BioCanRx
Biotherapeutics for Cancer Treatment
Biothérapies pour le traitement du cancer

CAR-T Cell Therapy – Fact Sheet

What are CAR-Ts?
Chimeric Antigen Receptor modified T cells. It's a powerful new tool for treating cancer.

What is CAR-T therapy?
CAR-T therapy extracts a patient's immune cells from their body. The cells are genetically engineered to recognize a patient's own tumour, and then returned to the patient's body in large numbers. This is known as adoptive cell transfer. The re-engineered cells are able to attack and kill the cancer cells. This therapy is having dramatic responses in some patients wither certain types of advanced cancer.

Ordinarily, a cancer patient's immune system poorly recognizes cancer cells, although sometimes the immune system can mount a natural immune response to a patient's cancer. This immune response, led mainly by T lymphocytes, is often ineffective – these T cells may fail to recognize tumour cells, fail to become activated, or fail to be maintained long enough to have an impact. Recent clinical research has shown that it is possible for these limitations to be overcome by isolating a sample of a patient's T lymphocytes from their blood, genetically modifying and activating the cells in the lab, and then re-administering them to the same patient.

Which cancers can be treated using CAR-T therapy?
CAR-T cell therapy has shown promise in paediatric and adult patients with certain blood cancers such as acute lymphoblastic leukemia and lymphoma.

How are the CART-T cells manufactured?
Because CAR-T therapy is very personalized (it requires genetically engineering the patient's own T cells) there is considerable infrastructure and expertise required to deliver treatment safely and successfully. The genetic modification step involves introducing into the T cells an extra gene using a vector that carries instructions to recognize tumour cells. As a result, the T cell becomes covered with a new component instructed to recognize tumour cells called a Chimeric Antigen Receptor (CAR). It is "chimeric" because it contains different receptor sub-components fused together, and it is an "antigen receptor" because it recognizes specific features, or antigens, on the surface of tumour cells. The vector containing the new tumour recognition receptor, and the engineered CAR-T cells are each grown in the laboratory. Once engineered CAR-T cells multiply in the billions in the lab, they are returned to the clinic to be re-administered to the same patient from whom the T cells were taken.

Where will the CAR-T production take place?
Our multidisciplinary team of nationally and internationally recognized researchers spans the entire basic/translational/clinical research continuum and is well positioned to deploy CAR-T design, manufacturing and clinical testing capacity. The vector containing the new T cell recognition receptor has been designed at the BioCanRx-funded Immunogenomics Core Facility located within the Michael Smith Genome Sciences Centre in Vancouver, the Biotherapeutics Manufacturing Centre (formerly known as the Ottawa Virus Manufacturing Facility) at the Ottawa Hospital Research Institute will produce the vector to deliver this recognition receptor to a patient's T cells, and the final T cell engineering, growth and purification steps will be conducted in the GMP cell production facility at the BC Cancer Agency in Victoria.