IGFAE workshop on technologies and applied research at the future Galician proton-therapy facility



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Proton Therapy beyond cancer: Potential benefits for neurodegenerative disorders

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Radiotherapy (RT) is a well-established medical modality that is delivered to more than 50% of cancer patients at some point of their treatment. Additionally, RT has been successfully used to treat extra-cranial amyloidosis and current evidence indicates that is a promising treatment for amyloid-associated neurodegenerative disorders such as Alzheimer's, Parkinson's, and Huntington's diseases. Furthermore, new modalities of RT could enhance biological effects and reduce potential toxicity.

Proton Therapy (PT) is one of the most effective techniques of external RT due to the substantial clinical advantages of protons over conventional RT based on photons or electrons. These advantages include a favorable depth dose distribution, a lower lateral spread and a minimal scatter that allows a decrease in collateral damage. This modality is currently tested in cancer settings, but it is largely untested in the context of amyloidosis and neurodegenerative disorders.

Our goal is to evaluate the capability of PT and other RT modalities to disrupt or diminish the formation of toxic protein amyloids associated with neurodegenerative disorders, bringing together fundamental nuclear physics and biochemistry. First gamma-irradiations of cell lines expressing neurodegenerative disease-associated proteins, indicated a decrease in the expression and aggregation of the pathological proteins, which was proportional to the applied dose. These results have encouraged the proposal of a PT irradiation experiment to established cell lines at the implantation beam line of the CMAM laboratory, which is currently under preparation.

In this talk, we will present the results of the gamma-irradiations, as well as the current status of the PT measurements. Our scope is to lay the groundwork for the application of PT beyond cancer, multiplying the versatility of new proton therapy facilities, and modifying the development of currently incurable neurode-generative disorders.

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