BOROLUSSI-1: The dosimetry for in-vitro BCNT radiobiological studies [POSTER]

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BNCT dose is due to a mixed field, whose components have different biological effectiveness. The conversion of absorbed dose into photon-equivalent dose has been traditionally obtained by fixed RBE/CBE factors, derived from in-vitro or in-vivo studies. Recently, other models have been proposed, such as photonisoeffective dose, based on the evaluation of the whole dose-effect radiobiological curves instead of fixing an endpoint. Whatever model is used to express BNCT dose in photon-equivalent units, the capacity to design proper treatment planning and dosimetry relies on solid radiobiological data. For example, the survival of tumour cells as a function of dose when irradiated with neutrons only, with neutrons in presence of boron and with a reference photon beam are a typical tool to explore BNCT effectiveness in comparison with photon therapy.

In Pavia, a long experience exists on the in-vitro BNCT studies, and we have explored the importance of dose calculations to construct the curves. Detailed Monte Carlo calculations assessing the most suitable transport strategies, together with dedicated boron measurements for each irradiation experiment lead to accurate dose calculation.

This work shows the effect of non-correct assumptions in dose calculations and of poor boron concentration knowledge in the determination of RBE/CBE factors and in drawing conclusions about BNCT effectiveness compared to conventional treatment with photons.