Overview of ICRP Committee 2

Doses from Radiation Exposure

John Harrison

3rd International Symposium on the System of Radiological Protection
20 October 2015

Committee 2 Remit

Committee 2 develops references models and data, including dose coefficients, for the assessment of exposures to radiation from both internal and external sources

- Large programme of work to replace all published dose coefficients following :

Publication 103 The 2007 Recommendations of the International Commission on Radiological Protection. Ann ICRP 37 (2-4) 2007

Dose coefficients

Effective dose

Equivalent dose to organs and tissues

Internal: **Sv per Bq intake**

External: **Sv per fluence or air kerma**

Membership 2013 - 17

John Harrison (Chairman) UK
François Paquet (Vice-Chairman) France
Wesley Bolch (Secretary) USA

Mike Bailey UK
Vladimir Berkovski Ukraine
Luiz Bertelli USA
Doug Chambers Canada
Marina Degteva Russia
Akira Endo Japan

John Hunt Brazil
Chan Hyeong Kim (S Korea)
Rich Leggett USA
Jizeng Ma China
Dietmar Noßke Germany
Nina Petoussi-Henss Germany
Frank Wissmann Germany

INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

Task Groups of Committee 2

- TG 36 – Radiopharmaceuticals (C2/C3)
  Dietmar Nosske + Soren Mattsonn
- TG 79 – Effective Dose — John Harrison
- TG 90 – Dose Coefficients for External Environmental Exposures — Nina Petoussi-Henss
- TG 95 – Internal Dose Coefficients (IDC)
  François Paquet
- TG 96 – Computational Phantoms and Radiation Transport (CPRT) — Wes Bolch

Recent Publications

Publication 119 Compendium of Dose Coefficients based on ICRP Publication 60. Ann ICRP 41 (Supp1) 2012

Publication 128 Radiation Dose to Patients from Radiopharmaceuticals: A Compendium of Current Information Related to Frequently Used Substances. Ann ICRP 44 (2S) 2015

Planned publications

Phantoms and radiations transport calculations

- Radiation Transport for Adult Phantoms (Adult SAFs)
- Pediatric Reference Computational Phantoms + SAFs
- Pregnant Female and Fetus Reference Computational Phantoms + SAFs

Internal dose coefficients

- Occupational Intakes of Radionuclides, Parts 1 - 5
- Internal Dose Coefficients for Members of the Public, Pts 1 & 2
- *In utero* Internal Dose Coefficients for Maternal Intakes
- Breast-feeding Infant Internal Dose Coefficients for Maternal Intakes

External dose conversion coefficients

- External Dose Coefficients for Members of the Public

Use of Effective Dose

Phantom development

Stylized Phantoms

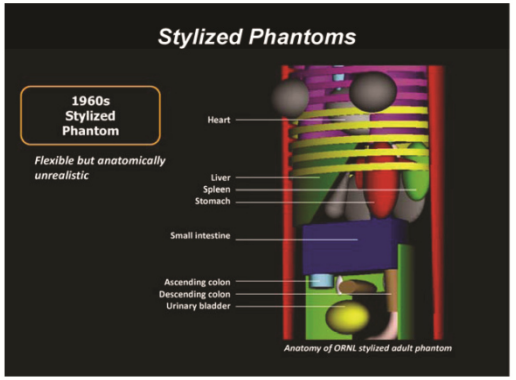
Organ / body contours defined by 3D mathematical surface equations

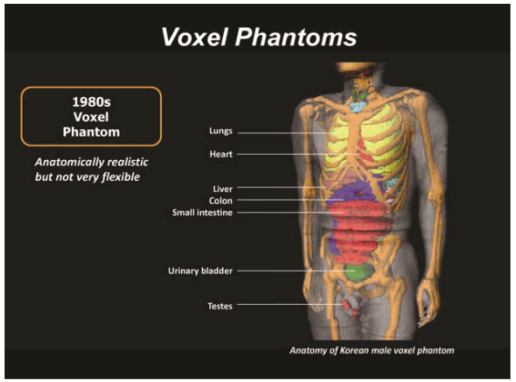
Voxel Phantoms

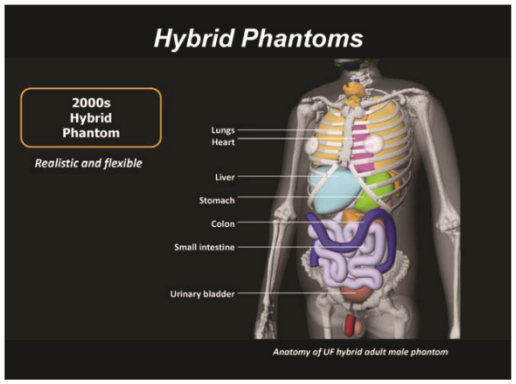
Organs and body tissues defined by groupings of 3D arrays of tagged image volume elements

Hybrid Phantoms

Organ / body contours defined by NURBS or polygon mesh surfaces



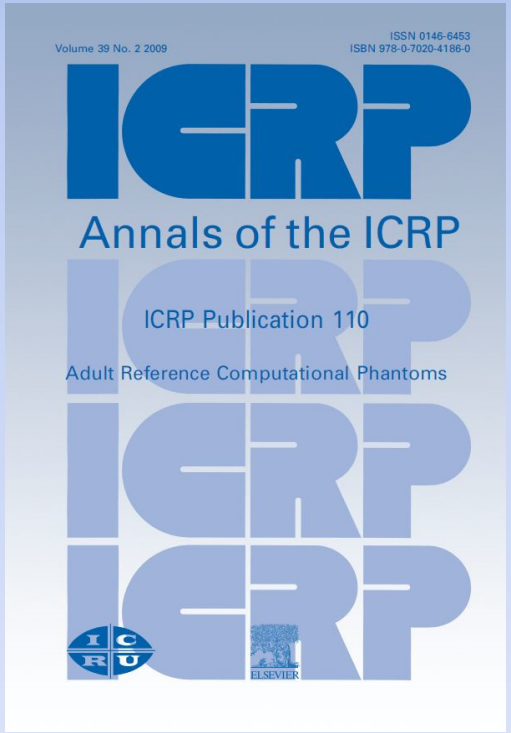




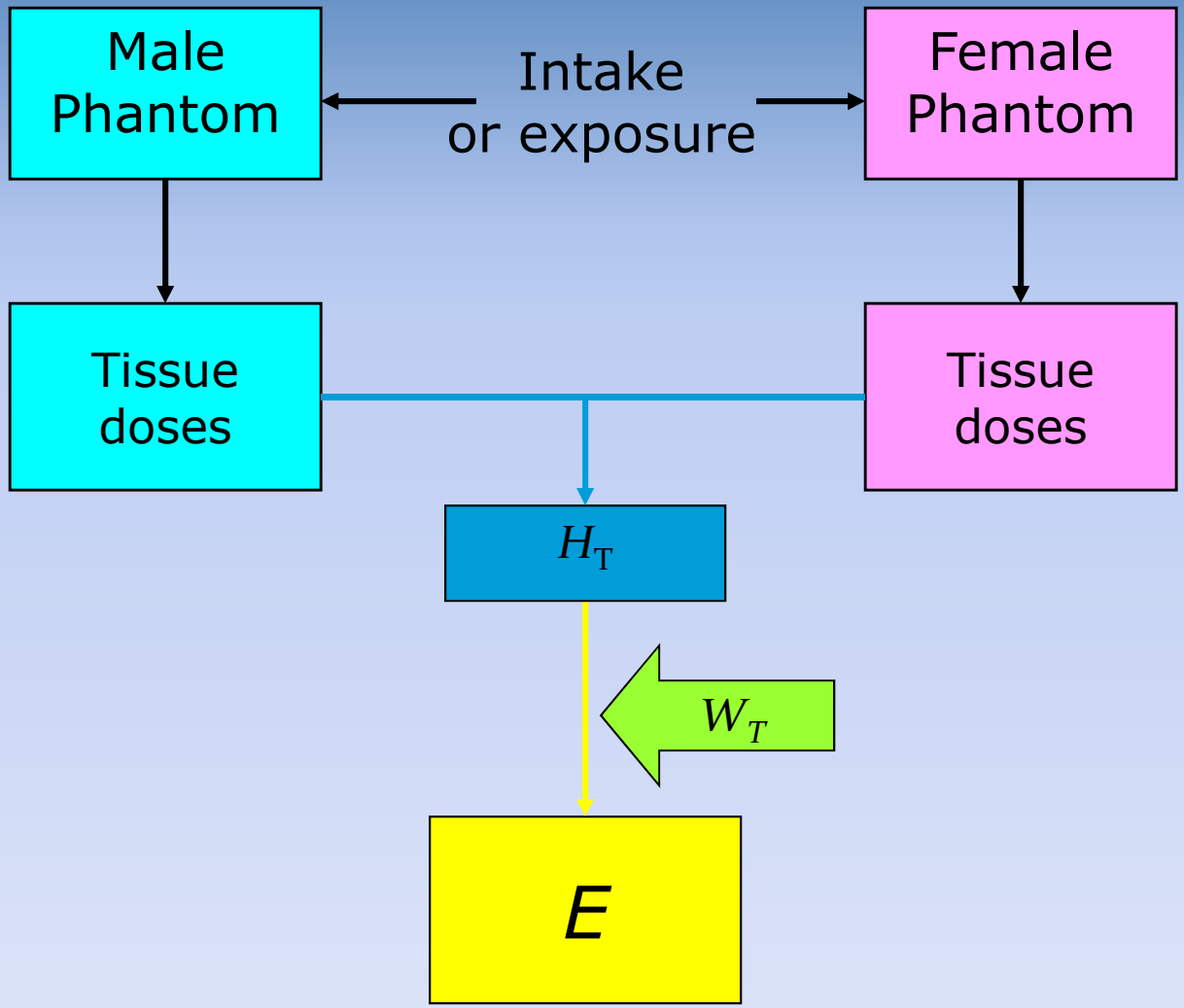
ICRP Adult Reference Computational Phantoms – Voxel Based

ICRP Publication 110

Ann ICRP 39 (2) 2009

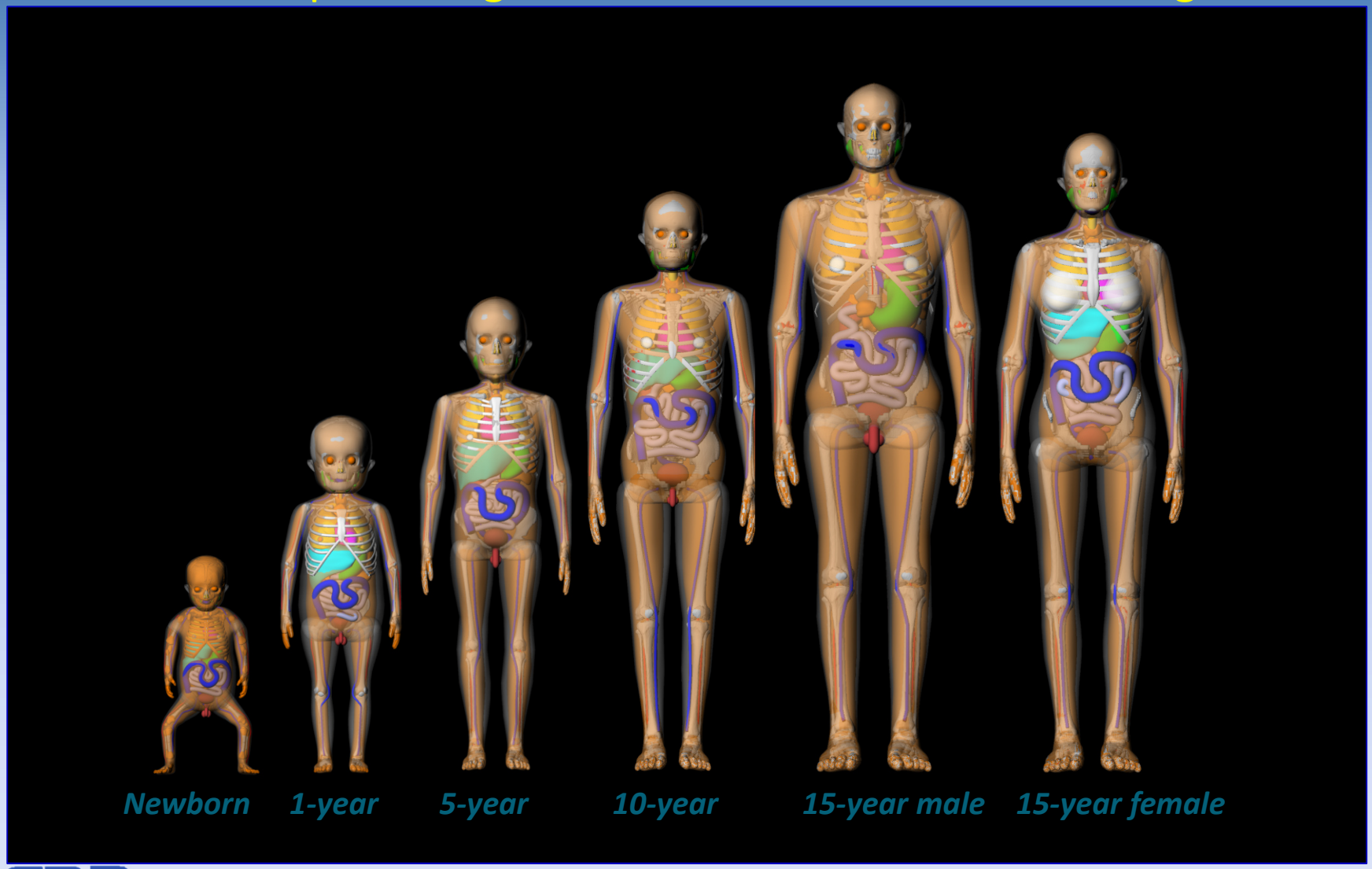


Sex averaging in calculation of E

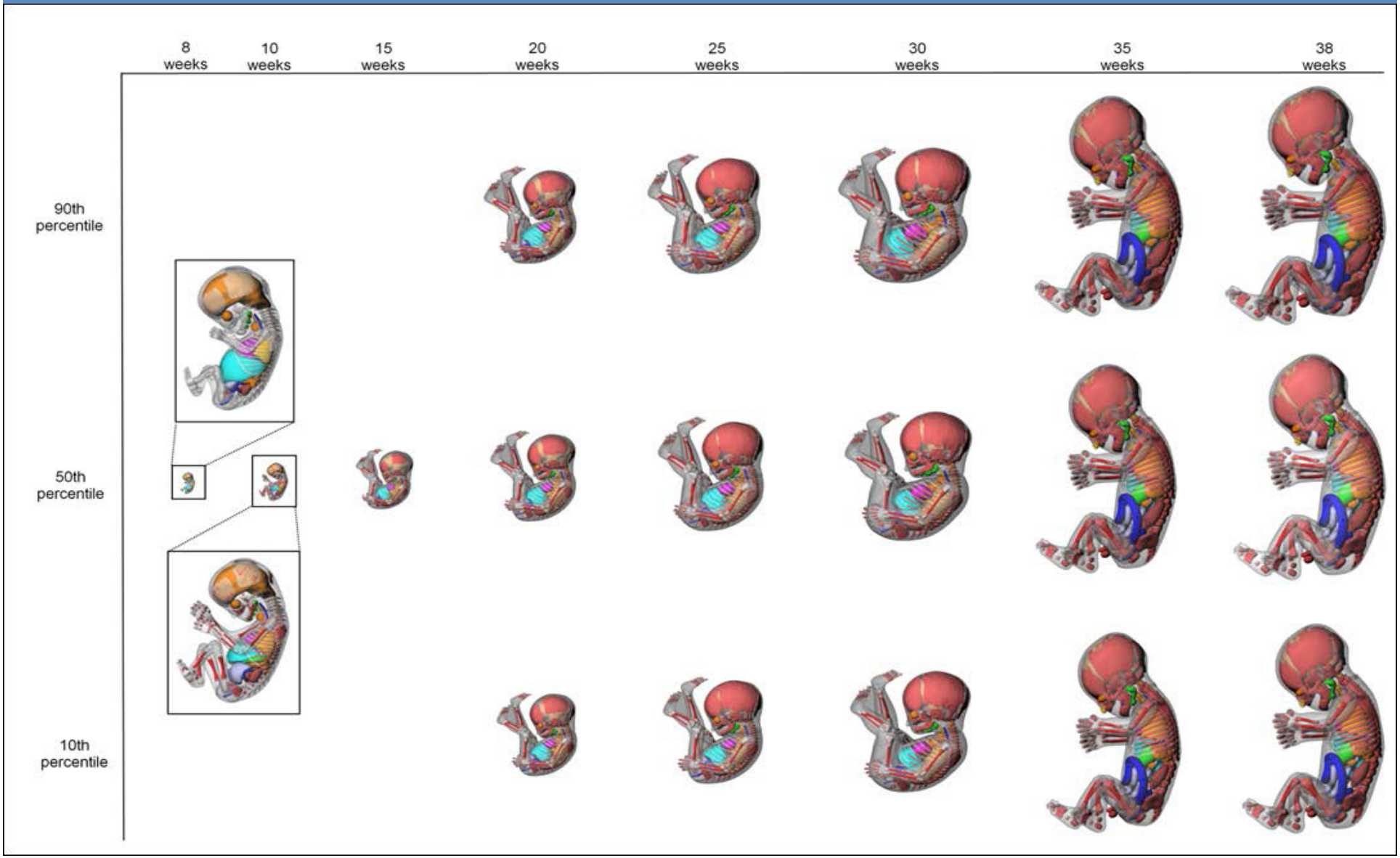


ICRP Computational Phantoms – Pediatric

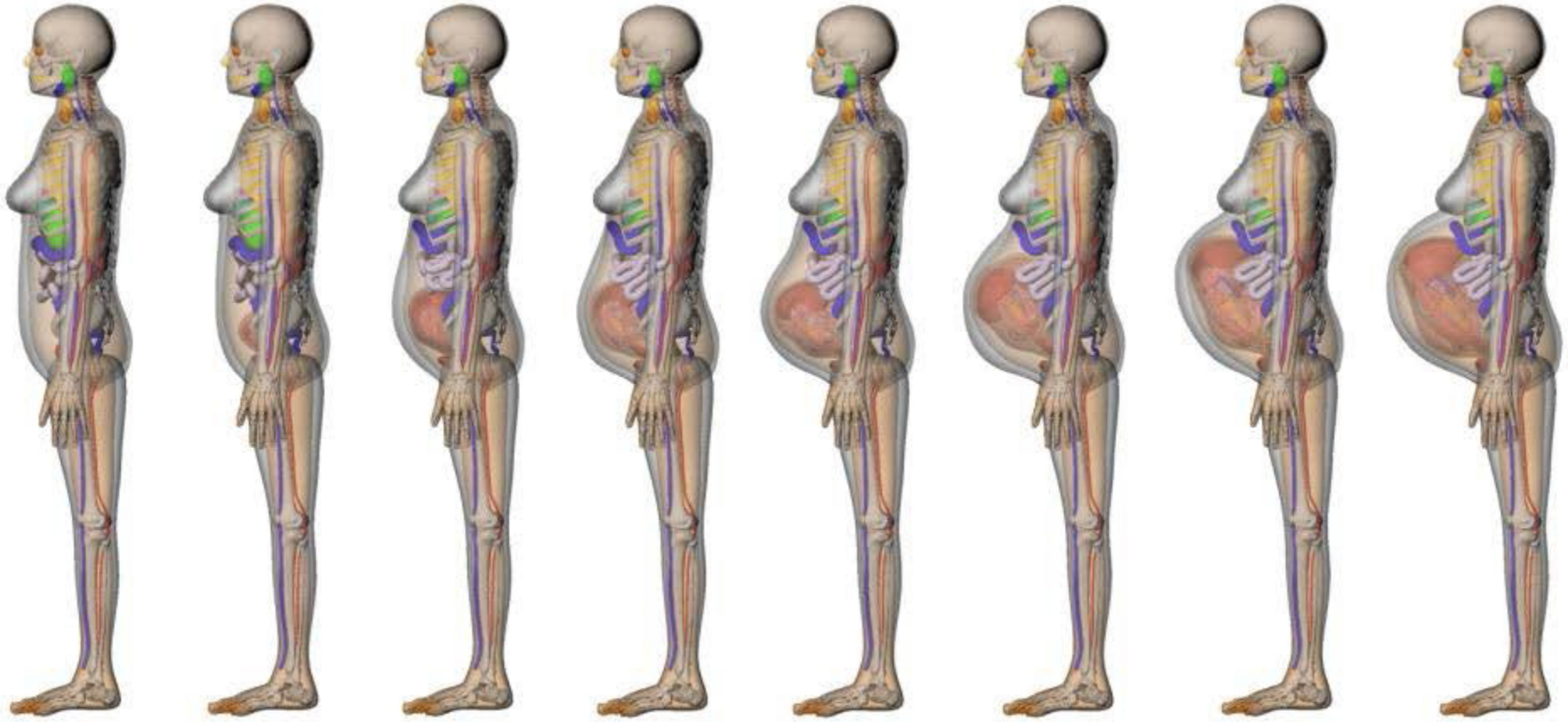
Developed using NURBS and PM Surface Modeling



Age-adjusted models of the human fetus



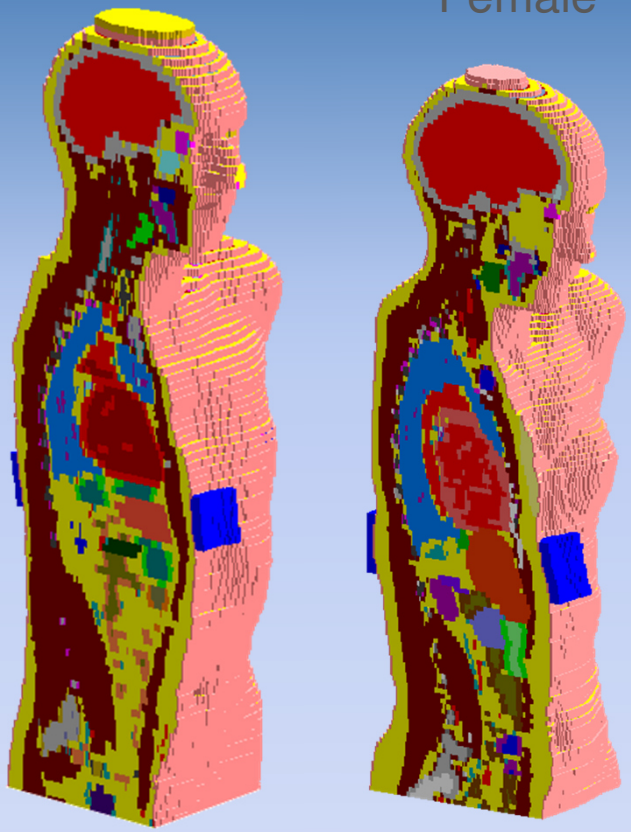
Proposed ICRP Reference series



Publication 110 Phantoms Conversion Project

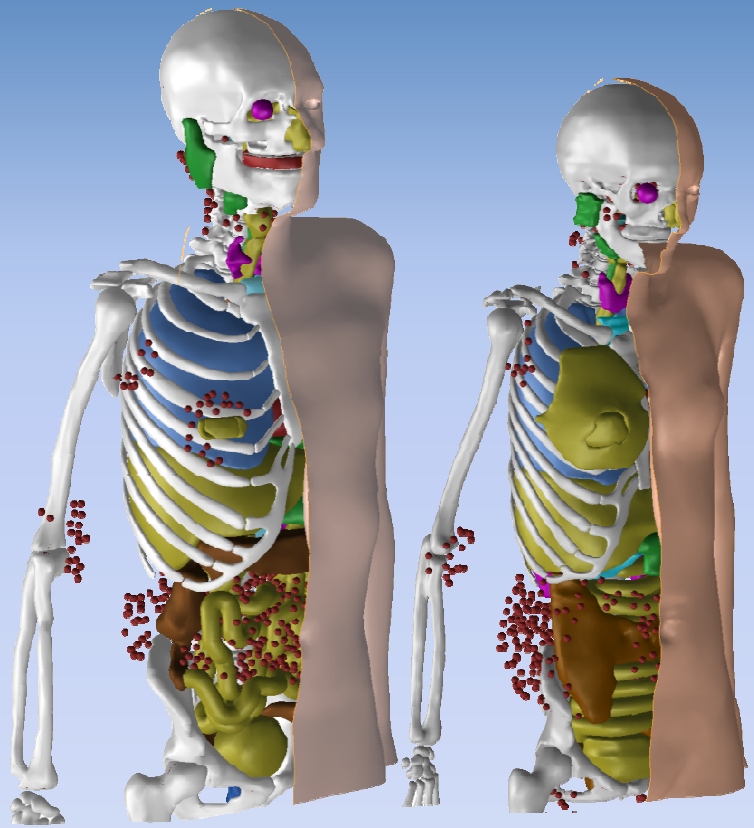
Male

Female



Male

Female



Publication 110 phantoms
(voxel geometry)

Polygon-mesh versions
(polygon-mesh geometry)

Occupational Intakes of Radionuclides

OIR Part 1
Introduction

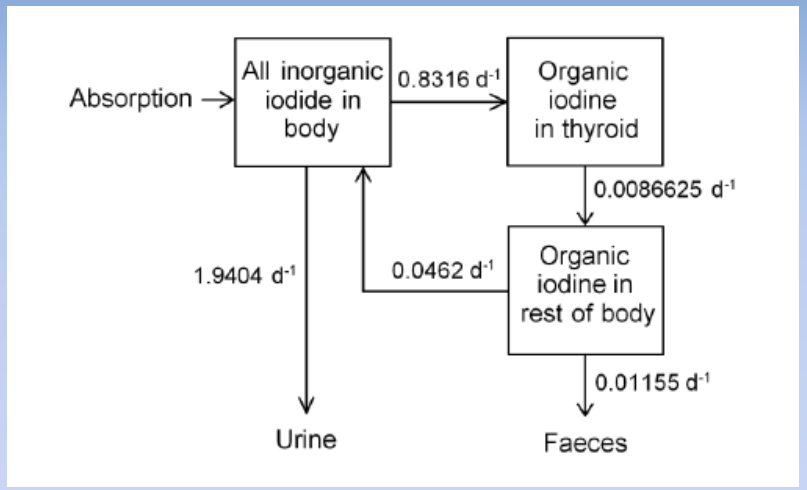
OIR Part 2
H, C, P, S, Ca, Fe, Co, Zn, Sr, Y, Zr, Nb, Mo, Tc

OIR Part 3
Ru, Sb, Te, I, Cs, Ba, Ir, Pb, Bi, Po, Rn, Ra, Th, U

OIR Part 4
Lanthanides and Actinides

OIR Part 5
F, Na, Mg, K, Mg, Ni, Se, Mo, Tc, Ag

Systemic model for Iodine



Former model (ICRP 1994)

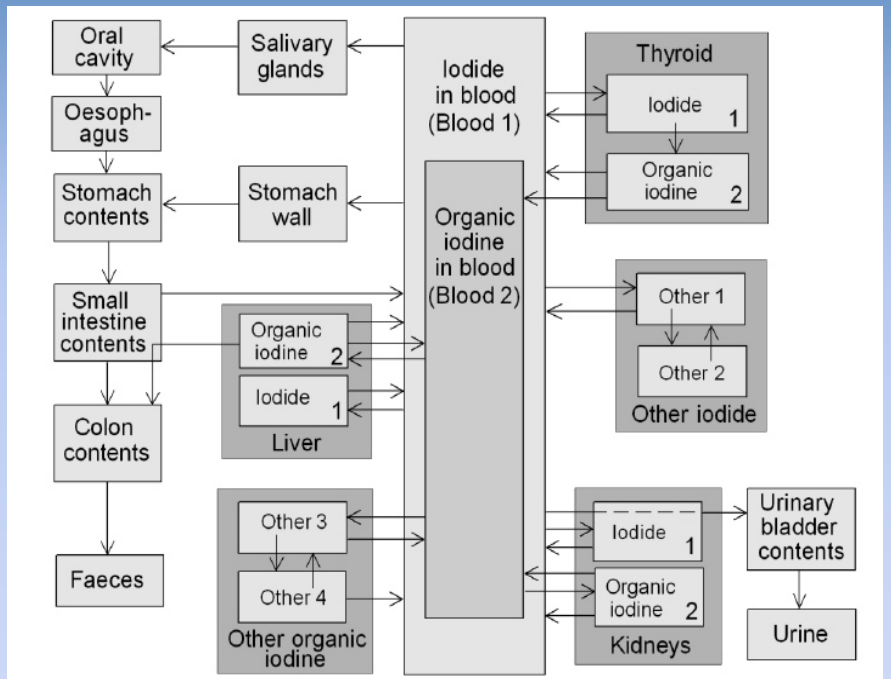


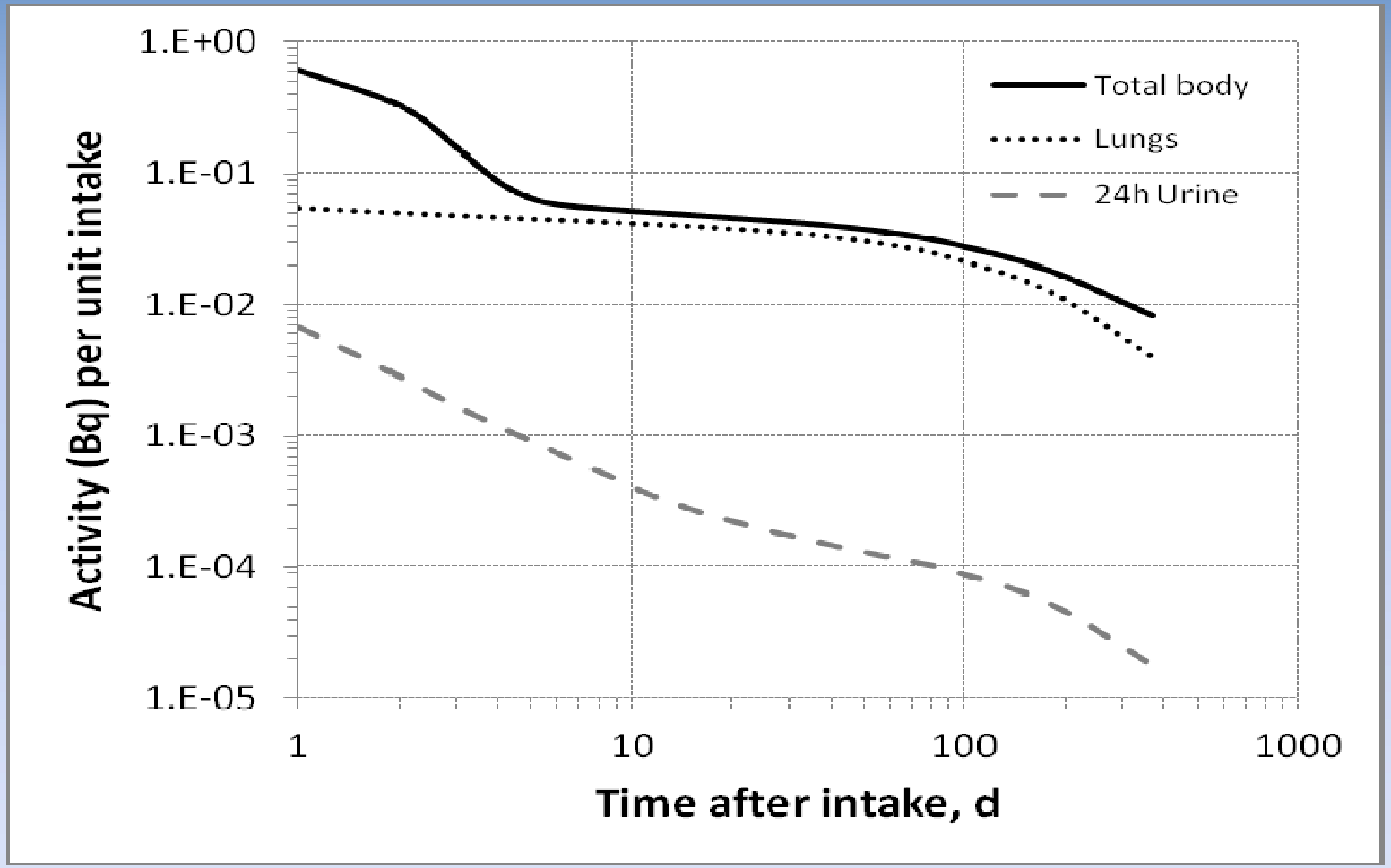
Figure 5-2. Structure of the biokinetic model for systemic iodine used in this report.

OIR model

OIR dose coefficients for cobalt

	Effective dose coefficients (Sv Bq^{-1})		
Inhaled particulate materials (5 µm AMAD aerosols)	^{57}Co	^{58}Co	^{60}Co
Type F, cobalt nitrate, chloride	3.3E-10	1.4E-09	1.1E-08
Type M, all unspecified forms	1.0E-09	4.3E-09	2.7E-08
Type S, cobalt oxide, FAP, PSL	2.4E-09	6.6E-09	1.7E-07
Ingested materials			
f_A = 0.1, all chemical forms	2.4E-10	1.2E-09	7.6E-09
f_A = 0.05, insoluble oxides	1.7E-10	9.8E-10	4.8E-09

Bioassay data for ^{60}Co : inhalation of 1 Bq Type M



Radon Publications

Publication 115 Lung Cancer Risk from Radon and Progeny. Ann ICRP 40 (1) 2010

Publication 126 Radiological Protection against Radon Exposure. Ann ICRP 43 (3) 2014

CEPN, Paris , March 2015

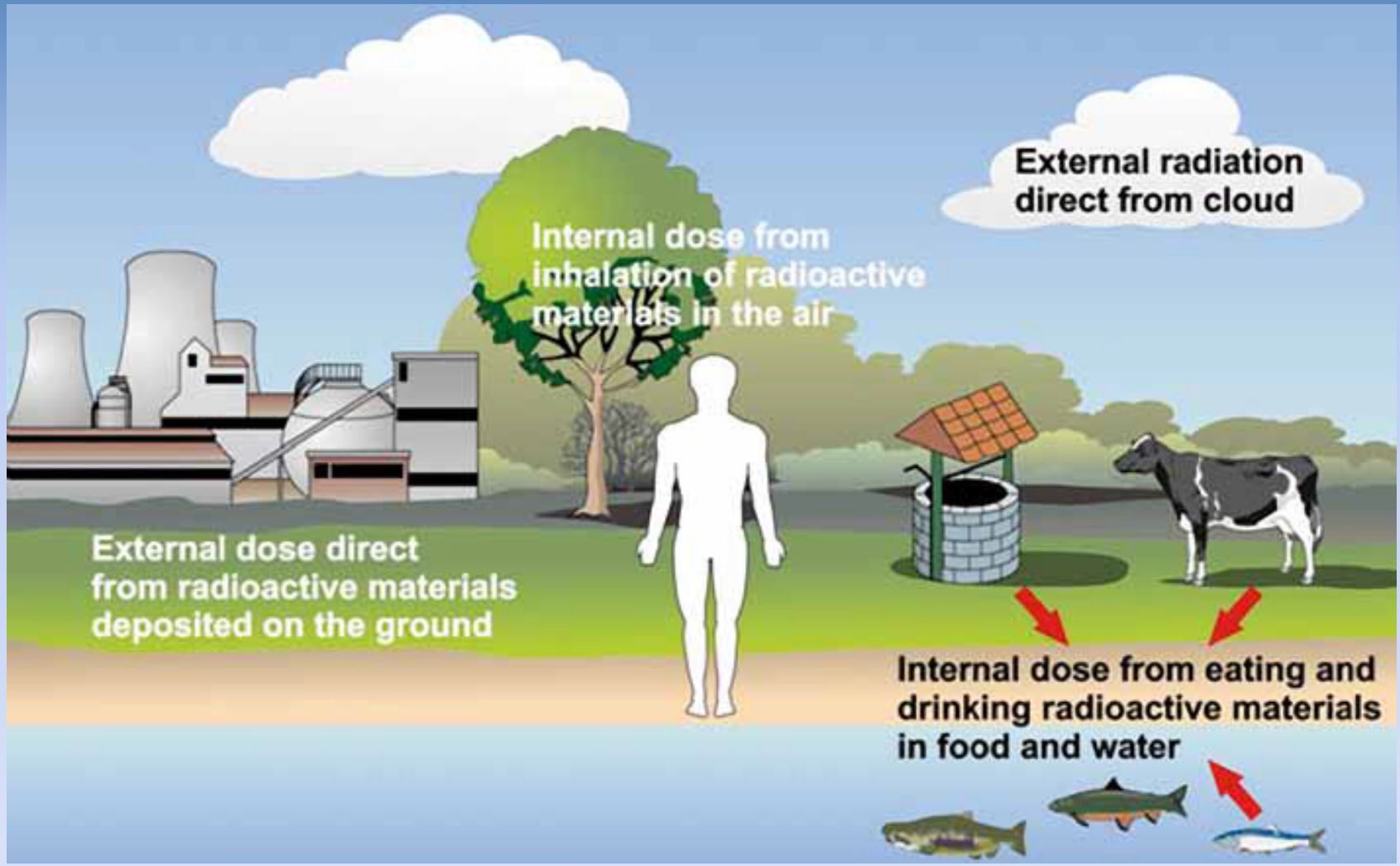
Working Group Proposal

CEPN 5-6 March 2015

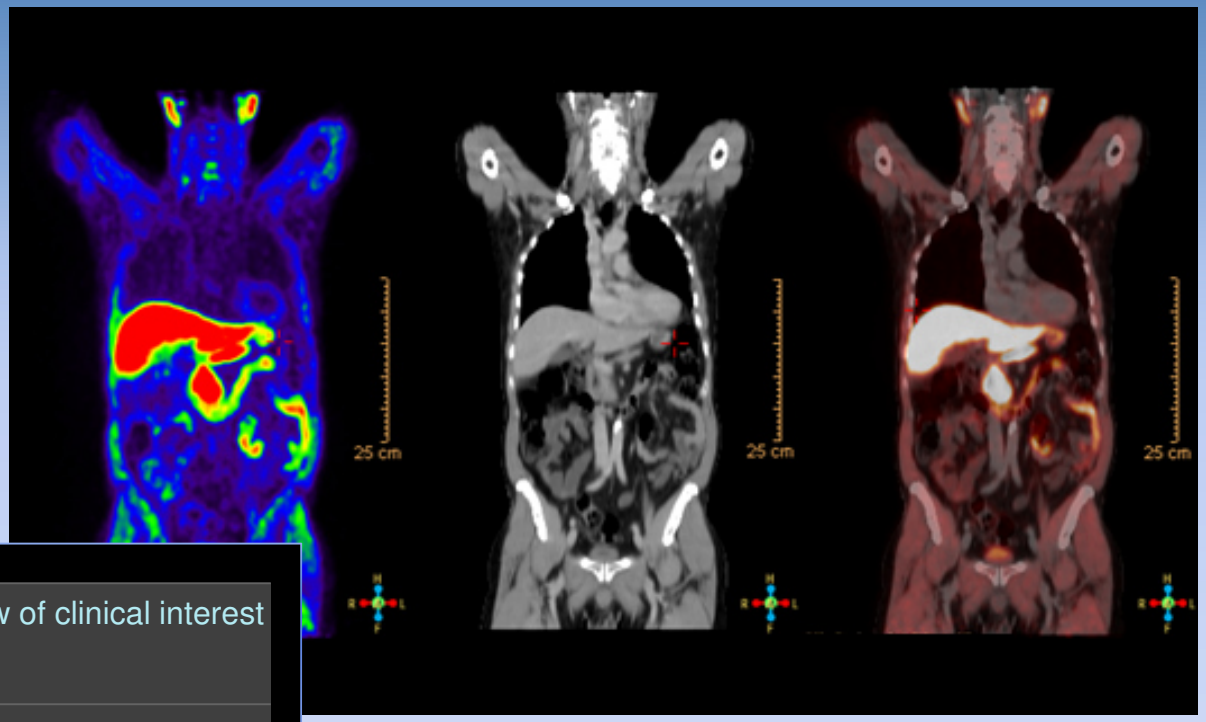
ICRP adopts a single value of 12 mSv per WLM

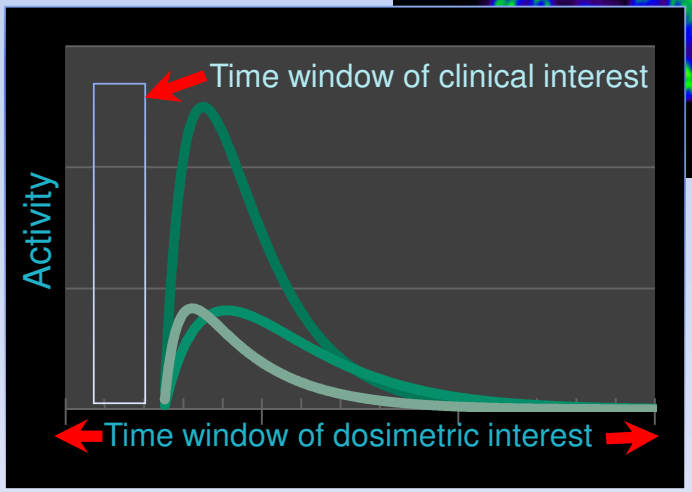
- Adjustments for aerosol characteristics are not warranted for most exposure situations
- Control for homes and other buildings on basis of radon concentrations, Bq m^{-3}
- Upper Reference Level of 300 Bq m^{-3} for homes and workplaces corresponds to doses of the order of 10 mSv.

TG 90 : Dose Coefficients for External Environmental Exposures



TG 36 : Radiopharmaceuticals





But what happens with the radiopharmaceutical after the image has been taken?

C2

- *large programme of work to provide new dose coefficients*
- *Biokinetic and dosimetric modelling is world leading, with scientific as well as protection applications*
- *Strong interactions between committees, including C2 membership of Task Groups*

www.ICRP.org