



Arnie Charbonneau Cancer Institute
The Riddell Centre for
Cancer Immunotherapy



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PROJECT TEAM

Sarcoma

Glioblastoma

TARGETED CANCERS

RESEARCH PRIORITIES

Discovery &
Innovation

RESEARCH ENABLERS

Genomics

Proteomics

Data science

Preclinical
modeling

Identifying New Targets for Hard-to- Treat Cancers

PARTNERS

Clark H. Smith
Tumour
Centre

Integrated Sarcoma
Research Program
(ISARP)

FUNDERS

Kids Cancer Care
Foundation Chair

Canada Research
Chair Tier II in
Precision Oncology

PROJECT SUMMARY

Glioblastoma and rare sarcomas are among the most challenging cancers to treat. Glioblastoma is an aggressive brain cancer known for its rapid progression and resistance to therapy, while sarcomas — though rare — affect connective tissues and often lack effective treatment options due to limited research and high genetic variability.

To address these challenges, a multidisciplinary team at UCalgary led by Dr. Sorana Morrissy conducted a study to search for new immunotherapy targets in brain cancer and sarcoma, using a cutting-edge approach that combines proteomics and genomics — two powerful tools that provide deep insight into the molecular makeup of cancer. Proteomics allows researchers to study the proteins that drive cancer behavior, while genomics reveals the genetic mutations that may be responsible for tumour growth.

By integrating these datasets generated from >150 patient samples, the team identified numerous proteins that are uniquely or predominantly expressed on the surface of glioblastoma and sarcoma cells, or in their microenvironments, but not on healthy tissues. The strongest findings were

validated in preclinical models. These proteins represent promising targets for new therapies, especially immunotherapies that can be designed to recognize and attack cancer cells with precision.

Indeed, discoveries from this project are now feeding directly into the Riddell Centre's innovation pipeline. This includes the identification of GPNMB as the promising target now being explored in an upcoming Phase 1 clinical trial. In addition, rational combinations of identified proteins are being targeted by “pools” of CAR T-cells, and proteins uniquely upregulated in brain cancer microenvironments are being used to “gate” CAR T-cells for better safety.

This project is also contributing to technological innovation. The team developed a novel data-integration method called MosaicMPI, which helps interpret complex biological data and was recently published in *Nucleic Acids Research* (Verhey, 2024). The team also developed advanced analytics for spatiotemporal modeling of glioblastoma, enabling high-resolution mapping of tumour invasion states and tumour-microenvironment interactions, published in *Genome Biology* (Thoppey Manoharan, 2024).

OVERALL IMPACT

This project paved the way for the development of precise, multi-targeted, logic-gated therapies for glioblastoma and rare sarcomas. By identifying new molecular targets, the research has expanded treatment possibilities for patients who currently have few options.