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A Rare Case of Cesium-137 Source Leakage: Lessons for Clinical Medical Physicists

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ABSTRACT

Purpose: To report a rare failure of a sealed source Cesium-137 E-Vial used for dose calibrator quality control, describe the methods used for detection and characterization of the leak and emphasize implications for radiation safety, source integrity verification, and quality assurance procedures.
Methods: As part of a routine quarterly hot lab audit, wipe testing identified suspected Cesium-137 sealed source leakage. Instrument quality control and performance for the well counter was verified prior to performing wipe testing. Following wipe test results inconsistent with expected background levels, contamination surveys and historical QA data were reviewed. The investigation determined that the sealed source vial was leaking and measured results exceeded the trigger limit of 0.005 uCi (185 Bq) of removable contamination. Appropriate radiation safety controls were implemented and institutional and regulatory notifications were initiated.
Results: Contamination consistent with Cesium-137 leakage was confirmed and localized to the low-dose vial and the associated lead storage container. No personnel contamination, hot lab contamination beyond the immediate storage container or exposures exceeding regulatory limits were identified. The source was removed from service, secured, and managed in accordance with institutional and regulatory requirements. Follow up surveys confirmed successful containment with no other evidence of further contamination in the hot lab or mobile coach.
Conclusion: This rare case demonstrates that sealed source failures, although rare, can be identified through routine monitoring and audit activities. The findings underscore the importance of comprehensive audit programs, adherence to contamination monitoring practices and continued vigilance in environments where sealed sources are handled.

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INTRODUCTION

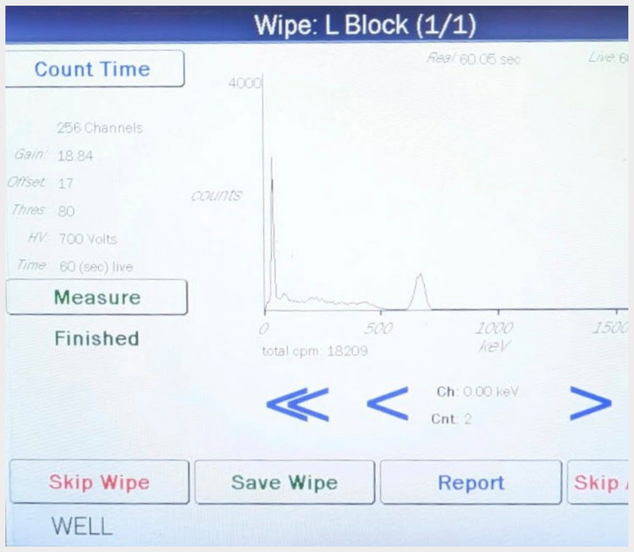
Cesium-137 (Cs-137) sealed sources are used in dose calibrators for quality control in nuclear medicine and research. Source integrity is critical for radiation safety. Failures of sealed sources, while rare, pose contamination risks to personnel and the environment. Routine monitoring and audit procedures are essential for early detection of leaks and ensuring regulatory compliance.

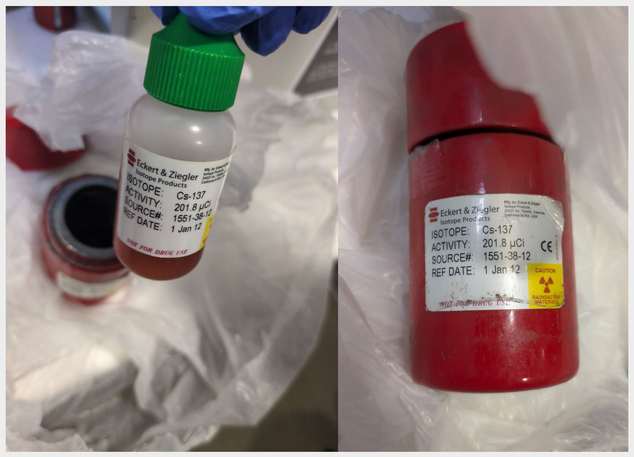
METHODS AND MATERIALS

During a routine quarterly hot lab audit, wipe testing identified suspected Cs-137 sealed source leakage. Instrument QC and well counter performance were verified. Contamination surveys and historical QA data were reviewed. Measured results exceeded the trigger limit of 0.005 uCi (185 Bq) of removable contamination, prompting implementation of radiation safety controls and institutional and regulatory notifications.

RESULTS

Contamination consistent with Cs-137 leakage was confirmed and localized to the low-dose vial and associated lead storage container. No personnel contamination or exposures exceeding regulatory limits were identified. The source was removed from service, secured, and managed per institutional and regulatory requirements. Follow-up surveys confirmed successful containment with no further contamination in the hot lab or mobile coach.





DISCUSSION

Key learning points:

- Sealed sources may look intact but can still be leaking and have removable contamination
- Well counter verification and QC should be performed prior to wipe testing
- Utilize well counter results to determine what type of contamination is present
- Follow radiation safety controls, institutional policy and submit regulatory notifications when a leaking source is found
- Finding a leaking source does not happen frequently. It is important to not become complacent.
- Treat each test as if the source could be leaking and know policies & procedures should action need to be taken.

CONCLUSIONS

This rare case demonstrates that sealed source failures can be identified through routine monitoring and audit activities. Findings underscore the importance of comprehensive audit programs, adherence to contamination monitoring practices, and continued vigilance in environments where sealed sources are handled, both in a clinical and research lab context.

ACKNOWLEDGEMENTS

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