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HSA Er-169 production at ILL nuclear reactor and CERN-MEDICIS

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Er-169 (half-life 9.39 d) is an almost pure β- emitter characterized by low energy electrons emission and few low energy and very low intensity gamma rays. It is currently produced in nuclear reactors through the neutron activation of Er-168, which is one of the 6 natural erbium isotopes. Er-168 is commercially available at around 98% enrichment level; nevertheless, the cross section of the reaction is quite low, entailing a dilution of Er-169 in high amount of stable Er-168. Thus, the low specific activity of the produced batches hinders its potential use for receptor-targeted radiotherapy. The combined use of nuclear reactor production and mass separation is proposed to overcome the low specific production of some carrier-added lanthanides, such as Er-169. The experiments performed at ILL nuclear reactor and CERN-MEDICIS facility showed the feasibility of the production method. The first production of high specific activity Er-169 has been performed with the collection of around 17 MBq. A specific activity increase from 1.3 GBq/mg to 235 GBq/mg at the time of mass separation was obtained. Nevertheless, the overall efficiency of the production method was around 0.2 %. Based on the first experiments, some improvements have been identified for the future amelioration. One is to optimize the position of the left slit maximizing the reduction of Er-168 atoms while minimizing the loss of Er-169 on the collection foil. The method identified for improving the efficiency, instead, consists in introducing the laser ionization in the mass separation process. The results achieved, as well as the future perspectives will be presented in more details. In parallel, it was shown that Er-169 can be produced and be available for preclinical studies. Thus, preclinical trials could be performed starting from mid-2019 in collaboration with hospitals and research centers.

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