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Radioactive Emissions from Fission-Based Medical Isotope Production and Their Effect on Global Nuclear Explosion Detection

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The use of medical isotopes, such as Tc-99m, is widespread with over 30 million procedures being performed every year, but the fission-based production of isotopes used for medical procedures causes emissions into the environment.
This paper will show that gaseous radioactive isotopes of xenon, such as Xe-133, are released in high quantities, because they have a high fission cross section and they are difficult to scrub from the processes used to produce the medical isotopes due to their largely unreactive nature. Unfortunately, the reasons that large amounts of radioactive xenon isotopes are emitted from isotope production are the same as those that make these isotopes the most useful isotopes for the detection of underground nuclear explosions. Relatively recently, the nuclear explosion monitoring community has established a provisional monitoring network for the Comprehensive Nuclear-Test-Ban Treaty (CTBT) that includes radioactive xenon monitoring as a major component. This community has discovered that emissions from medical isotope production present a more serious problem to nuclear explosion monitoring than thought when the network was first conceived. To address the growing problem, a group of scientists in both the monitoring and the isotope production communities have come together to attempt to find scientific and pragmatic ways to address the emissions problems, recognizing that medical isotope production should not be adversely affected, while monitoring for nuclear explosions should remain effective as isotope production grows, changes, and spreads globally.

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