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Dear regulators:

CNSC request for feedback on discussion paper

DIS 16-02, Radiation Protection and Dosimetry

This letter responds to the request in the April 29th CNSC's discussion paper DIS 16-02 (CNSC 2016) for feedback regarding the CNSC proposal to create two new regulatory documents that define CNSC guidance for radiation protection and dosimetry. I am a knowledgeable member of the public.

CNSC Radiation Protection Policy

The CNSC has stated repeatedly that its policy is transparent, science-based decision-making (Binder 2016a, 2016b). Since regulations are now required to be science-based, this CNSC initiative to revise its radiation protection guidance is welcome news.

The present guidance is based on a radiation protection policy that was adopted by a consensus of the world nuclear regulators. They accepted the recommendation of the U.S. National Academy of Sciences, issued in June 1956, to use a linear no-threshold (LNT) model∗ for assessing risks to the genome from ionizing radiation, replacing the threshold dose-response model (NAS 1956). The apparent purpose of this alarming recommendation was to create widespread social fear of low doses of ionizing (nuclear) radiation to stop atomic bomb development and testing.

The biological reality of a likely health benefit after a low dose, which scientists and medical practitioners have known for more than 120 years, contradicts the LNT model's predictions of excess risk, upon which the policy of ALARA† is based (Cuttler 2016). Furthermore, three very comprehensive examinations of the documented correspondence of the people who prepared this recommendation and the records of their meetings and other activities, during the 1950s, reveal considerable evidence of scientific misconduct (Calabrese 2015a, 2015b, 2016). Therefore, the June 1956 recommendation of the U.S. National Academy of Sciences should be rejected. A new radiation protection policy should be adopted that is based on radiobiological science (Feinendegen et al 2012).

∗ The LNT model assumes that ionizing radiation causes an excess risk of adverse health effects, namely cancer, and that the risk of radiation-induced cancer increases linearly with radiation dose from zero.

† As low as (is) reasonably achievable, taking into account technology, economics and social considerations

A low dose of x-rays generally stimulates an organism's protection systems causing its wounds to heal more quickly, diseases to be cured or alleviated more effectively, and life-span to be extended (Cuttler et al 2016). A recent review of the original analysis that linked low radiation exposures to an elevated risk of cancer revealed a serious error that was not previously identified (Cuttler and Welsh 2015). That scientist analyzed the incidence of leukemia among the 195,000 atomic bomb survivors in Hiroshima and Nagasaki. But he did not properly account for the leukemia incidence of the "controls," the unexposed populations. By including the low-dose populations with the controls, he concealed the evidence of a threshold dose, at about 50 rem or 500 mSv, for the onset of radiation-induced leukemia. Since blood-producing bone marrow tissue is most sensitive to radiation, it is very likely that the threshold doses are higher for radiation induction of other cancer types. Therefore, no predictions or suggestions of excess radiation-induced cancer risks (or any other health risk) should be made for an acute dose below 50 rem or 500 mSv until significant evidence is provided to validate the model for predicting such excess risks (Cuttler and Welsh 2015).

Feedback on DIS 16-02

Executive Summary

Changing the CNSC radiation protection policy to be science-based instead of LNT-based will affect clauses in the Canadian Radiation Protection Regulations (Canada 2016). A strategy and an education plan will be necessary to communicate to Canadians the real effects of ionizing radiation on health. Changing the attitudes and beliefs will be difficult because of the consensus opinion that was promoted in the 1950s and is still defended today. That opinion holds that a small dose of radiation, e.g., from medical diagnostic imaging or from small amounts of radioactive materials, released from nuclear energy facilities, increases the risk of cancer death.

The practice of good medicine has been constrained by a radiation protection policy of minimizing dose, ALARA, instead of preventing doses from exceeding harmful thresholds.

Current radiation protection policy has also been causing the phase-out of nuclear energy due to cost escalation and lack of social acceptance. Both are due to fear of increased risk of cancer. The emergency evacuation of hundreds of thousands of residents, living near the Fukushima Dai-ichi power plant, caused enormous suffering and approximately 1600 deaths, even though the radiation level was far below the threshold for harm. Applying the precautionary principle is not appropriate when the effect is likely a net health benefit and very likely no risk. Fear of radiation from a hypothetical accident may shut down the Indian Point nuclear power plant near New York City.

It is very important for Canadians to be informed that there is no reason to fear a low dose of radiation. Unscientific influences on radiation protection standards and practice, as described and discussed by Lauriston Taylor (1980), should be challenged and resisted.

1 Introduction

The Radiation Protection Regulations should be changed. ALARA should be replaced by the requirement to protect people against exposures that exceed thresholds for harm.

2 Background

ALARA should be replaced by dose limits that incorporate margins of safety, below the thresholds for harmful effects. High doses should be recorded; but there is no need to record the accumulation of low

doses because their effects are healed by the natural protection systems. The old requirements and guidance documents should be replaced by new documents, based on science and conforming to a new radiation protection policy.

Harmless radiation levels should not be regulated. Organisms adapt to the environment.

3 Need for Radiation Protection and Dosimetry Regulatory Documents

The new documents should be made compatible with the evidence accumulated over the past 120 years of experience with radiation exposures. Strengthening CNSC documents is not warranted as this would increase social fear of harmless radiation levels. No one is being harmed because of weaknesses in the present documents. On the contrary, current documents should be replaced by science-based documents.

The recommendations on radiation protection regulation by renowned Canadian scientist and W.B. Lewis Medal winner, R.E.J. Mitchel (2007), should be studied and acted upon.

3.1 Amendments to the Radiation Protection Regulations

The current regulations should be replaced by regulations that are science-based.

International benchmarks

Current ICRP recommendations should be replaced by the simple recommendations that the ICRP issued in 1934. They were satisfactory then and would be satisfactory today. The ICRP recommendations should be changed to be compatible with the radiobiological evidence that has been collected during the past 120 years. The linking of a risk of cancer to a low dose of radiation (below 50 rem or 500 mSv) should be removed.

The IAEA standards are based on the invalid consensus opinion that links hypothetical risks of adverse health effects to low radiation exposures. The IAEA should change its radiation protection standards to be science based. The IAEA should remove the link between a low radiation dose and a risk of cancer.

March 2011 nuclear event in Fukushima

Remove the implied link between a low radiation exposure and a risk of cancer.

Lessons learned

Three very important lessons should be learned from the 1986 Chernobyl accident and the experience of the three reactors at Fukushima that were destroyed by the 2011 tsunami.

• Severe nuclear accidents release radioactive materials that increase the radiation levels in nearby residential areas to levels that are comparable to those in high natural background radiation areas, where humans and many other organisms live.

• Long-term evacuation of residents would be inappropriate because the radiation levels would be below the thresholds for harmful effects. Evacuation should be ordered only when the dose rate is above the known threshold for harmful effects.

• Precautionary emergency measures (evacuation) in areas where the radiation level is low should be avoided because the physical stress and the severe, fear-induced psychological stress would result in many premature deaths.

3.2 Strengthening existing CNSC documents

The existing documents should be changed to information and policies that conform to radiobiological science and medical experience. The link between low radiation exposure and a risk of cancer should be broken.

Replace ALARA by the policy of keeping exposures below the thresholds for harm. CNSC documents that are not science based mislead the medical community.

Radiation safety training programs for workers should be science-based.

Radioiodine and other radiation sources are not a significant cause of thyroid cancer. Screening for thyroid cancer greatly increases the number of thyroid nodules discovered, most of which are harmless (Ahn et al. 2014). The new CNSC documents should reflect this scientific information.

3.3 Improvement opportunities

Regulatory guidance should be science-based.

4. Proposed Content of Radiation Protection and Dosimetry Regulatory Documents

New CNSC documents should be science-based. They should not contain information from previous CNSC documents that are based on ALARA and other non-scientific radiation protection policies. They should aim to keep radiation exposures below the known dose or dose-rate thresholds that cause harmful effects.

5. Impact of Proposed Changes

Science-based radiation protection regulations will have a very important positive impact on medicine, nuclear energy and human welfare.

6. Implementation

Implementation of science-based radiation protection regulations will be very difficult because of the opposition of the many people who have accepted the consensus opinion that was achieved in the 1950s.

7. Stakeholder Feedback

In response to the request in this section, the author has provided his feedback on the proposed changes to radiation protection and dosimetry regulatory documents.

Sincerely

Jerry M. Cuttler, D.Sc., P.Eng.

References

Ahn HS, Kim HJ, Welch HG. Korea's Thyroid-Cancer "Epidemic" Screening and Overdiagnosis. N Engl J Med 371:19. November 6, 2014. p1765-1767. Available at: http://www.nejm.org/doi/full/10.1056/NEJMp1409841

Binder M. Nuclear in a Low-Carbon Future: Moving Forward within a Strong Regulatory Framework. Presentation to the Canadian Nuclear Association 2016 Conference and Trade Show. February 26, 2016a. Available at:

http://www.nuclearsafety.gc.ca/eng/pdfs/Presentations/President/2016/20160226-nuclear-in-low-carbon-future-eng.pdf

Binder M. Regulating the Safety of Radioactive Waste. Presentation to the Multinational Workshop on the Regulation of DGRs. March 14, 2016b. Available at: http://www.nuclearsafety.gc.ca/eng/pdfs/Presentations/President/2016/20160314-regulation-deep-repositories-eng.pdf

Calabrese EJ. An Abuse of Risk Assessment: How Regulatory Agencies Improperly

Adopted LNT for Cancer Risk Assessment. Letter to Editor, News and Views, plus the Supplementary Material. Archives of Toxicology 89(4):647-648; 2015a.

Calabrese EJ. On the Origins of the Linear No-Threshold (LNT) Dogma by Means of Untruths, Artful Dodges and Blind Faith. Environmental Research 142:432-442; 2015b.

Calabrese EJ. LNTgate: How Scientific Misconduct by the U.S. NAS Led to Governments Adopting LNT for Cancer Risk Assessment. Environmental Research. In Press. 2016. Available at: http://www.sciencedirect.com/science/article/pii/S0013935116301219

Canada. Radiation Protection Regulations. SOR/2000-203. April 2016. Available at: http://laws-lois.justice.gc.ca/PDF/SOR-2000-203.pdf

CNSC. Radiation Protection and Dosimetry. Discussion Paper DIS 16-02. April 2016. Available at: http://www.nuclearsafety.gc.ca/eng/pdfs/Discussion-Papers/16-02/Discussion-paper-DIS-16-02-eng.pdf

Cuttler JM, Welsh JS. Leukemia and Ionizing Radiation Revisited. J Leukemia 3(4):1-2; 2015. Available at: http://dx.doi.org/10.4172/2329-6917.1000202 and Canadian Nuclear Society Bulletin 37(1):37-39; 2016.

Cuttler JM. Urgent Change Needed to Radiation Protection Policy. Health Physics 110(3):267-270; 2016.

Cuttler JM, Moore ER, Hosfeld VD, Nadolski DL. Treatment of Alzheimer Disease with CT Scans: A Case Report. Dose-Response 14(2):1-7; 2016. Available at: http://dos.sagepub.com/content/14/2/1559325816640073.full and Canadian Nuclear Society Bulletin 37(1):31-37; 2016.

Feinendegen LE, Pollycove M, Neumann RD. Hormesis by Low Dose Radiation Effects: Low-dose Cancer Risk Modeling Must Recognize Up-regulation of Protection. In: Baum

RP, ed. Therapeutic Nuclear Medicine. Berlin Heidelberg: Springer Verlag; 2012:789-805.

Mitchel REJ. Cancer and Low Dose Responses in Vivo: Implications for Radiation Protection. Dose-Response 5(4): 284-291; 2007. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2477713/

National Academy of Sciences (NAS). Genetic effects of atomic radiation. Science 123:1157-1164; 1956.

Taylor LS. Some Non-scientific Influences on Radiation Protection Standards and

Practice. Proceedings of 5th Congress of the International Radiation Protection Association, held in Jerusalem:307-319; 1980. Available at:

http://www.irpa.net/irpa5/cdrom/VOL.1/J1_64.PDF