Arnie Charbonneau Cancer Institute
The Riddell Centre for Cancer Immunotherapy

University of Calgary | Alberta Health Services

BCAR1: Advancing Armored CAR T-Cell Therapy for Multiple Myeloma

PROJECT TEAM


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TARGETED CANCERS

Blood cancers

RESEARCH PRIORITIES

Clinical Research & Translation

PARTNERS

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FUNDERS

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PROJECT SUMMARY

Multiple myeloma is a cancer of plasma cells that disrupts normal blood cell production in the bone marrow. While several treatments exist, relapse is common, and the disease remains incurable.

In response, a team of researchers led by Dr. Nizar Bahlis at UCalgary and AHS have been investigating strategies to improve the outcomes of patients with multiple myeloma. One area of focus has been CAR T-cell therapies that target BCMA, a protein commonly found on myeloma cells. Since 2019, the team has enrolled patients in industry-sponsored clinical trials to evaluate the effectiveness of BCMA-targeted therapies. To better understand why some patients respond while others do not, they applied single-cell DNA sequencing to analyze both the cancer and the CAR T-cells. Their studies revealed that BCL2L1 — a gene known to support T cell function — was highly expressed in CAR T-cells from patients who experienced better outcomes, suggesting it could play a role in enhancing CAR T-cell performance.

Building on this insight, the team developed a novel "armoured" CAR T-cell — BCAR1 — that expresses BCL2L1 in addition to the CAR to extend how long the CAR T-cells remain active in the body and reduce their exhaustion. In preclinical studies, BCAR1 shows dramatically improved survival, expansion and anti-tumour activity compared to standard CAR T-cells.

Early findings from this work have been shared widely, including presentations at the American Society of Hematology's annual meetings in 2021 and 2023.

To move BCAR1 toward clinical testing, the team has consulted with Health Canada and initiated additional studies based on its regulatory feedback. Manufacturing process development is now underway in collaboration with partners in Vancouver and Ottawa. Regulatory preparations for a Phase I clinical trial are also in progress, with trial launch anticipated in 2026 or 2027.

Although BCAR1 was developed for multiple myeloma, the armouring strategy may have broader applications. Studies are now exploring its use in other CAR T therapies, including those targeting glioblastoma and sarcoma — offering a potential platform solution to overcome T cell exhaustion across multiple cancers.

OVERALL IMPACT

The development of BCAR1 represents a significant step forward in optimizing CAR T-cell therapy for multiple myeloma. By enhancing T cell persistence and reducing exhaustion, this approach addresses key limitations of current treatments and offers a promising strategy to improve patient outcomes. Beyond multiple myeloma, the BCL2L1-armouring strategy has the potential to strengthen a wide range of cell therapies across different cancer types.

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