UT AUSTIN PORTUGAL ANNUAL CONFERENCE 2023
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Theranostic Strategy for Proton Boron Capture Therapy of Pancreatic Cancer (THER-PBCT)

MEDICAL PHYSICS
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INTRODUCTION/MAIN GOAL

- Pancreatic cancer will become the second leading cause of tumour-related mortality in the next decade, according to the current estimations. Hence, more efficacious treatments are urgently needed to treat this radioresistant tumour, known as one of the “big killers”.

- Having this in mind, we have devised the THER-PBCT project that studied the delivery of boronated micelles to radioresistant pancreatic cancer cells and evaluated their biological responses upon irradiation with an 80-MeV clinical proton beam at the MDACC facilities.

- Our main goal was to demonstrate that the PBCT approach will lead to a significant dose enhancement factor through the production of highly ionizing α particles by a proton-boron fusion nuclear reaction occurring preferentially in the cancer cells.

RESULTS/CONCLUSIONS

- New boronated polymeric micelles (M-carb) were assembled, characterized and used in cellular studies with pancreatic cancer cells which included: uptake assays (Fig. 1) and irradiation experiments with a clinical proton beam.

- The obtained preliminary data indicate that M-carb seems to efficiently reduce the survival of pancreatic cancer cells upon irradiation with a clinical proton beam with induction of significant DNA damage, in particular for high linear energy transfer (LET) protons (see Figs 2 and 3).

- To pursue with the proposed theranostic strategy we foresee the labeling of the boronated micelles with a nuclear imaging probe (e.g., ^{111}In-oxine) to perform microSPECT and/or biodistribution studies in appropriate animal models.

FIGURES

Figure 1: Cellular uptake of boronophenylalanine (BPA) and M-carb micelles in Miapac-2 cells.
Figure 2: Survival fraction (0-1.0) of Miapac-2 cells treated with BPA and M-carb and irradiated with protons.
Figure 3: DNA damage in Miapac-2 cells treated with BPA (A) and M-carb (B) and irradiated with protons.

Figure 1

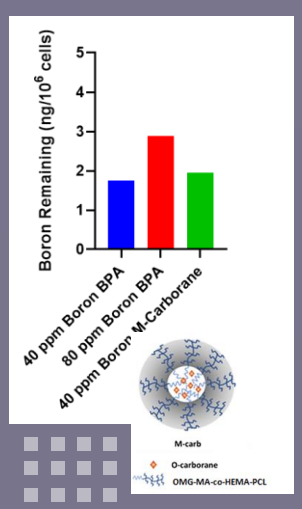


Figure 2

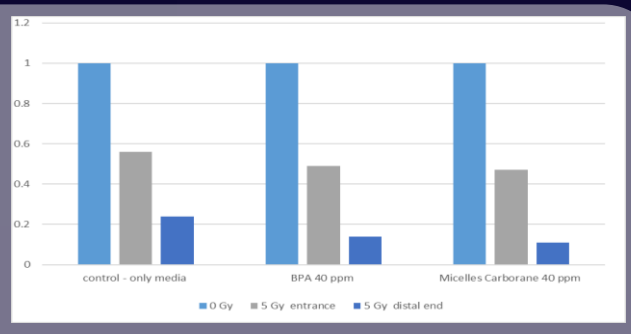
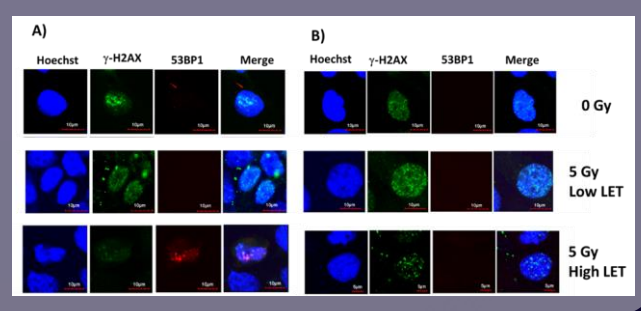


Figure 3



TEAM

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This work was supported by Fundação para a Ciência e Tecnologia (project UTAP-EXPL/FMT/0020/2021)

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