The Official Newsletter of the
USC BRAIN TUMOR CENTER

USC Norris Comprehensive Cancer Center
Keck Medicine of USC

USC BRAIN TUMOR CENTER Report

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*On December 3, 2020, the Brain Tumor Center held a virtual program announcing the launch of our Center. Our world-renowned research and clinical faculty shared key developments within the USC Departments of **Neurological Surgery** and **Neurology**, the **Norris Comprehensive Cancer Center**, and **CHLA**. Highlighting our research, technological innovations, and our patient-centered clinical care, the USC BTC is poised to forever change the scope of medicine.*

From the Director

We are thrilled to share with you the relaunch of the USC Brain Tumor Center (BTC). Although our specialist team has been providing exemplary care for thousands of patients with brain tumors over the past several decades, the USC BTC team has been recently enhanced with the addition of several new multi-disciplinary team members from a variety of specialties dedicated to the most effective and efficient care for our patients, including Dr. Frances Chow, our newest member of the Neuro-Oncology team. With an emphasis on streamlined, multidisciplinary clinical care, access to the latest clinical trials, and cutting edge translational research, the USC BTC is paving the way towards longer-term control and cures for a variety of brain tumors.

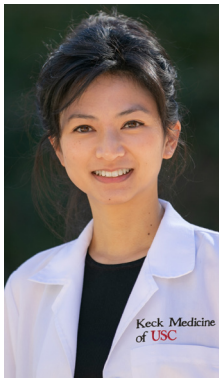
We offer patients from Southern California, all over the U.S., and internationally, next day in person and telemedicine visits and a concierge style, navigated patient experience, and treat the highest number of brain tumor patients of any academic center in Southern California. Our vast clinical and research network spans from the ***Keck Medical Center of USC*** to the ***Norris Comprehensive Cancer Center***, ***CHLA***, ***LA County Hospital***, the ***University Park Campus***, and ***Caltech***, among others. Our research team is supported by millions of dollars of NIH funding and unique investigational treatment modalities for a variety of malignant and benign brain tumors, including inhaled drug delivery and immunotherapy platforms. We are very proud of the care we deliver, and the USC BTC promises to only hone its treatment and research portfolio over the next decade. Stay tuned, and thank you for your support!

Gabriel Zada, MD, MS
Professor of Neurological Surgery
Director, USC Brain Tumor Center

Frances Chow, M.D. joins the USC Brain Tumor Center

The USC Brain Tumor Center (BTC) is pleased to announce the successful recruitment of Frances Chow, M.D. to the Keck School of Medicine.

Dr. Frances Chow specializes in neuro-oncology and joins the USC community to provide expertise in the treatment of brain tumors. She will collaborate with experts at USC's Brain Tumor Center to provide exceptional patient-centered care, offer clinical trials featuring innovative therapies, and discover novel treatments through translational research.



Dr. Chow received her undergraduate degree in Molecular & Cell Biology from the University of California, Berkeley and her medical degree from Drexel University College of Medicine. She completed her Internal Medicine internship at the University of California, Irvine and her Neurology residency at USC, where she was appointed as Chief Resident based on her exemplary record of leadership and clinical skills. She was recognized for her compassionate patient care with the Department of Neurology Victor M. Victoroff M.D. Award, and she was honored for her commitment to education with the Keck School of Medicine Outstanding Teaching Award. She completed her fellowship in Neuro-Oncology at the University of California, Los Angeles, where she conducted research on the glioblastoma tumor microenvironment and systemic responses to immunotherapy.

Dr. Chow has been named by *Southern California Super Doctors® Rising Stars 2020* as one of the top doctors in Southern California for 2020. These doctors have made noteworthy achievements early in their careers and are rising through the ranks of their field. As part of the selection process, other physicians are asked to consider the following question: "If you needed medical care, which doctor would you choose?" No more than 2.5% of doctors are selected for this distinction.

Phase I trial of Intranasal NEO100 completed for recurrent Glioblastoma Multiforme

NEO100-01 is a Phase 1/2A study of the monoterpene, perillyl alcohol (NEO100) in patients with recurrent glioblastoma.

Thomas Chen, MD, PhD

Keck Medicine of USC is the principal site for the multicenter (USC, Cleveland Clinic, University of Washington, University of Wisconsin) NEO100 trial. The NEO100 trial is unique in that it employs a novel brain delivery technology called nasal brain transport. This clinical trial is led by Thomas Chen, M.D., Ph.D., Professor of Neurological Surgery.

Nasal brain transport allows a therapeutic agent to be delivered to the brain using a cranial nerve (olfactory and trigeminal nerve) to brain delivery. NEO100 is delivered four times a day by intranasal administration using a nebulizer and nasal mask for up to 6 months. Four escalating doses will be evaluated for tolerability, and the maximum tolerated dose will be extended in the 2A phase for a total of 25 patients. NEO100 is a highly purified GMP quality version of a small molecule called perillyl alcohol.

Inclusion criteria is for patients with recurrent GBM, Karnofsky >60, and tumor less than 3x3 cm in size. To date, the Phase I trial has been completed, with no observed toxicities, and three patients obtaining partial response, and one patient achieving complete response. The next step will be to enroll 31 patients for Phase II. If successful, a new treatment paradigm will have been achieved for these patients with currently no cure from this deadly disease.

SELECTED PUBLICATIONS

The Genomic Landscape of Pediatric Cancers: Implications for Diagnosis and Treatment

E. Alejandro Sweet-Cordero[1], Jaclyn A. Biegel[2]

[1]Department of Pediatrics, Division of Hematology and Oncology, University of California, San Francisco, California, United States and [2]Department of Pathology and Laboratory Medicine, Children's Hospital of Los Angeles, and Keck School of Medicine, University of Southern California, Los Angeles, California, United States

Science 15 Mar 2019: Vol. 363, Issue 6432, pp. 1170-1175

The past decade has witnessed a major increase in our understanding of the genetic underpinnings of childhood cancer. Genomic sequencing studies have highlighted key differences between pediatric and adult cancers. Whereas many adult cancers are characterized by a high number of somatic mutations, pediatric cancers typically have few somatic mutations but a higher prevalence of germline alterations in cancer predisposition genes. Because most studies have genetically profiled pediatric cancers only at diagnosis, the mechanisms underlying tumor progression, therapy resistance, and metastasis remain poorly understood. We discuss evidence that points to a need for more integrative approaches aimed at identifying driver events in pediatric cancers at both diagnosis and relapse. We also provide an overview of key aspects of germline predisposition for cancer in this age group.

NEO212, a Conjugate of Temozolomide and Perillyl Alcohol, Blocks the Endothelial-to-Mesenchymal Transition in Tumor-Associated Brain Endothelial Cells in Glioblastoma

Nagore I.Marín-Ramos[1], NiyatiJhaveri[1], Thu Zan Thein[1], Rochelle A.Fayngor[1], Thomas C. Chen[1,2], Florence M.Hofman[1,2]

[1]Department of Neurosurgery and [2]Department of Pathology, Keck School of Medicine, University of Southern California, Los Angeles, California, United States

Cancer Letters, Volume 442, 1 February 2019, Pages 170-180

As the endothelial-to-mesenchymal transition (EndMT) supports the pro-angiogenic and invasive characteristics of glioblastoma multiforme (GBM), blocking this process would be a promising approach to inhibit tumor progression and recurrence. Here, we demonstrate that glioma stem cells (GSC) induce EndMT in brain endothelial cells (BEC). TGF-β signaling is necessary, but not sufficient to induce this EndMT process. NEO212, a conjugate of temozolomide and perillyl alcohol, blocks EndMT induction and reverts the mesenchymal phenotype of tumor-associated BEC (TuBEC) by blocking TGF-β and Notch pathways. Consequently, NEO212 reduces the invasiveness and pro-angiogenic properties associated with TuBEC, without affecting control BEC. Intracranial co-implantation of BEC and GSC in athymic mice showed that EndMT occurs *in vivo*, and can be blocked by NEO212, supporting the potential clinical value of NEO212 for the treatment of GBM.

Efficient Brain Targeting and Therapeutic Intracranial Activity of Bortezomib Through Intranasal Co-delivery with NEO100 in Rodent Glioblastoma Models

Weijun Wang[1], Steve Swenson[1], Hee-Yeon Cho[1], Florence M. Hofman[2], Axel H. Schönthal[3], Thomas C. Chen[1,2]

Departments of [1]Neurosurgery, [2]Pathology, and [3]Molecular Microbiology & Immunology, Keck School of Medicine, University of Southern California, Los Angeles, California, United States

J Neurosurg March 15, 2019, published online.

Many pharmaceutical agents are highly potent but are unable to exert therapeutic activity against disorders of the central nervous system, because the blood-brain barrier impedes their brain entry. One such agent is bortezomib (BZM), a proteasome inhibitor that is approved for the treatment of multiple myeloma. Preclinical studies established that BZM can be effective against glioblastoma, but only when the drug is delivered via catheter directly into the brain lesion, not after intravenous systemic delivery. The authors found that intranasal delivery of BZM combined with NEO100 significantly prolonged survival of tumor-bearing animals over those that received vehicle alone and also over those that received BZM alone or NEO100 alone. This study demonstrates that intranasal delivery with a NEO100-based formulation enables noninvasive, therapeutically effective brain delivery of a pharmaceutical agent that otherwise does not efficiently cross the BBB.

To refer a patient, please call (844) 33-**BRAIN** (844-332-7246)

CLINICAL TRIALS: Now Enrolling at the USC Brain Tumor Center

For more information about these clinical trials, please contact **Aida Lozada**, Clinical Trials Manager, at **Aida.Lozada@med.usc.edu**.

An Open-Label, Phase 1/2A Dose Escalation Study of Safety and Efficacy of NEO100 in Recurrent Grade IV Glioma

NEO100-01 is a Phase 1/2A open- label study of perillyl alcohol (NEO100) in patients with recurrent glioma. NEO100 is delivered four times a day by intranasal administration using a nebulizer and nasal mask for up to 6 months. There is no concurrent control. This is the first nasal administration in the US, after prior oral studies with perillyl alcohol proved ineffective.

Condition or disease	*Intervention/treatment*	*Phase*
Recurrent Grade IV Glioma (Glioblastoma)	Inhaler drug: Perillyl Alcohol	Phase: 1 Phase: 2 ClinicalTrials.gov Identifier: NCT02704858

Study to Evaluate Eflornithine + Lomustine vs Lomustine in Recurrent Anaplastic Astrocytoma (AA) Patients (STELLAR)

The purpose of this study is to compare the efficacy and safety of eflornithine in combination with Lomustine, compared to Lomustine taken alone, in treating patients whose Anaplastic Astrocytoma has recurred/progressed after radiation and temozolomide chemotherapy.

Condition or disease	*Intervention/treatment*	*Phase*
Recurrent Anaplastic Astrocytoma	Oral Drug: Eflornithine Oral Drug: Lomustine	Phase: 3 ClinicalTrials.gov Identifier: NCT02796261

Single Fraction Stereotactic Radiosurgery Compared with Fractionated Stereotactic Radiosurgery in Treating Patients with Resected Metastatic Brain Disease (CTSU- A071801)

This phase III trial studies how well single fraction stereotactic radiosurgery works compared with fractionated stereotactic radiosurgery in treating patients with cancer that has spread to the brain from other parts of the body and has been removed by surgery. Single fraction stereotactic radiosurgery is a specialized radiation therapy that delivers a single, high dose of radiation directly to the tumor and may cause less damage to normal tissue. Fractionated stereotactic radiosurgery delivers multiple, smaller doses of radiation therapy over time.

Condition or disease	*Intervention/treatment*	*Phase*
Metastatic Malignant Neoplasm in the Brain	Single Fraction Stereotactic Radiosurgery vs Fractionated Stereotactic Radiosurgery	Phase: 3 ClinicalTrials.gov Identifier: NCT04114981

Observation or Radiation Therapy in Treating Patients with Newly Diagnosed Grade II Meningioma That Has Been Completely Removed by Surgery (NRG-BN003)

This randomized trial studies how well radiation therapy works compared with observation in treatment patients with newly diagnosed grade II meningioma that has been completely removed by surgery. Radiation therapy uses high energy x-rays to kill the tumor cells and shrink tumors.

Condition or disease	*Intervention/treatment*	*Phase*
Grade II Meningioma ***Intracranial Meningioma***	Other: Clinical Observation Radiation: Radiation Therapy	Phase: 3 ClinicalTrials.gov Identifier: NCT03180268

Olaparib in Treating Patients with Advanced Glioma, Cholangiocarcinoma, or Solid Tumors with IDH1 or IDH2 Mutations

This phase II trial studies how well Olaparib works in treating patients with glioma, cholangiocarcinoma, or solid tumors with IDH1 or IDH2 mutations that have spread to other places in the body (metastatic) and usually cannot be cured or controlled with treatment (refractory). Olaparib may stop the growth of tumor cells by blocking some of the enzymes needed for cell growth.

Condition or disease	*Intervention/treatment*	*Phase*
Advanced Malignant Solid Neoplasm ***Glioblastoma*** ***Recurrent Cholangiocarcinoma*** ***Recurrent Glioma*** ***Recurrent Malignant Solid Neoplasm*** ***WHO Grade II / III Glioma***	Drug: Olaparib	Phase: 2 ClinicalTrials.gov Identifier: NCT03212274

CLINICAL TRIALS: Coming soon to the USC Brain Tumor Center

For more information about these clinical trials, please contact **Aida Lozada**, Clinical Trials Manager, at **Aida.Lozada@med.usc.edu**.

A Study of Selinexor in Combination with Standard of Care Therapy for Newly Diagnosed or Recurrent Glioblastoma

This is a global, Phase 1/2, multicenter, open-label study, randomized study to evaluate a combination regimen with or without Selinexor. The study will independently evaluate 3 different combination regimens in 3 treatment arms in participants with New GBM, MGMT promotor unmethylated disease in Arm A, MGMT methylated in Arm B, and participants with Recurrent GBM regardless of MGMT status in Arm C.

Condition or disease	*Intervention/treatment*	*Phase*
Newly Diagnosed and Recurrent Glioblastoma Multiforme	Drug: Selinexor Drug: Temozolomide (TMZ) Drug: Lomustine (CCNU) Radiation: Standard Fractionated Radiation therapy (RT)	Phase: 1 Phase: 2 ClinicalTrials.gov Identifier: NCT04421378

Pivotal, Randomized, Open-label Study of Optune® Concomitant with RT & TMZ for the Treatment of Newly Diagnosed GBM (EF-32)

To test the effectiveness and safety of Optune® given concomitantly with radiation therapy (RT) and temozolomide (TMZ) in newly diagnosed GBM patients, compared to radiation therapy and temozolomide alone. In both arms, Optune® and maintenance temozolomide are continued following radiation therapy. Optune® is a medical device that has been approved for the treatment of recurrent and newly diagnosed glioblastoma (GBM) by the Food and Drug Administration (FDA) in the United States, and Optune® has obtained a CE mark in Europe for recurrent and newly diagnosed GBM

Condition or disease	*Intervention/treatment*	*Phase*
Newly Diagnose Glioblastoma Multiforme	Device: Optune®	Phase: N/A ClinicalTrials.gov Identifier: NCT04471844

Trial of Enzastaurin Plus Temozolomide During and Following Radiation Therapy in Patients with Newly Diagnosed Glioblastoma with or Without the Novel Genomic Biomarker, DGM1

This study will be conducted as a randomized, double-blind, placebo-controlled, multi-center. The randomized part of the study will be preceded by a safety run- in to evaluate the safety and tolerability of Enzastaurin in combination with radiation therapy and temozolomide. The primary analysis will be conducted in all randomized patients who are DGM1 biomarker positive regardless of MGMT methylation status

Condition or disease	*Intervention/treatment*	*Phase*
Newly Diagnosed Glioblastoma Multiforme	Oral Drug: Enzastaurin (Kinenza®) Hydrochloride Other: Placebo Chemotherapy: Temozolomide Radiation: Radiation Therapy	Phase: 3 ClinicalTrials.gov Identifier: NCT03776071

Stereotactic Radiosurgery (SRS) Compared with Collagen Tile Brachytherapy

This trial will be a randomized controlled study comparing the efficacy and safety of intraoperative radiation therapy using GammaTiles TM (GT) versus SRS 3-4 weeks following metastatic tumor resection which is the current standard of care. GammaTile is a biocompatible permanently implanted system. Each GammaTile unit is composed of a collagen "tile" that contains 4 Cesium-131 (Cs-131) titanium-encased sources. The primary outcome measure will include the intent to treat population.

Condition or disease	*Intervention/treatment*	*Phase*
Brain Metastasis	Device: Gamma Tile-Surgically Targeted Radiation Therapy (STaRT) Radiation: Stereotactic Radiation Therapy	Phase: 3 ClinicalTrials.gov Identifier: NCT04365374

Standard Chemotherapy vs Chemotherapy Guided by Cancer Stem Cell Test in Recurrent Glioblastoma (CSCRGBM)

The purpose of this clinical study is to confirm the utility of chemosensitivity tumor testing on cancer stem cells (ChemoID) as a predictor of clinical response in poor prognosis malignant brain tumors such as recurrent glioblastoma (GBM).

Condition or disease	*Intervention/treatment*	*Phase*
Recurrent Glioblastoma	Diagnostic Test: ChemoID assay Drug: Chemotherapy	Phase: 3 ClinicalTrials.gov Identifier: NCT03632135

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- California's Office of Statewide Health Planning and Development (OSHPD), Calendar Year 2019, most recent data available.

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For more information about brain tumor clinical trials, please contact **Aida Lozada,** *Clinical Trials Manager,* at **Aida.Lozada@med.usc.edu**

Please email us with your questions at **BTC@med.usc.edu**

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