October 10, 2008

Mr. 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 Security and Continued Use of Cesium-137 Chloride Sources [Docket Number: NRC-2008-0419]

Dear Mr. Lesar:

The Federation of American Societies for Experimental Biology (FASEB) and the Association of American Medical Colleges (AAMC) are grateful for the opportunity to provide input to the Nuclear Regulatory Commission (NRC) in response to the Federal Register notice on the Security and Continued Use of Cesium-137 Chloride Sources (73 FR 44780, July 31, 2008). FASEB comprises 21 scientific societies, representing more than 80,000 biomedical scientists, many of whom use cesium-137 chloride irradiators in their research. The AAMC represents 129 U.S. medical schools, nearly 400 teaching hospitals and health systems, and 89 academic societies, and thus includes many of the institutions where irradiation facilities are maintained for medical research and clinical application. We endorse the comments of the Radiation Research Society and the American Society for Therapeutic Radiology and Oncology (ASTRO) in **cautioning against precipitous action towards prohibition of cesium-137 chloride.** FASEB and AAMC urge the NRC to consider the impact abrupt regulatory restrictions may have on lifesaving medical research, as detailed in our comments below. Our comments here are largely confined to the *research application* of cesium-137 chloride irradiators, which are especially relevant to our constituents, although FASEB and AAMC also acknowledge the importance of the critical clinical applications of these irradiators, including blood irradiation for prevention of graft-versus-host-disease and brachytherapies.

Use of Cesium-137 Chloride Irradiators for Research: Self-contained cesium-137 chloride irradiators are used to irradiate both cells and whole animals for a variety of research purposes. Irradiators are involved in research leading to new therapies to treat disease, development of countermeasures against radiologic attack, and generation of fundamental knowledge on living systems. Cesium-137 chloride irradiators have been in use for decades and remain vital for cutting-edge biomedical research, including the creation of transgenic animals and the growth of embryonic stem cells in the development of regenerative medicine. Scientists use cesium-based irradiators to study the molecular effects of radiation on cancer cells and normal tissue in order to improve and refine chemotherapies. Cell lines that are used as models for disease, such as the growth of carcinomas in the central nervous system, are created using irradiation. Cesium-137 chloride irradiators are commonly used for work with whole animals, particularly mice, for immunosuppression, which allows creation of models for different cancers, study of new treatments for disease, and transplantation of stem cells or tissues for research or therapeutic purposes. In short, cesium-137 chloride irradiators have contributed tremendously to medical advances, and continue to play a central role in biomedical research.

Impact on Research of Removing Cesium-137 Chloride Irradiators: Our constituents inform us that, because of the widespread use of cesium-137 chloride irradiators, the areas of research affected would be manifold and difficult to describe comprehensively. Not only radiation researchers themselves, which include medical physicists, radiologists, and radiation oncologists among others, but physiologists, immunologists, pathologists, and cell biologists would also be harmed. The most commonly shared concern in eliminating the use of cesium-based irradiators would be the need to recreate decades of baseline data and scientific protocols. Biomedical research discovery is based on incremental knowledge development, and disruption of that process by a sudden, forced shift in technologies would impede scientists and delay our progress in understanding the underlying biology of disease and generation of new therapies.

Alternatives to Cesium- Based Irradiators: As described in the National Research Council report, *Radiation Source Use and Replacement*, x-ray (orthovoltage) irradiators have been proposed as a non-radioactive alternative to cesium-137 chloride irradiators[1]. While x-ray irradiators may prove to be a viable alternative for many research applications, FASEB and AAMC share many concerns in transitioning between technologies including the impacts on facilities, requirements for training and retrofitting laboratories, and for the above mentioned issue of reproducing decades of baseline data and alteration of research protocols. There are also types of research, including investigations specifically relevant to countermeasures to cesium exposure, for which x-rays would prove an inadequate alternative.

Promising alternatives, as described by the National Research Council, would include cesium-137 sources in forms that are less dispersible than powdered cesium chloride. However, these forms have yet to be developed for levels of specific activity that would effectively substitute for current sources. It is estimated that at least several years of further development would be needed to develop these sources, demonstrate their effectiveness, and to make necessary changes to irradiators to accommodate them. Such research should be supported.

We believe that the process of technology transition and current lack of appropriate alternatives, particularly as they relate to biomedical research, need to be carefully considered by the Commission before any regulatory changes are proposed.

[1] National Research Council. 2008. *Radiation Source Use and Replacement: Abbreviated Version*. National Academies Press: Washington, DC.

Transitioning Between Technologies: Cesium-137 chloride irradiators operate by emitting gamma rays, which produce different biological responses at a molecular level than do x-rays. As noted by ASTRO, in order to prevent disruption of ongoing research and to prevent scientists from having to recreate enormous amounts of data, a tremendous investment of time and specialized human capital would be necessary. With time and the availability of skilled physicists, current cesium protocols could be re-engineered for x-ray technology. Moreover, comparative, side-by-side studies of experiments performed using cesium-based and x-ray irradiators could be used to establish appropriate controls to preserve existing data. However, neither of these options constitutes a small undertaking.

First, the knowledge of physics and skill necessary to calibrate and operate an x-ray irradiator is substantially greater than that needed to use a cesium-137 chloride irradiator for many research applications. Whereas, for example, a physiologist without a considerable background in physics could ably use a cesium-based irradiator with fairly minimal training, a trained medical physicist will likely be necessary to assist with the calibration and dosimetry of an orthovoltage machine for some types of research. Most research institutions do not employee enough medical physicists to meet this need, nor do FASEB and AAMC believe that the existing workforce of qualified medical physicists is adequate to accommodate the increased demand that would result from a precipitant switch to x-ray irradiators.

In addition to personnel challenges, the side-by-side studies necessary for transition would require a cesium-137 chloride irradiator and x-ray irradiator to be operating at the same facility simultaneously for long enough to perform the comparative experiments. Many institutions will simply be unable to provide the properly secured space for the contemporaneous operation of two large machines. Even research facilities that currently offer both types of irradiator will be challenged to provide the skilled, technical assistance during the time it takes to make the transition. At a minimum, the time that scientists and laboratory personnel could be using to generate new data, to continue our advancements in medicine, will instead be spent repeating previous experiments for calibration purposes.

Inadequate Alternatives: Projects designed to study the effects of continuous, low dose radiation, a major research interest of the Department of Energy and the National Aeronautics and Space Administration,[2] for example, cannot be done using x-ray irradiators. As the National Research Council acknowledges in its report, "No current compact x-ray sources can operate continuously and steadily for such long-time periods."[3] Studies involving low dose radiation are critical for understanding development of cancers, studying the consequences of DNA damage, refining therapeutic radiation dosages, and for developing medical countermeasures for space-flight and deliberate or accidental radiologic exposure.

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[2] Department of Energy's Low Dose Radiation Research Program: http://www.lowdose.energy.gov/about_main.htm

[3] National Research Council. 2008. *Radiation Source Use and Replacement: Abbreviated Version*. National Academies Press: Washington, DC, p. 96.

Economic impacts of replacement: In matters of national security and risks to human and environmental health, concerns for financial costs alone should not determine our decision making. However, it must be recognized that in an era of tightly constrained research and clinical care budgets, imposing an extraordinary burden on biomedical institutions through imprudently expeditious regulatory restrictions will have an effect on human health and well-being, as well as national security. X-ray irradiators are well-known for having higher maintenance costs and lower lifespans than their radioactive counterparts, in addition to the aforementioned increase in personnel costs. Moreover, many institutions have already invested substantially in security upgrades to safeguard their cesium-based irradiators. Resources dedicated to replacement of cesium-137 chloride could be diverted from research budgets, reducing funds for research that benefits human health or improves our nation's security. While cost alone may not be reason enough to justify continuation of cesium-137 chloride irradiator use, FASEB and AAMC urge the NRC to consider the financial impact on research as part of its deliberations. The National Research Council report details a number of potential solutions to this issue, including government subsidies, user incentive programs, and market/manufacturing incentives, and we would encourage the Commission to look closely at these and other proposals to mitigate the financial burden of any proposed regulations.

Security issues: Regulatory actions at the juncture of science and security often fall prey to the law of unintended consequences. While the NRC's central concern is, and should be, the potential for misuse of the CsCl radiation source to harm society, FASEB and the AAMC also believe there needs to be consideration of the risk of diverting resources or prohibiting research for which these sources are essential, including countermeasures research relevant to homeland security. We also question whether removal of cesium-137 chloride irradiators would substantially improve security or if, in fact, such an action could present new security challenges. Cesium-137 chloride irradiators are already protected by the high-level security requirements, and some institutions go beyond the minimum standard. Individuals who wish to gain access to irradiators must be fingerprinted and are subject to background checks by the Federal Bureau of Investigation. Facilities are monitored by cameras, feature biometrically-enabled entry systems, and are inspected regularly. Disabling of security systems or removal of the sealed radiation sources triggers an immediate response from armed guards. Attempting to remove the entire irradiator unit would require heavy equipment and tearing down of walls. However, even if, despite these protections, the NRC deems cesium-137 chloride sources to be high-risk enough to merit their removal, FASEB and AAMC respectfully request they give serious thought to issues of disposal, transportation, and subsequent security. We question whether transporting and stockpiling decommissioned cesium-137 chloride sources might not present a greater security threat than the current situation.

Final recommendations: In conclusion, FASEB and AAMC recommend the NRC consider the severe negative consequences that precipitous prohibitions on the use of cesium-137 irradiators could have on life-saving biomedical research. Furthermore, because those affected by potential regulatory changes represent a diverse group of stakeholders, including patients, scientists, physicians, and research universities, we strongly urge the NRC make full use of the federal rulemaking process through notices in the Federal Register and allow for consideration of public comment prior to enacting new regulations.

Thank you again for the opportunity to comment on the Security and Continued Use of Cesium-137 Chloride Sources, an issue of consequential interest to the biomedical research community. If you have any questions, or if our organizations may be of additional assistance, please contact Carrie Wolinetz, Ph.D., in the FASEB Office of Public Affairs at (301) 634-7650 or cwolinetz@faseb.org or Stephen Heinig, AAMC Biomedical and Health Sciences Research, (202) 828-0488 sheinig@aamc.org.

Sincerely,

Richard B. Marchase, Ph.D.
FASEB President

Darrell G. Kirch, M.D.
AAMC President and CEO