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United States Department of Agriculture

Office of the Assistant Secretary For Administration

Office of Procurement and Property Management

Radiation Safety Staff

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**FROM:** John T. Jensen, Director
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**TO:** John Jankovich, Ph.D., Team Leader
Nuclear Regulatory Commission

**SUBJECT:** Response to NRC Issues Paper on the Security and Continued Use of Cesium-137 Chloride Sources

The USDA uses high-risk radiation cesium chloride sources in self-contained irradiators for production of sterile insects for the eradication of certain insect pests and for research and development in a variety of biological research programs. The elimination or prohibition of cesium chloride irradiators will significantly impact USDA programs. Some programs may not be able to use x-ray sources as alternatives and all programs will incur additional costs associated with irradiator disposal and replacement. Responses from program managers and researchers using irradiators to relevant questions in the NRC Issues Paper have been consolidated and are included below.

Thank you for the opportunity to participate in your decision making process, this is an important area of research and agricultural protection for USDA. Please let me know if you have any question.

**Q2-1. Are X-ray generators already commercially available as substitutes for applications that do not require the gamma rays with Cs-137 and Co-60?**
No, this technology is still in development. Prototypes are undergoing evaluation with IAEA in Seibersdorf, Austria and in Panama by the USDA. However, it would take an additional investment of two years and significant funding to validate the use of this technology for insect production. It should be noted, currently there is only one commercial source that is marketing an X-ray generator for use in the small-scale application for insect production.

For clarification, the unit that is being evaluated by IAEA is the RadSource RS2400. USDA is evaluating an earlier model from the same company.

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**Q2-2. Are X-ray tubes cost-effective considering the initial cost, operating costs, and requirements for more maintenance for periodic calibration and replacement than radioactive sources?**
No, testing of tubes by the USDA in Panama (Screw Worm Program) showed that seven tubes failed in 3 months giving only 200 hours of use per tube. The tubes cost $50,000 each. Problems include burning out or breaking of the filament, vacuum leaks and corrosion. It should be noted that currently there is only one vendor (RadSource). Screw Worm Program indicates that after the warranty ran out, they would have to staff a department for refurbishing the tubes. The issue of reliability is critical because the insects are perishable. The insects must be irradiated at the proper stage of development or they will have to be discarded.

We expect that the operation of X-ray technology will be more expensive than the Cs-137 or C0-60 units. This is largely due to maintenance and the need for electrical power.

Larger commercial X-ray technology (e.g. E-Beam Technology) is also subject to technical difficulties and the reliability of the local power network.

X-ray units are available but (see response to Q2-2) they are not a cost effective/practical substitute.

**Q2-3. Is there any indication that the performance of the alternatives will change (improve or worsen) with respect to Cs-137?**
Given current information, we expect that the X-ray technology will perform worse than Cs-137. Unacceptable levels of fertility were encountered during testing by the Screw Program. Cobalt 60 irradiators have proven reliable under program parameters.

Regardless of the source, gamma and X-rays would not improve or worsen the results; the consideration is that of sufficient source strength and, in our case, the capacity for temperature control.

**Q3.1-3. What would be the economic consequences to users if CsCl was to be banned?**
The two major costs would be replacement and decommissioning of the current Cs-137 units. USDA, APHIS currently has 9 Husman Irradiators in use.

The cost of replacement for these 9 units with those containing Cobalt 60 would be approximately $6 million. This might vary depending on models selected based on program needs at the time of replacement.

Of great importance is we do not know what it would cost to decommission nine Cs-137 irradiators.

**Q3.3-1. Should the Federal government issue incentives to implement replacements?**
Yes.

**Q3.3-2. (a) Are there feasible incentives to shift users away from radioactive CsCl for users?**
An incentive would be for the Federal Government to pay for decommissioning and replacement costs.

**(b) Manufacturers?**
If the Federal Government holds the license on a particular technology (e.g., Husman Irradiators), the license could be made available to manufacturers at no cost in order to encourage the development of replacement technologies (e.g., Cobalt, X-ray).

The Federal Government could absorb the cost of initial licensing for replacement technologies.

**Q3.3-3. (a) What incentives should the Federal government provide to licensees to decommission their existing sources or devices because the devices still have use value?**
The Federal Government could pay for decommissioning and replacement.

**Q3.3-4. How can the Federal government compensate licensees when they are forced to decommission these sources? Should compensation include the cost of the replacement technology? Decommissioning?**
Yes. Yes.

Compensation should include at the very least the cost of decommissioning and replacement and, if the replacement source involves a greater degree of maintenance for safe and proper operation, that should be included as well. This would enable us to continue our research in the areas of food safety and security.

**Q4.3. Would additional security requirements for CsCl create a disincentive for owning them?**
Monitoring systems paid for by the government would not discourage their use. Setting a security standard unrealistically high just to discourage use would be improper given the long safe history of USDA with Husman irradiators.