RADIother**A**nostic pep**T**id**E**s in **I**mmuno-**O**ncology **(RADIATE-IO)**

Problem being solved:
According to the WHO, the global cancer burden will rise by 77% by 2050. Most of the current treatment strategies involve a combination of targeted therapy or immunotherapy with therapies that cause immunogenic cell death (ICD) such as chemotherapy and external beam radiation therapy (EBRT).

- however, chemotherapy is highly non-specific and cytotoxic; its significant side effects limiting its use in these chronically ill patients
- due to the high radiation doses and practicalities, external beam radiation therapy is limited to locoregional disease or oligometastases and cannot be used in patients with systemic disease spread
- there is a need for more effective combination therapies to obliterate tumoural heterogeneity and overcome cancer immunotherapy (CIT) resistance

Solutions:
The team aims to develop a toolbox of novel radiotheranostic peptides is anticipated to significantly improve accuracy of immunoprofiling

- developing a toolbox of novel radiotheranostic peptides that can more accurately and non-invasively immunoprofile patients to guide combination CIT use
- targeted radioligand therapy (RLT) which allows the delivery a similar effective dose of radiation to the lesion to cause ICD without the non-specific side effects of chemotherapy and EBRT but at the same time
- having a long enough path length for cytotoxic bystander effects to on neighbouring non-target expressing tumour cells, thus overcoming intralesional heterogeneity of a specific target

Market Size:
The global theranostic market reached USD $1.8B in 2022, and is projected to experience substantial expansion, reaching USD $4.2B by 2031. The *in vivo* animal data generated based on the proposed project from this funding would position RADIATE-IO technology as new theranostic tools in LCa treatment, a market valued at over USD $29.5B in 2022 with 11% CAGR.

Competition:
Duke-NUS peptide inventions integrate technologies from immunology, chemistry and *in vivo* molecular imaging for the development of a multi-modal radiotheranostic peptide, other competitors include:

- CytoSite Bio Inc (USA) has recently reported the FDA investigational new drug (IND) approval for first-in-human (FIH) trials for its flagship GZB PET imaging agent, CSB-321, for the assessment of immunotherapy efficacy
- Researchers at UCSD (USA) and Peking University that have their own GZB peptides based on similar scaffolds
- To-date no team has demonstrated the potential of a GZB peptides as a radiotheranostic in cancer or infectious disease

Team:

- Ann-Marie Chacko, Asst Professor, Duke NUS medical school
- Prof Chandra Verma, A*STAR Bioinformatics Institute (BII)
- A/Prof Daniel Tan, National Cancer Centre Singapore

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