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OPENING LECTURE - Recent advances in nuclear data research for medical radionuclide production

Wednesday, 19 September 2012 08:00 (30 minutes)

Nuclear data play a key role in the optimisation of production routes of medical radionuclides. In general, the production data of all commonly used diagnostic and therapeutic radionuclides are well known. The international activities to standardise those data will be reviewed. Furthermore, some recent efforts to develop alternative routes of production of a few widely used radionuclides, such as 99mTc and 68Ga, will be briefly discussed.

Regarding research oriented radionuclides, great demand exists for novel positron emitters, e.g. to study slow biological processes and to quantify dose distribution in internal radiotherapy. Some recent studies related to the development of 64Cu ($T_{1/2}$ = 12.7 h), 124I ($T_{1/2}$ = 4.2 d), 86Y ($T_{1/2}$ = 14.7 h), etc. will be described as typical examples. In general, the low-energy (p,n) reaction on highly enriched corresponding target isotope is successfully utilized. However, for production of several positron emitters, intermediate energy reactions are preferable. Another area of increasing interest is internal radiotherapy and the choice lies on low-range highly ionising radiation emitters, i.e. low-energy β-, α and Auger electron emitters. In recent years a large number of charged-particle induced reaction cross section measurements have been performed, especially to produce some important therapeutic radiolanthanides with higher specific activity than in reactor production, though only with partial success. Cross section measurements to develop some novel therapeutic radionuclides have been challenging, and interdisciplinary techniques were employed. This will be exemplified by studies on a few radionuclides, such as 67Cu ($T_{1/2}$ = 2.6 d; Eβ- = 577 keV), 225Ac ($T_{1/2}$ = 10.0 d; Eα = 5830 keV) and 193mPt ($T_{1/2}$ = 4.3 d; Auger electrons).

The future perspectives of medical radionuclide production will be considered. The potential of use of high energy protons and heavier mass projectiles will be discussed.

Primary author: Prof. QAIM, Syed M. (Forschungszentrum Jülich, Germany)

Presenter: Prof. QAIM, Syed M. (Forschungszentrum Jülich, Germany)

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