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Boron Neutron Capture Therapy, a form of hadrontherapy mediated by neutrons

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Boron Neutron Capture Therapy (BNCT) is a radiotherapy that consists in patient irradiation with low energy neutrons after the administration of a tumour-targeting borated drug [1]. The thermal neutron capture in 10B generates two high-LET, short-range charged particles that cause non-reparable damages to the cell where the reaction takes place. Provided a suitable tumour-to-normal tissue boron concentration ratio, the neutron irradiation can provide a therapeutic effect while sparing the healthy tissues. Selectivity is guaranteed by boron bio-distribution, thus BNCT is the only hadrontherapy potentially useful to control spread tumours, such as metastases, or malignancies located close to very radiosensitive targets. One of the crucial elements of a BNCT clinical facility is the availability of an intense neutron beam with precise spectral characteristics. The beam design is thus a pivotal aspect of the design of a clinical BNCT centre. Modern BNCT is based on neutron beams obtained from proton accelerators coupled to Be or Li targets. Some aspects of a facility project based on a 5 MeV, 30 microA RFQ proton accelerator, on Be target and on a Beam Shaping Assembly based on aluminum fluoride will be presented, together with the assessment of its therapeutic potential and suitability for clinical use [2]. Moreover, important advancement concerning BNCT mixed-field dosimetry will be introduced. In particular, the need of radiobiological data to feed models for the translation of BNCT dose into photon-equivalent units will be presented in light of the future work in this field [3].

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