Canadian Radiotheranostics Leaders' Summit 2025

Abstract Submission

Title: Characterisation of a murine ovarian cancer model for nanoparticle-based radiotheranostics

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Abstract:

Purpose: We have previously developed porphyrin-lipid nanoparticles (PS) capable for chelating Copper radioisotopes for cancer imaging (Copper-64, 64Cu) and radiotherapy (Copper-67, 67Cu). In this work, we report the development and characterisation of a mouse model of ovarian cancer for enabling future investigations of 64Cu/67Cu-PS nanotheranostics for diagnosing and treating metastatic disease, and priming for immune checkpoint blockade therapy.

Materials and methods: Female C57BL/6J mice were implanted with 1M ID8-Luc+ cells in the right ovary. PS were radiolabelled with 64CuCl2 in a 'one-pot' reaction achieving RCP ≥ 95%. 6 weeks post-implantation mice were injected IV with 18F-FDG (1 GBq 18F/kg, IV) and imaged with PET/MR 45 min after. A day later the same mice were injected with 64Cu-PS (10 mg/kg, 4.5 GBq 64Cu/kg, IV) and PET/MR imaged 3, 24, 48 and 72 h post-injection. ROIs of the orthotopic tumour and healthy ovary were contoured from PET/MR images. At 96 h mice were sacrificed, BLI of the abdominal cavity performed, and the tumour and ovary

activities measured ex vivo.

Results: 6 weeks post-implantation, >90% of mice had orthotopic tumours. Rates of intraabdominal metastases were >80%. Uptake of 64Cu-PS in the orthotopic tumour peaked at 14.5 %ID/mL 24 h post-injection. The tumour-to-ovary ratio was 5.8. By 96 h, tumour concentration had fallen to 9.2 %ID/mL and the tumour-to-ovary ratio was 4.4. At it peak, 64Cu-PS provided 2.1-fold greater PET imaging contrast in the tumour compared to 18F-FDG. The liver and spleen also exhibited high uptake and retention of 64Cu-PS.

Conclusions: 64Cu-PS exhibited selective uptake and prolong retention in orthoptic ovarian tumours for over 96 h post-injection; ideal for sustained delivery of low dose radiation to the tumour while sparing sensitive organs from significant exposure. Future studies will explore folate receptor targeted versions of PS in preparation for therapeutic studies with 67Cu.