

Resolution of Public Consultation Comments for

ICRP Publication 150: Cancer Risk from Exposure to Plutonium and Uranium

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Background

ICRP is grateful for the time and effort taken to review and comment on the draft of this publication during the public consultation period. Active public consultations are a valuable part of developing high-quality publications. Comments are welcome from individuals and organisations, and all are considered in revising the draft prior to publication.

To ensure transparency, comments are submitted through the ICRP website and visible by visiting www.icrp.org.

This document summarises the general themes of the comments and how they were considered during preparation of the final report for publication.

Public Consultation

This draft report was available for public consultation from 27 February to 10 July 2020. The following individuals and organisations provided comments: Harmen Bijwaard; Robert Drollinger; CRIEPI, Japan; China Institute for Radiation Protection; and Southern Urals Biophysics Institute, Russian Federation.

Resolution of Comments

Globally, the comments received welcomed the extensive review of studies of exposure to plutonium and uranium and its conclusions. However, a few mistakes were pointed out and complementary information were requested on some items. Consequently, editorial corrections were performed and further information and discussion is now provided on the following points.

Review of epidemiological studies of plutonium exposure

The review and analysis of liver cancer and bone cancer results was extended and now includes more detailed information, mainly from Mayak workers data. Two paragraphs were added to specifically discuss environmental exposure to plutonium and related dosimetric aspects, in addition to occupational exposure.

The lag time of risk models during which it is considered that the effect cannot be linked to the exposure is now explained in the glossary and addressed in the discussion of studies of lung cancer and plutonium exposure. Indication of confidence interval on estimated risk was added for many studies. Information on the smoking status of workers in epidemiological studies was added to the main points. The expectations regarding future studies are now

more developed in the executive summary. The discussion of circulatory diseases was not added to the abstract and main points since the focus of the document is on cancer risk.

A comment underlined the absence of reference to animal experiments of plutonium exposure. This is indeed consistent with the mandate of the task group to review epidemiological studies, not experimental studies. A paragraph was added in the Introduction to refer the reader to review of experimental studies by IARC and ATSDR.

Lifetime risk calculation

As requested by several commenters, more information on the method of lifetime risk calculation has been added to the report. It is intended to investigate the effect of uncertainty associated with some parameters and discuss results in a separate scientific publication. The interpretation of RBE values derived in this report, and the caution needed when comparing them with w_R for alpha radiation has been discussed further. However, in contrast with a comment, we consider there is no risk of confusion in the respective discussions of w_R and DDREF. Also, it is not intended to discuss existing limits and standards applying to alpha-emitting radionuclides in this report. The discussion is focused here on the comparison of lifetime risk per dose from photon exposure in the LSS and from alpha radiation emitted by incorporated plutonium, in respect of the existing values of DDREF and w_R for alpha radiation.

The source of the baseline rates is now explicit in the executive summary. The definition of DDREF has been revised. We prefer providing charts of annual lung doses in figures rather than cumulative doses for better readability.

Dosimetry and toxicology

As suggested by a comment, the average of absorbed doses to different regions of the lung is no longer said to be weighted by the detriment. It is now simply called “weighted absorbed dose”, with the unit Gy that applies to absorbed dose. The weighting is performed with equal regional weights taking account of the relative sensitivity of the 3 regions of the lung to radiation induced cancer.

More information is provided on the values of dissolution parameters retained in MWDS-2013 for plutonium in lungs, with a more detailed explanation of its bound fraction and slow dissolution rate. Doses-2000 and Doses-2005 systems used for the dosimetry of relatively early Mayak workers studies are now explained. So are shared, unshared and Berkson errors. Although a comment requested more information on Bayesian techniques, differences between MDWS-2013 and MWDS-2008 and a diagram showing the location of target cells in lungs, the reader is rather referred to other publications containing such information.

The description of uranium chemical toxicity was clarified, in agreement with the conclusions of UNSCEAR, US ATSDR and WHO and is supported by additional references to studies of veterans exposed to depleted uranium. The discussion of threshold values for uranium kidney content associated with detectable adverse effects was extended, referring to publications of the UK Royal Society, US NRC, UNSCEAR and R.W. Leggett et al.