klinische Fragestellung	Bildgebendes Untersuchungsverfahren	Grad der Empfehlung	Kommentar
Lendenwirbelsäule (LWS)			
C6 Rückenschmerzen			
a) Akute Rückenschmerzen **ohne** neurologische Symptomatik oder andere Warnsymptome	Rö	N	Knöcherne Veränderungen sind in der Regel nicht Ursache der Schmerzen
	MRT	N	Liefert keinen Beitrag zur Abklärung akuter Rückenschmerzen
	CT	N	Liefert keinen Beitrag zur Abklärung akuter Rückenschmerzen
b) Akute Rückenschmerzen **mit** neurologischer Symptomatik	MRT	P	Verfahren der ersten Wahl
	CT	P	Wenn MRT nicht verfügbar oder kontraindiziert
	Rö	P	Ausschluss einer manifesten Osteoporose, falls MRT und CT nicht verfügbar
	Nuk	S	Nur falls MRT/CT nicht konklusiv, z. B. zum Nachweis entzündlicher Ursachen
c) Chronische oder therapierefraktäre Rückenschmerzen ohne neurologische Symptomatik, sofern Infektparameter	Rö	W	Zum Nachweis struktureller Knochenveränderungen. Mit Vorsicht zu bewerten, da häufig nicht Ursache für die Schmerzen
	MRT	W	Bei therapierefraktären Beschwerden
	CT	W	Nur, wenn MRT nicht verfügbar, oder bei Kontraindikation für MRT

Typische effektive Dosen radiologischer und nuklearmedizinischer Untersuchungsverfahren für einen Standardpatienten

Diagnoseverfahren	Typische* effektive Dosis (mSv)	Anzahl von Untersuchungen des Thorax p.a., die zu einer vergleichbaren effektiven Dosis führt	Ungefährer Zeitraum der natürlichen Strahlenexposition, der zu einer vergleichbaren effektiven Dosis führt [1]
Brustwirbelsäule a.p./p.a.	0,14	8	3,5 Wochen
Thorax (p.a.-Aufnahme)	0,018	1,0	3 Tage
Thorax in 2 Ebenen	0,07	3,7	1,5 Wochen
Abdomen a.p./p.a.	0,34	20	2 Monate
Lendenwirbelsäule a.p./p.a.	0,28	16	1,6 Monate
Lendenwirbelsäule lat.	0,26	15	1,5 Monate
Hüfte in einer Ebene	0,06	3,5	1,5 Wochen
Becken a.p./p.a.	0,27	15	1,5 Monate
Mammografie bds. in 2 Ebenen [4]	0,36	20	2 Monate
CT-Untersuchungen			
CT – Hirnschädel	1,6	90	9 Monate
CT – Gesichtsschädel	0,42	23	2,5 Monate
CT – Nasennebenhöhlen	0,28	16	1,6 Monate
CT – Hals	2,4	130	1 Jahr
CT – HWS-Knochen	2,3	130	1 Jahr
CT – Lunge (Hochkontrastdarstellung)	1,3	70	7 Monate
CT – Thorax	5,1	280	2,4 Jahre
CT – Thorax und Oberbauch	6,3	350	3 Jahre
CT – Abdomen und Becken	11	600	5,2 Jahre

Rechtfertigung und Optimierung in der Medizin

Level III: Individuelle Rechtfertigung bei einem bestimmten Patienten. **Ist ein Verfahren, das nach Level II gerechtfertigt wäre für diesen Patienten geeignet?**

Technische Optimierung (Dosismodulation, iterative Rekonstruktion neue Detektoren, virtuelle Raster, KI etc.)

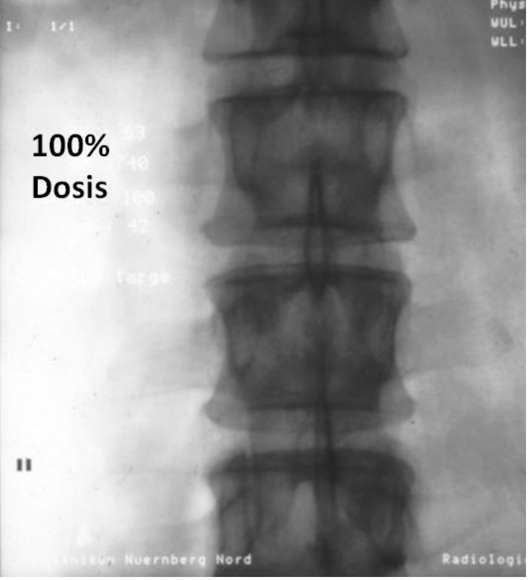
Optimierung einer Untersuchung

- **Untersuchungs- oder Scanbereich**
- **Anzahl der Aufnahmen / Serien**
- **Dosis je nach Fragestellung**

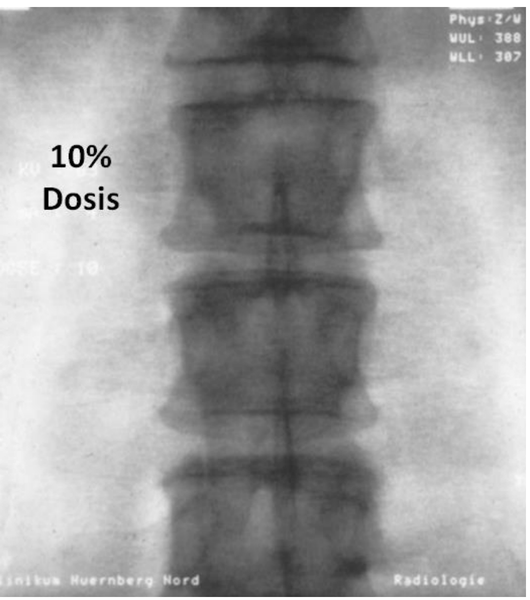
  CT Harnleitersteine, CT Sinusitis, CT Lungenembolie,
  CT Wirbelsäule Knochen ⇔ Weichteile, CT Anzahl der Phasen,
  HRCT Lunge, Metallimplantate

EUCLID – European Study on Clinical Diagnostic Reference Levels for X-ray Medical Imaging

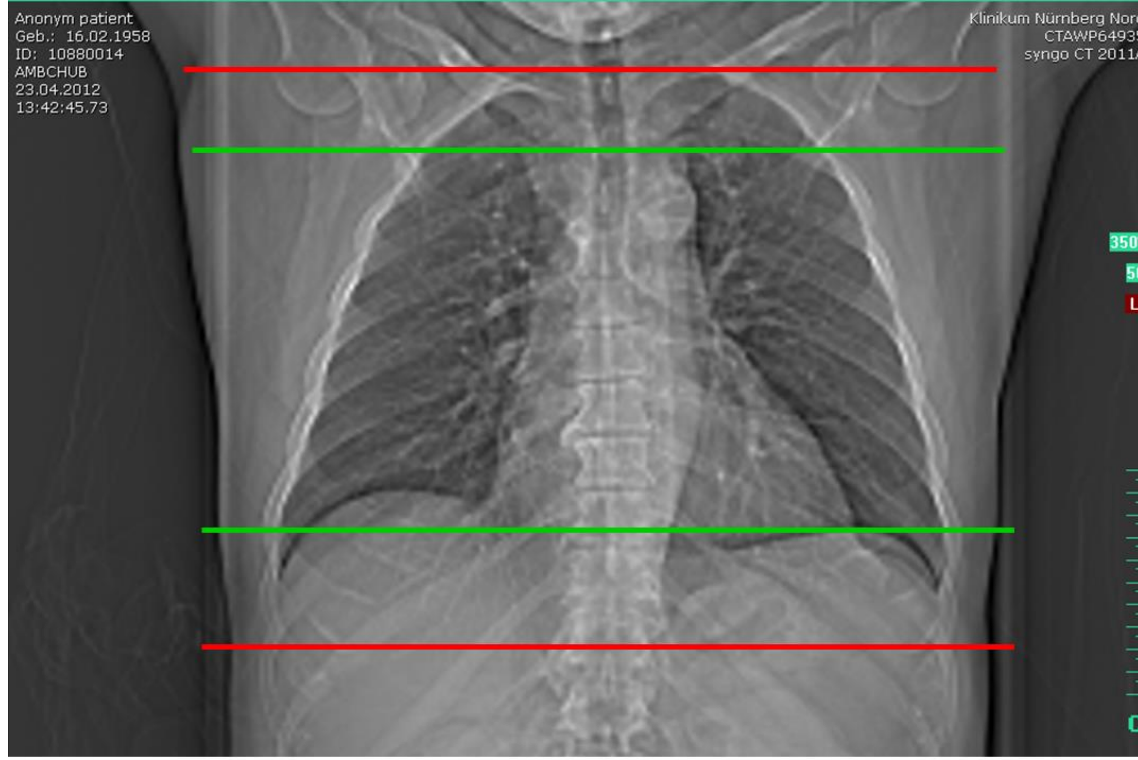
EUCLID | European Study on Clinical DRLs



Trauma, Tumor



Metallentfernung
Skoliosewinkel



Scan-Range -30%, Dosis -60% (L.R.Goodman, ECR 2012)

Wie weit und was optimieren?

Verwendung von Patienten-Strahlenschutzmitteln bei der diagnostischen Anwendung von Röntgenstrahlung am Menschen

Empfehlung der Strahlenschutzkommission und wissenschaftliche Begründung

SSK 2018

Kritik an der ICRP ?

Senkung des Grenzwerts der Linsendosis
von 150 auf 20 mSv/a

Dosiskoeffizienten für Radon
5×10^{-4} per WLM (ICRP 65)
2.8×10^{-4} per WLM (ICRP 115)

Committee 5: Protection of the Environment
Reference Animals and Plants (RAPs)
C5: Erst gegründet, dann aufgelöst

Tiermedizin in C3, Strahlenschutz der Tiere, (nicht beruflich)

Nationale Abweichungen

z.B. USA: NCRP Empfehlungen statt ICRP
Occupational: 50 mSv/a eff. Dosis