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Toward a Hospital Based Reactor for Neutron Capture Therapy

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Abstract

The concept of the neutron capture therapy (NCT) is older than 60 years, but a specific tool that is convenient to use in the hospital is not realized yet. The 3 MW Brookhaven Medical Research Reactor (BMRR) has been the only reactor specifically designed for the NCT. Although it was designed in 1950s, it still has the best capability for the NCT in the world. If recent knowledge is applied to design a NCT reactor, its power could be much lower than BMRR with better safety features. While new installation of a reactor in the metropolitan hospital is deemed very hard, accelerators have been installed at many medical centers and the number is increasing. Therefore, research on the use of accelerators as neutron sources of the NCT is active. Since nuclear reactors are already proven neutron sources for the NCT, however, a reactor could be a readily available tool to a medical center in case the efficacy of NCT is proven. It is believed that designing an extremely safe reactor effective for the NCT is technically possible, and it is worthwhile reviewing its basic design concept for the readiness because patients of malignant cancer cannot wait. This paper suggests basic guidelines for the design of a hospital based reactor for the NCT.