

Radionuclide production

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Radioactive isotopes are widely used in the physical and biomedical sciences as radiotracers, in diagnostics (which makes 95% of all medical uses) and in therapy. The first practical application of a radionuclide as a radiotracer dates back to 100 years ago. All radionuclides commonly administered to patients in nuclear medicine are artificially produced, either in nuclear reactors or with particle accelerators, usually a cyclotron. The lecture will first illustrate the characteristics required to medical radionuclides and compare reactor- versus accelerator-production. Next it will address production with a cyclotron in more details, discussing production rate, cross-section and targetry. Examples will be given of the most common radionuclides used in medicine, for both diagnostics and therapy, and of the nuclear reactions employed to produce them. Finally, radionuclide generators will be discussed, with particular reference to the widely used $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$.