Arnie Charbonneau Cancer Institute
The Riddell Centre for Cancer Immunotherapy

University of Calgary | Alberta Health Services

Enhancing CAR T-Cell Therapy for Solid Tumours with Engineered Oncolytic Viruses

PROJECT TEAM


Dr. Douglas Mahoney (PI)


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TARGETED CANCERS

- Sarcoma
- Glioblastoma
- Solid cancers

RESEARCH PRIORITIES

- Discovery & Innovation

RESEARCH ENABLERS

- Synthetic immunology
- Preclinical modeling

Previous enablers:
- Vectorology

FUNDERS

CIHR IRSC
Canadian Institutes of Health Research | Instituts de recherche en santé du Canada

PROJECT SUMMARY

CAR T-cell therapy has improved outcomes for certain blood cancers, but its success in solid tumours has been limited. Solid cancers often create hostile environments that suppress immune responses and resist treatment. To overcome these barriers, researchers at UCalgary, led by Dr. Douglas Mahoney, conducted a study to develop a novel vaccine to boost anticancer T cell activity, using engineered oncolytic rhabdoviruses — viruses designed to selectively infect and destroy cancer cells while sparing healthy tissue.

This innovative approach involved modifying the viruses to carry immune-boosting signals that enhance the function and persistence of CAR T-cells. In early preclinical studies, these engineered viruses helped CAR T-cells survive longer, penetrate tumours more effectively and slow tumour growth. These results were presented at several International Oncolytic Virotherapy Conferences and are helping to shape the next generation of immunotherapies.

Building on these promising results, the team partnered with experts in preclinical modelling to test the vaccine in models of glioblastoma and sarcoma — two solid tumours that remain especially difficult to treat. These experiments showed that the viral vaccine can improve CAR T-cell therapy outcomes, albeit modestly, either on its own or in combination with standard treatments.

The ultimate goal of this research is to create an off-the-shelf vaccine that can be readily administered to patients, making CAR T-cell therapy more effective and accessible for solid tumours. This work is part of a broader effort to engineer “designer viruses” that not only attack cancer directly but also reshape the immune environment to support long-lasting therapeutic responses. Recent findings from this project have provided new insights into how one class of viruses can achieve this, by interacting with the immune system in a previously unknown way (Rajwani et al., *Nature Communications* (2024)).

OVERALL IMPACT

By developing oncolytic virus vaccines that strengthen the immune system’s responses against solid tumours, this research holds promise for improving outcomes to CAR T and other immunotherapies in patient with these hard-to-treat cancers.

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