GENERAL COMMEMTS

- We can understand the concept of changing the settings of dose limit from equivalent doses to absorbed doses to prevent tissue reaction. However, practical guidance on how to actually use absorbed dose limit to avoid non-cancer effects should be prepared until new main recommendations are issued. It has not been clarified yet how we should use the absorbed dose including RBE, particularly for high-LET radiation. Pub. 118 did not provided updated knowledge on high-LET radiation. For skin and extremities, w_R can be used for absorbed dose limits for skin and extremities, because RBE_M and RBE_m have been compared. However, for the lens of the eye, such comparison has not been made, and RBE will thus be more appropriate.

- The summary of the October 2012 Main Commission meeting states "the use of the special name sievert without proper context can cause confusion, and therefore recommends that the quantity (effective dose or equivalent dose) always be specified. Furthermore, when used for equivalent dose the relevant organ must also be specified". This statement may be explicitly described in this report, i.e., noting that "when used for absorbed dose the relevant organ must also be specified".

- This document is a supplementary guideline for the use of effective dose described in Publ.103. So, ICRP should give us a possible scientific evidence for the items mentioned in this document as a reference. For example, in this draft document para. (46), it is mentioned that "*for doses in excess of 100mSv delivered at high dose rate, a DDREF of two applied in determining solid cancer risk at low dose /dose rates will not apply*". ICRP should identify the value of high dose rate above which a DDREF of two is not applicable to evaluate radiation risk at an actual field while showing the scientific evidence.

- According to the report of TG84 they mentioned that the lack of a formal quantity for a radiation-weighted dose for high doses was an issue in the current radiological protection system. We think that ICRP should add the comment to this issue in this draft document.

SPECIFIC COMMENTS

Main Points lines 241-242
Section 3.7 (63)

- As described in this draft document (63) the use of committed doses introduces conservatism into calculation of doses from annual intakes for the radionuclide with long half-lives and long retention time, which should be reconsidered to avoid irrational anxiety or excess concern about internal exposure among the public and workers.

Main Points lines 221-223
Section 6 (126) line 2020-2022

- "*its use exceptionally in emergency exposure situations at acute doses in the range up to around 1 Sv (or the order of several 100 mSv) is reasonable*" ← For managing short term exposure of the Fukushima emergency workers (age >40 with low risk for radiogenic thyroid cancer), the equivalent dose to the thyroid was added to effective dose (in the same way as for the planned exposure situation). There is the possibility that this impeded emergency responses or led emergency workers to increase their anxiety. As such, for management of dose to emergency workers, other index may be considered, taking into account mortality, lethality or severity of health effects.

Section 6 (122) lines 1963-1973

- ICRP is required to clarify the following points in advance. In updating the dose limit associated with non-cancer effects, ICRP should consider the establishment of a factor substituting the radiation weighting factor so that radiation risks can be easily evaluated even in a mixed radiation field.
  - ・Concept of setting the dose limit (how are the effects of high LET radiation and the distribution of tissue doses incorporated in setting the dose limit)
  - ・Evaluation of doses associated with non-cancer effects (a specific way of evaluating doses in the work place exposed to mixed low and high LET radiation)

Section 6 (126) lines 2025-2028

- The paragraph(126) describes the thyroid tissue reaction; if there was a significant contribution to the effective dose from radionuclides concentrated in particular organs (e.g., iodine-131 in the thyroid, inhaled insoluble radionuclides in the lung),tissue damage could occur. Notable for 131I, for example, an effective dose of 250 mSv could correspond to a thyroid dose of >6 Gy. On the other hand, ICRP Publ. 41 notes that if the whole thyroid is exposed to approximately 25～30 Gy x-ray doses in fractions for 30 days, it could result in serious functional damage. It is necessary to clearly describe the effects that may be caused by the difference in the thyroid tissue reaction from Publ. 41 description.

Section 3.7 (64) lines 1209-1213

- Dose coefficient for internal exposure due to radiopharmaceuticals has been provided for age groups, but the control of public or occupational exposures does not include medical exposure. This statement may need to be added.

Section 4.2 (88) lines 1522-1524

- "*It is important to balance the reduction in doses with any deleterious effects of the action and a cautious assessment of doses could lead to unnecessary actions with adverse consequences for the affected population.*" ← For optimization purposes, a balance between the degree of caution and efforts for dose reduction is important in any exposure situations. To clarify this, the following revision of the sentences is

proposed. "*It is important to balance the reduction in doses with any effort or resource to reduce dose in any exposure situation. Particularly in an emergency exposure situation, a too cautious assessment of doses could lead to unnecessary actions with adverse consequences for the affected population.*"

Section 5.4 Table 5.2

- It needs to be explicitly stated that this table is only dedicated to risk communications for medical exposures of adults. From the viewpoint of risk communications, it is important to touch on epidemiological observability as was done in Table 1 of Publication 96. In the second column from the left, it needs to be stated that risk at <0.1, 0.1-1, 1-10 mSv is also based on LNT in addition to that at 10-100 mSv. The label for the second column from the right may be changed from "Proposed term for dose level" to "Proposed term for dose level in medical exposure of adults"

Section 1 (3) lines 327-328

- The need to define the concrete level of low dose rate is unclear, and it may be better if only the order of magnitude is described while describing the relevant numbers: e.g., <5 mGy/h [originally defined by Wakeford & Tawn (PMID: 20234068) and employed by NCRP], <6 mGy/h averaged over a few hours (defined by UNSCEAR 1993), and 0.1 mGy/min averaged over one hour (UNSCEAR 2012).

Section 1 (6) lines 368-370

- "*The use of equivalent dose in setting limits for the avoidance of tissue reactions in the cases of irradiation of the hands and feet, lens of the eye, and skin; that is, limits set below thresholds for the occurrence of acute damage to organs and tissues.*" ← "acute" needs to be deleted. Take cataracts and circulatory effects for instance: these thresholds are set for effects occurring at >20 years and >10 years after exposure, respectively.

Section 1 (6) lines 370-372

- "*In general, smaller differences in effects per Gy are observed between radiation types in relation to tissue reactions than stochastic effects (ICRP, 2003b).*" ← This does not apply to the lens because the lens does not develop tumors.

Section 2.2 (10) lines 440-443

- "*However, the available data indicate that differences between radiation types (e.g. alpha particles and neutrons relative to gamma rays) in their effectiveness per Gy in causing tissue reactions are smaller than differences in their effectiveness in relation to cancer induction (ICRP, 1990, 2003b).*" ← This does not apply to the lens of the eye, because the lens does not develop tumors.

Section 5.1 (97)

- Dose conversion coefficient for effective dose due to external exposure and dose coefficient for committed effective dose due to internal exposure should distinctively

be described.

Section 5.4 (116) lines 1853-1854

- "*Depending on the risk projection models used, there are also differences between populations.*" ← Risk can differ among populations, but population transfer is used for simplification.

Section 6 (122) lines 1970-1973

- "*This change to the use of absorbed dose rather than equivalent dose would not require changes to the numerical values of dose limits for tissue reactions and will be considered by the Commission when new general recommendations are formulated.*" ← It is unclear what the Commission will consider upon formulation of the new general recommendations.

Section 6 (125) lines 1997-2000

- "*It has been argued that this approach does not adequately protect women and younger children and that differences between males and females and greater risks at younger ages should be reflected more explicitly in the ICRP system, including the use of different detriment values and w_T values.*" ← Detriment is used only for deriving w_T. As such, age-, sex-dependent detriments have no specific functions in the system of radiological protection as indicated in Table A.4.18 of Publication 103.

Section 6 (126) lines 2028-2033

- "*A secondary consideration is that for doses in excess of 100 mSv (or more precisely, absorbed doses to organs and tissues > 100 mGy) delivered at high dose rate, the DDREF of 2 applied in determining solid cancer risk at low doses will not apply, so that risks may be somewhat greater than might be assumed on the basis of Publication 103 (ICRP, 2007a) nominal risk coefficients.*" ←The risk posed by acute exposure to >100 mSv can directly be estimated based on epidemiological evidence, rather than with the nominal risk coefficients.

EDITORIAL COMMENTS

Section 2.6 (21) lines 687-688

- "Risk of Exposure-Induced InCidence (REIC)" may be changed to "Risk of Exposure-Induced Cancer"

Section 3.2 (34) line 841

- "clinical radiology" may be changed to "radiology, radiation oncology".

Section 3.5 Fig 3.2

- "reference phantoms" in the title may be changed to "adult reference phantoms".

Section 3.6 (54) lines 1085-1087

- "*The standard approach to the calculation of skin doses is to determine the average dose to the most exposed 1 cm² at a depth of 70 µm (ICRP, 1991a, 2007a)*" ← The local skin dose is defined by the mean equivalent dose in 0.07 mm depth averaged over any 1 cm² of the skin, regardless of the area exposed.

Section 3.7 (58) lines 1143-1147

- "*the increased importance of the lens of the eye with the reduction in the dose limit to 20 mSv per year (ICRP, 2012a) has led to a re-evaluation of its application (ICRP, 2010a; Bolch et al., 2015).*" ← "20 mSv per year" may be changed to "20 mSv/year year, averaged over defined periods of 5 years, with no single year exceeding 50 mSv".