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.

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

City of Hope

This clinical trial is testing a therapy to treat brain metastases that came from breast cancers expressing high levels of a protein called HER2. The therapy consists of a genetically-modified version of the patient’s own T cells, which are an immune system cell that can destroy foreign or abnormal cells. The T cells are modified with a protein called a chimeric antigen receptor (CAR) that recognizes the tumor protein HER2. These modified T cells (CAR-T cells) are then infused into the patient’s brain where they are expected to detect and destroy the HER2-expressing tumors in the brain.

- Learn more about this clinical trial

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
<table>
<thead>
<tr>
<th>Researcher Name</th>
<th>Institution</th>
<th>Grant Title</th>
<th>Grant Type</th>
<th>Award Amount</th>
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<tbody>
<tr>
<td>Noriyuki Kasahara</td>
<td>University of California, Los Angeles</td>
<td>Stem cell-based carriers for RCR vector delivery to glioblastoma</td>
<td>Early Translational II</td>
<td>$3,340,625</td>
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<tr>
<td>Karen Aboody</td>
<td>City of Hope, Beckman Research Institute</td>
<td>Stem Cell-mediated Therapy for High-grade Glioma: Toward Phase I-II Clinical Trials</td>
<td>Disease Team Research I</td>
<td>$17,890,623</td>
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<tr>
<td>Mitchel Berger</td>
<td>University of California, San Francisco</td>
<td>Stem Cell-Mediated Oncocidal Gene Therapy of Glioblastoma (GBM)</td>
<td>Disease Team Research I</td>
<td>$6,214,914</td>
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<td>Robert Wechsler-Reya</td>
<td>Sanford Burnham Prebys Medical Discovery Institute</td>
<td>The role of neural stem cells in cerebellar development, regeneration and tumorigenesis</td>
<td>Research Leadership</td>
<td>$5,226,049</td>
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<td>Albert Wong</td>
<td>Stanford University</td>
<td>Recombinant Bispecific Antibody Targeting Cancer Stem Cells for the Therapy of Glioblastoma</td>
<td>Disease Team Therapy Planning I</td>
<td>$109,750</td>
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<td>Stephen Forman</td>
<td>City of Hope, Beckman Research Institute</td>
<td>Targeting glioma cancer stem cells with receptor-engineered self-renewing memory T cells</td>
<td>Early Translational III</td>
<td>$5,235,447</td>
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<td>Michelle Monje</td>
<td>Stanford University</td>
<td>White matter neuroregeneration after chemotherapy: stem cell therapy for “chemobrain”</td>
<td>New Faculty Physician Scientist</td>
<td>$2,800,526</td>
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<td>Michael Barish</td>
<td>City of Hope, Beckman Research Institute</td>
<td>Genetically-modified neural stem cells for treatment of high-grade glioma</td>
<td>Disease Team Planning</td>
<td>$55,000</td>
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<td>Michael Snyder</td>
<td>Stanford University</td>
<td>Center of Excellence for Stem Cell Genomics - Stanford</td>
<td>Genomics Centers of Excellence Awards (R)</td>
<td>$22,796,609</td>
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<td>Joshua Stuart</td>
<td>University of California, Santa Cruz</td>
<td>Center of Excellence for Stem Cell Genomics - UCSC</td>
<td>Genomics Centers of Excellence Awards (R)</td>
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<td>Anthony Gringeri</td>
<td>ImmunoCellular Therapeutics</td>
<td>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</td>
<td>Clinical Trial Stage Projects</td>
<td>$5,391,016</td>
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<td>Albert Wong</td>
<td>Stanford University</td>
<td>2nd Generation Vaccine for the Treatment of Glioblastoma</td>
<td>Therapeutic Translational Research Projects</td>
<td>$2,929,889</td>
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<td>Christine Brown</td>
<td>City of Hope, Beckman Research Institute</td>
<td>Phase I Study of Chimeric Antigen Receptor Engineered Central Memory T cells for the Treatment of Malignant Glioma</td>
<td>Clinical Trial Stage Projects</td>
<td>$12,753,854</td>
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<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Project Description</th>
<th>Stage</th>
<th>Funding</th>
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<tr>
<td>John Zaia</td>
<td>City of Hope, Beckman Research Institute</td>
<td>Ex Vivo Gene Engineering of Blood Stem Cells for Enhanced Chemotherapy Efficacy in Glioblastoma Patients</td>
<td>Late Stage Preclinical Projects</td>
<td>$3,684,259</td>
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<td>Hideho Okada</td>
<td>University of California, San Francisco</td>
<td>Non-viral reprogramming of the endogenous TCRα locus to direct stem memory T cells against shared neoantigens in malignant gliomas</td>
<td>Quest - Discovery Stage Research Projects</td>
<td>$900,000</td>
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<td>Saul Priceman</td>
<td>City of Hope, Beckman Research Institute</td>
<td>A Phase I Study of Chimeric Antigen Receptor Engineered Stem/Memory T Cells for the Treatment of HER2-Positive Brain Metastases</td>
<td>Clinical Trial Stage Projects</td>
<td>$9,015,149</td>
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Total: $102,323,710.00

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

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Source URL: https://www.cirm.ca.gov/our-progress/disease-information/brain-tumor-fact-sheet