AlphaMet project - Metrology for emerging targeted alpha therapies at NCNR RC POLATOM

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Targeted alpha therapy (TAT) is a rapidly growing cancer treatment modality that uses alpha-emitting radiopharmaceuticals to selectively target tumours while minimizing the radiation to healthy tissue. Currently, only $^{223}RaCl_2$ is approved. The success of its use has led to an unprecedented level of interest and investment in other α-emitters that can be used to treat a range of cancers. TAT therapy has demonstrated efficacy in clinical trials, with improved survival observed even in patients who do not respond to beta-emitting analogues. The implementation of new TAT therapies is hindered by several barriers, which result in variable levels of therapeutic efficacy in individual cases. The most common problems encountered are the lack of approved primary (secondary) activity standards, time-dependent growth of parent nuclides, and low levels of delivered activity. All of these problems translate into poor assessment of size and absorbed doses in vivo. The ongoing three-year EURAMET-funded project, 22HLT03 AlphaMet: Metrology for emerging targeted alpha therapies, will provide the requisite metrology to achieve full traceability of TAT therapy prior to its widespread routine use. The project is being conducted by 17 national metrology institutes, hospitals, academic institutions, and industry partners from 10 countries. The Laboratory of Radioactivity Standards (LWR) at NCBJ OR POLATOM is one of the project's contractors. The LWR is currently engaged in the implementation of a task aimed at developing new primary activity standards and new nuclear data measurements (α and γ emissions, half-lives) of α-emitters, with the objective of improving dosimetric calculations. The objective of this task is to standardize ^{225}Ac in equilibrium with daughter nuclides, thereby enhancing the metrological consistency of measurements pertaining to these nuclides. In fulfilment of its obligations under the aforementioned task, the LWR laboratory participated in an international comparison of ^{225}Ac solution activity measurements. As part of the process of enhancing the nuclear database pertaining to 225Ac, the half-life of the latter has been determined. The results of measurements conducted using the TDCR method, the gamma spectrometry method with an HPGe detector, and the scintillation counter method with an NaI(Tl) crystal are presented herein. The ionization chambers utilized in the LWR laboratory have undergone calibration and will be employed to transfer the activity of the generated standards, thereby enabling the determination of the doses administered to patients in the pre-clinical centres and hospitals participating in the project.

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