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Michael Lesar
Chief, Rulemaking, Directives, and Editing Branch, Office of Administration
Mail Stop T–6D59
U.S. Nuclear Regulatory Commission
Washington, DC 20555–0001

Subject: Comments on the Security and Continued Use of Cesium-137 Chloride Sources

Dear Mr. Lesar,

The removal of ^{137}Cs sources from the research environment would have a tremendously negative impact on basic science and biomedical research. The Cesium based irradiator is the standard for research in several fields critical to human health including stem cell biology, immunology, and molecular effects such as how human cells respond to DNA damage. The removal of instruments using ^{137}Cs would severely limit current and future bio-medical research aimed at treating diseases such as cancer. At the same time, it would also be a severe setback for research on preventing radiation effects due to accidents or terrorism such as the medical countermeasures against radiation work done at the University and affiliated institutions. This would levy a major disadvantage on US laboratories relative to other countries that operate without this restriction.

Cesium-137 has aided biomedical research in numerous ways and is the basis for comparison in many fields of study. This technique is very well understood and is vital for countless studies that involve irradiation. For example, a review of scientific literature in the field of "DNA Damage" reveals that more than 7,400 papers have been published using ^{137}Cs as the method for damaging cells or manipulating animal functions. In the study of immunology, molecular response, and stem cell research, the biological effect elicited by ^{137}Cs is different on a micro-cellular level than that of other radionuclides and chemical treatments.

While it is possible to substitute ^{137}Cs with other radioactive materials, changing the type of source would mean that we would have to repeat much of our previous work. A preponderance of scientific studies and literature is based on the use of ^{137}Cs. The fields of immunology, stem cell, and cancer research have used ^{137}Cs extensively. Cesium sources are widely used for irradiating cells for in vitro human and mouse immunology studies and for irradiating mice for in vivo immunology experiments. Consequently, without access to ^{137}Cs-sources, stem cell research and research using mouse disease models would be severely compromised.

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Furthermore, many studies would no longer be scientifically replicable since the specific interactions from ^{137}Cs irradiation are integral to the studies.

The response of biological systems to this specific radiation is very well established. It is well known that the response of cells and tissues varies with radiation type and energy[1]. The substitution of another radiation source will introduce additional uncertainties due to changes in the cellular response mechanism. Without comparison studies, it would be difficult to correlate research using an alternative source to the existing ^{137}Cs-based data sets and could raise scientific doubts in any new research data. These issues will impact our ability to maintain and extend our knowledge in this complex scientific field.

Clearly, the use of ^{137}Cs sources has contributed greatly to our understanding of basic sciences and human health. While we recognize that the aqueous solubility and the potential dissemination of these sources undoubtedly constitute a serious risk, we are persuaded that this risk can be managed through a combination of oversight and physical controls. This should include secure removal of disused material, evaluation of the scientific and financial implication of a change in irradiation technique, and steps taken towards hardening the existing irradiators. These measures should supplement the existing security protocols that have been in place for the last two years. To limit the total risk, significant international efforts should be initiated to securely manage the world's inventory of $^{137}CsCl$ sources. These efforts will effectively manage the existing sources and would allow time for manufacturers to develop an alternate physical form that is safer than $^{137}CsCl$.

Future decisions regarding the use of ^{137}Cs should be based on a risk benefit evaluation to the overall population. As recognized by the International Commission of Radiological Protection (ICRP), the evaluation should include radiation exposure and other risks as well as the costs and benefits such that the potential radiation use does more good than harm[2]. The evaluation should include the cost to society for the alternative sources or methodologies, the impact of that change, the addition of current and future security improvements to protect these sources as well as the costs and risks of removing these sources.

To help evaluate the options, scientific studies should be done to evaluate the use of alternate radiation sources and chemical techniques in research. If research indicates the applicability of alternate techniques, the data could be used to help scientists convert historical scientific data for use with the new techniques. While reviewing this complex set of risks and data, every effort should be made to increase the physical protections for these sources to minimize the theft potential. Congress should enhance and properly fund the Offsite Source Recovery Program to ensure the ability to provide safe and effective storage of disused sources. The United States should work with the International Atomic Energy Agency to ensure that these sources are

[1] Von Sonntag C. The Chemical Basis of Radiation Biology. NY: Taylor and Francis; 1987.

[2] International Commission on Radiological Protection. The 2007 Recommendations of the International Commission on Radiological Protection. Oxford: Elsevier Ltd; ICRP Publication 103; Ann ICRP 37(2-4); 2007.

properly inventoried around the world. Source safety and security standards as stringent as those in the US should be adopted globally. Disused ^{137}CsCl sources should be collected and securely dispositioned while the import and export of these sources are tightly controlled.

Sincerely,

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Radiation Safety Officer

cc: Radiation Safety Committee
Attachment: Additional Signatory List

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