Contribution ID: **18** Type: **not specified**

PRODUCTION OF SHORT-LIVED ALPHA EMITTERS 223RA, 227TH AND 225AC FOR THE NEEDS OF NUCLEAR MEDICINE AT RIAR JSC

Nowadays the application of alpha-emitting radionuclides is becoming more wide-spread in the therapy of malignancies. Alpha particles have high linear energy transfer and short track in the human body. Alpha therapy can be applied for targeted killing of cancer cells, while minimizing radiation exposure to other unaffected organs and tissues. In 2021-2022 the development of a domestic 223Ra-based radiopharmaceutical for therapy of castrate-resistant prostate cancer burdened with bone metastases was undertaken at the FSCCRO of FMBA of Russia in Dimitrovgrad in cooperation with RIAR JSC. The effectiveness and safety of the Russian pharmaceutical was proved during clinical studies at FSCCRO of FMBA of Russia. Pharmaceuticals based on other alpha emitters, such as 225Ac, 227Th, etc., are currently being tested during preclinical and clinical trials.

Periodic generation from long-lived parent nuclides such as 227Ac and 229Th is the main process for production of 223Ra, 227Th, and 225Ac. Since 2010 RIAR JSC has been undertaking irradiation of radium targets to accumulate isotopes 227Ac and 229Th.

In 2022, a production area for 223Ra and 227Th was set up at RIAR. The work was based on the approach implying interim separation of 227Th from 227As by anion-exchange chromatography followed by separation of 223Ra and 227Th on two columns with anion- and cation-exchange materials once it has been held. Additional purification of 223Ra from trace amounts of the long-lived parent nuclide 227Ac at the first stage of the process, as well as the opportunity to supply 227Th as a separate pharmaceutical is the main advantage of this method. The 227Th preparation is also produced at the same site.

In 2023, a separate production area for 225Ac was put into operation, which is produced by periodic generation from 229Th. Since the parent thorium is a mixture of 228 and 229 isotopes, 225Ac needs to be purified from both 228,229Th and 224,225Ra. The developed process makes it possible to achieve purification factors at the level of 106 ÷ 107 for purification of target 225Ac from radionuclides 228Th, 229Th, 224Ra and 225Ra.

Quality control of products is a major focus of attention. The developed methods of analysis make it possible to determine radioactive impurities (especially long-lived isotopes) at 10-3÷10-4% of the activity of the target radionuclide during certification of radiopharmaceuticals. The content of non-radioactive impurities in radiopharmaceuticals is found by atomic emission analysis.

The paper describes in detail the specifications of the resulting products.

Section

4th International Conference "Nuclear and Radiation Technologies in Medicine, Industry and Agriculture" (Section 4)

Primary author: BUTKALIUK, Irina (Lvovna)

Co-authors: Mr ANDREEV, Oleg (Nikolaevich); Mr BUTKALIUK, Pavel (Sergeevich)

Presenter: BUTKALIUK, Irina (Lvovna)

Track Classification: 4th International Conference "Nuclear and Radiation Technologies in Medicine, Industry and Agriculture"(Section 4): Sub-Section 4-1 "Nuclear Medicine"