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Operational nuclear research reactors in the Asia-Pacific with potential for medical radionuclide production

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Personalised cancer treatment is of growing importance and can be achieved via targeted radionuclide therapy. Radionuclides with theranostic properties are proving to be clinically effective and are widely used because diagnostic imaging and therapy can be accomplished using a single formulation that avoids additional procedures and unnecessary radiation burden to the patient. For diagnostic imaging, single photon emission computed tomography (SPECT) or positron emission tomography (PET) is used to obtain functional information noninvasively by detecting the gamma (γ) rays emitted from the radionuclide. For therapeutics, high linear energy transfer (LET) radiations such as alpha (α), beta (β^-) or Auger electrons are used to kill cancerous cells in close proximity, whereas sparing the normal tissues surrounding the malignant tumour cells.

One of the most important factors that lead to the sustainable development of nuclear medicine is the availability of functional radiopharmaceuticals. Nuclear research reactors play a vital role in the production of medical radionuclides for incorporation into clinical radiopharmaceuticals. The disruption of medical radionuclide supplies in recent years has highlighted the importance of ongoing research reactor operation. This article reviews the current status of operational nuclear research reactors in the Asia-Pacific region that have the potential for medical radionuclide production. It also discusses the different types of nuclear research reactors, their operating power, and the effects of thermal neutron flux in producing desirable radionuclides with high specific activity for clinical applications.

Keywords: neutron activation; nuclear medicine; nuclear research reactor; radionuclides
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