

## Brain Tumor Fact Sheet

CIRM funds many projects seeking to better understand brain tumors and to translate those discoveries into new therapies.

### Description

A type of brain tumor called a high-grade glioma, or malignant brain tumor, is among the hardest tumors to treat. An estimated 17,000 Americans will die from brain tumors in 2017<sup>1</sup>.

Gliomas are particularly difficult to treat because they are made up of tumor cells that spread throughout the brain, not remaining in a single area where they could be removed through surgery or targeted by radiation. Chemotherapy has not been effective at eradicating all of the glioma cells.

Stem cell approaches look promising for treating gliomas. Certain types of stem cell tend to migrate toward the tumor cells wherever they are in the brain. CIRM-funded researchers are trying to genetically engineer those stem cells to produce cancer-killing molecules. Transplanted into the brain, these cells would seek out the cancer cells and deliver their therapy directly where it is needed. This approach could significantly decrease toxic side-effects to normal tissues, preserving or improving the patient's quality of life.

### Clinical Stage Programs

#### City of Hope

A team at the City of Hope led by Dr. Christine Brown is pursuing a Phase 1 trial targeting an aggressive brain cancer called malignant glioma. City of Hope will re-engineer a patient's immune system central memory T cells (TCM cells) to express chimeric antigen receptors (CAR). These CAR-T cells will recognize a molecular marker on the surface of glioma cancer stem cells and kill the tumors. Dr. Brown's award to pursue CAR-T therapy for solid cancers comes at an exciting and opportune time with the recent U.S. Food and Drug Administration (FDA) approval of the first CAR-T therapy, called Kymriah, for patients with acute lymphoblastic leukemia, a deadly form of blood cancer.

- [Learn more about this clinical program](#)
- [Trial details on clinicaltrials.gov](#)

#### Immunocellular Therapeutics

This trial is targeting six proteins that are found on the surface of cancer stem cells in glioblastoma, a brain cancer. Immune cells from the patient's own immune system are exposed to fragments of these cancer cell proteins in the lab. When returned to the patient's body, these immune system cells can now help the patient's immune system identify, and then hopefully kill, the cancer stem cells responsible for the tumor's recurrence and growth. This Phase 3 trial was suspended in June 2017 due to lack of sufficient financial resources.

- [Learn more about this clinical program](#)

### CIRM Grants Targeting Brain Tumors

Researcher name	Institution	Grant Title	Grant Type	Award Amount
Mitchel Berger	University of California, San Francisco	Stem Cell-Mediated Oncocidal Gene Therapy of Glioblastoma (GBM)	Disease Team Research I	\$6,214,914

Robert Wechsler-Reya	Sanford-Burnham Medical Research Institute	The role of neural stem cells in cerebellar development, regeneration and tumorigenesis	Research Leadership	\$5,226,049
Albert Wong	Stanford University	Recombinant Bispecific Antibody Targeting Cancer Stem Cells for the Therapy of Glioblastoma	Disease Team Therapy Planning I	\$109,750
Stephen Forman	City of Hope, Beckman Research Institute	Targeting glioma cancer stem cells with receptor-engineered self-renewing memory T cells	Early Translational III	\$5,215,447
Michelle Monje	Stanford University	White matter neuroregeneration after chemotherapy: stem cell therapy for "chemobrain"	New Faculty Physician Scientist	\$2,800,536
Michael Barish	City of Hope, Beckman Research Institute	Genetically-modified neural stem cells for treatment of high-grade glioma	Disease Team Planning	\$55,000
Michael Snyder	Stanford University	Center of Excellence for Stem Cell Genomics - Stanford	Genomics Centers of Excellence Awards (R)	\$22,796,609
Joshua Stuart	University of California, Santa Cruz	Center of Excellence for Stem Cell Genomics - UCSC	Genomics Centers of Excellence Awards (R)	\$4,000,000
Anthony Gringeri	ImmunoCellular Therapeutics	A Phase III randomized double-blind, controlled study of ICT 107 with maintenance temozolomide (TMZ) in newly diagnosed glioblastoma following resection and concomitant TMZ chemoradiotherapy	Clinical Trial Stage Projects	\$5,391,016
Albert Wong	Stanford University	2nd Generation Vaccine for the Treatment of Glioblastoma	Therapeutic Translational Research Projects	\$2,929,889
Christine Brown	City of Hope, Beckman Research Institute	Phase I Study of Chimeric Antigen Receptor Engineered Central Memory T cells for the Treatment of Malignant Glioma	Clinical Trial Stage Projects	\$12,753,854
John Zaia	City of Hope, Beckman Research Institute	Ex Vivo Gene Engineering of Blood Stem Cells for Enhanced Chemotherapy Efficacy in Glioblastoma Patients	Late Stage Preclinical Projects	\$3,684,259
Hideho Okada	University of California, San Francisco	Non-viral reprogramming of the endogenous TCR $\alpha$ locus to direct stem memory T cells against shared neoantigens in malignant gliomas	Quest - Discovery Stage Research Projects	\$900,000

Noriyuki Kasahara	University of California, Los Angeles	Stem cell-based carriers for RCR vector delivery to glioblastoma	Early Translational II	\$3,340,625	
Karen Aboody	City of Hope, Beckman Research Institute	Stem Cell-mediated Therapy for High-grade Glioma: Toward Phase I-II Clinical Trials	Disease Team Research I	\$17,890,623	
					Total: \$93,308,571.00

### CIRM Brain Tumor Stem Cell Videos



Brain Tumors: Advancing Stem Cell Therapies - 2011 CIRM Grantee Meeting

### News and Information

- CIRM Stem Cellar Blogs on Brain Cancer

### Resources

- National Cancer Institute: Brain Tumor Facts
- Find a clinical trial near you: NIH Clinical Trials database
- American Brain Tumor Association
- National Brain Tumor Society
- The Brain Tumor Foundation
- Family Caregiver Alliance
- National Family Caregivers Association

### Find Out More:

Stem Cell FAQ | Stem Cell Videos | What We Fund

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