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Production of At-211 using a cyclotron and an import plan of Ac-225 サイクロトロンにおける At-211 生成と Ac-225 輸入計画

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Targeted alpha-particle therapy (TAT), using short-lived alpha emitters such as At-211, Ac-225 and Ra-223, is one of remarkable cancer treatment methods especially for refractory cancer. At-211 with a half-life of 7.2 hours is produced by the nuclear reaction of 209Bi(4He,2n)211At. The energy of a 4He2+ ion beam should be tuned to 29 MeV or less to avoid production of At-210 which decays to a toxic element of Po-210. Several hundreds MBq of At-211 can be obtained by irradiation of a few particle-micro-A 29 MeV 4He2+ ion beam. Small amounts of At-210 are now available only for academic studies, provided from "Supply Platform for Short-lived RI"called RI-PF. Ac-225 with a half-life of 10 days is also one of the most powerful alpha emitters for TAT, commonly obtained from the parent nucleus Ra-225 by a milking method. In recent years, an accelerator-based Ac-225 production technique using an around 500 MeV proton beam has been developed at TRIUMF in Canada. A Th-232 target placed at the beam dump was used for production of RIs such as Ac-225 and Ra-225 by the spallation reaction of 232Th(p,x). We have a plan to import the generator Th-229 or Ra-225 for milking Ac-225 in near future. In this paper, the details of At-211 production and Ac-225 import will be presented.

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