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Update on IAEA Activities Supporting Non-HEU Production of Mo-99 & Tc-99m

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ABSTRACT

Technetium-99m (^{99m}Tc) is the most employed medical radioisotope, amounting to about 30 million studies per year and accounting for more than 80% of all procedures in diagnostic nuclear medicine. ^{99m}Tc is obtained from its parent nuclide molybdenum-99 (^{99}Mo), an isotope that is most commonly produced through the fission of uranium targets in research reactors. Since 2008, the supply chain for this strategic radioisotope has experienced shortages due to unexpected shutdowns both at reactors and processing facilities. The possibility of future shortages remain, particularly as some of the key reactors producing ^{99}Mo cease operation, either permanently or for prolonged periods for maintenance and facility upgrades.

Realizing the need to support Member States in mitigating the effects of a supply crisis of ^{99}Mo/^{99m}Tc in the future, the IAEA facilitates a number of activities that will be highlighted in this paper. The following IAEA activities will be presented: (i) the Mo-99 HEU minimization project, aimed at the transition of ^{99}Mo production away from the use of HEU, (ii) the Coordinated Research Project on "Accelerator-based Alternatives to Non-HEU Production of Mo-99/Tc-99m", aimed at the direct production of ^{99m}Tc through the reaction ^{100}Mo(p,2n)^{99m}Tc using cyclotrons, (iii) the Peaceful Uses Initiative project on "Supporting the Global Deployment of Mo-99 Production Capacity for Nuclear Medicine Applications without the Use of Highly Enriched Uranium (HEU)", aimed at assisting small-scale, national-level producers in setting up their production capability using low enriched uranium (LEU) fission or the ^{98}Mo(n,γ)^{99}Mo reaction, (iv) the new Coordinated Research Project on "Sharing and Developing Protocols to Further Minimize Radioactive Gaseous Releases to the Environment in the Manufacture of Medical Radioisotopes, as Good Manufacturing Practice", aimed at mitigating emissions from medical isotope production, and (v) a Round Robin exercise aimed at providing experimental results on production capabilities of the participating research reactors of ^{99}Mo based on ^{nat}Mo(n,γ)^{99}Mo reaction for supply to local users. The outcomes of these projects thus far as well as the activities planned for the future will be discussed.