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RADIATION SAFETY UNIT

26 September 2008

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

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RULES AND DIRECTIVES
BRANCH
USNRC

RE: Public Comments on the Continued Use of Cesium-137 Sources

Dear Mr. Lesar,

In response to the Request for Comments by the Nuclear Regulatory Commission on the issue referenced above, please accept this letter.

We urge careful and thoughtful consideration of this issue. CsCl irradiators play a vital role in both health care and research.

Impact on Healthcare

It is a standard of care in hospitals today to irradiate blood for immunocompromised patients. These patients are at very high risk of fatal transfusion-derived graft vs. host disease, which is essentially untreatable. Before a ban on CsCl irradiators was enforced, the University would urge the NRC to ensure that a clear plan is in place to replace these devices.

For the record, some hospitals, like ours, irradiate **all** cellular blood components because most cases of graft vs. host disease reported in the literature now occur in non-immunocompromised patients. We irradiate 30,000+ individual cell and platelet components per year.

Installation, maintenance and reliability of alternative technologies

While x-ray irradiators are available, there are a number of features that make them more expensive to install and operate. X-ray units are generally larger and more complex. Whereas the typical CsCl irradiator requires about one square meter of floor space and one 120 V/15 A circuit, the typical high capacity x-ray irradiator may take up three or more square meters and require a dedicated 230 V/50 A circuit and a dedicated water line for cooling.

Maintenance costs are considerably higher with x-ray irradiators. In general, the source in a CsCl irradiator is changed out every 30 years and it cannot break or otherwise fail to operate. X-ray tubes will fail at some point, necessitating

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replacement. The estimated life span of an x-ray irradiator is only ten years, compared to over 30 years for an isotope irradiator. While the initial purchase costs of CsCl and x-ray irradiators are similar, the shorter lifespan of the x-ray unit means the routine life cycle costs are higher for x-ray units than for CsCl irradiators.

Co-60 could be used as replacement for Cs-137. However, its shorter half life would necessitate source exchange every five or six years. This would also dramatically increase the life cycle cost of irradiators.

Impact on Research

CsCl irradiators have been used for decades for a broad range of applications. Thousands of investigators have used these irradiators in their research. There are several issues that are very important in biomedical research.

Capacity

CsCl irradiators are frequently used to irradiate small animals such as mice and rats. Several models currently on the market are capable of irradiating up to 12 mice at one time. This allows for a high throughput and increases the range of possible experiments. No x-ray irradiator on the market is capable of irradiating more than one animal at time.

As a result, and due to the need to warm up the x-ray tube prior to use, one University investigator estimates that a typical experiment (with 60 mice) will take anywhere from 4.5 to 20 times longer to complete (depending on the model of x-ray irradiator). This will drive up research costs significantly, to the point that many crucial experiments will become unaffordable.

Again, Co-60 could replace Cs-137 but irradiators have not been purpose built for such studies.

Penetration and dose uniformity

Gamma rays from the decay of Cs-137 have a much higher energy (662 keV) than x-ray irradiators (150 to 320 kVp). This results in a more uniform dose distribution throughout a small rodent. This is particularly important for whole body experiments where ablation of the bone marrow is required. No x-ray irradiator currently on the market can match the penetrating ability or uniformity of dose provided by irradiators charged with Cs-137.

Comparison to previous studies

If CsCl irradiators are banned or severely restricted, researchers would be forced to purchase new, untried units and repeat hundreds of experiments to "recalibrate" their experimental procedures. Again, it is unlikely that grant funding agencies would be

willing to pay to repeat past experiments. This could set back research productivity for years and could render previous data unusable.

Cost of replacing CsCl irradiators

Recent market forces and changes in regulations have driven up costs associated with decommissioning CsCl irradiators. A recent informal quote from a vendor indicated the cost of removing and disposing of an irradiator could exceed $105,000. This quote included $35,000 for the cost of removal and disposal of the radioactive source and $70,000 for rental of the Type B(U) transport container.

Replacement irradiators could cost as much as $500,000 for a high capacity unit, if such a unit were even available. This means it could cost the University more than $600,000 to replace each CsCl irradiator. These funds are not readily available. It is unlikely that grant funding agencies would be willing to pay to replace these units. Therefore, it would likely take a number of years before any institution could afford to replace each unit. This is particularly relevant when considering the fact that under normal use, we wouldn't plan to replace any Cs unit for at least 30 years.

Available manufacturing capacity for alternative technologies

At the present time, only two companies market x-ray-type irradiators suitable for blood irradiation or other applications. Assuming each vendor has sized their production line to meet the current market, neither has the capacity to replace all CsCl irradiators in a reasonable time frame (i.e. one year). Although manufacturing capacity could be increased, it is still very unlikely that the needed capacity could be on line in one year.

As mentioned above, Co-60 irradiators optimized for small animal studies are not currently available.

Sincerely,

Thomas L. Morgan, Ph.D., CHP
Radiation Safety Officer