USF TECHNOLOGY TRANSFER

BIOPARTNERING

Oncology

Oncological Sciences

Morsani College of Medicine (USF Health)

The Morsani College of Medicine has active research programs in basic, translational, and clinical sciences. Research is carried out in Departments, Institutes, Centers and at Veterans Hospitals and at their teaching facility, Tampa General Hospital. In addition, there are rich collaborations with the Colleges of Public Health, Nursing and Pharmacy as well as the USF College of Arts and Sciences.

The goal is to pursue new knowledge in the biomedical sciences, clinical sciences, and healthcare delivery, relevant to human health and disease. The department of Oncologic Sciences at USF Health, provides the academic home for faculty physicians and scientists who work at Moffitt Cancer Center.

Moffitt Cancer Center

Moffitt Cancer Center is a not-for-profit institution in Tampa, Florida. Moffitt has made a lasting commitment to the prevention and cure of cancer, working tirelessly in the areas of patient care, research and education to advance one step further in fighting this disease.

Moffitt's size, its singular focus on cancer, and its close interaction and outreach with academic partners and caregivers throughout the state, nation, and world all contribute to the rich, collegial, and collaborative environment required to perform outstanding cancer research and educate the next generation. Moffitt's five research programs consist of integrative teams of more than 140 faculty members working together to tackle the complexity of cancer.

Research Programs:

- Cancer Biology and Evolution
- Cancer Epidemiology
- Health Outcomes & Behavior
- Immuno-Oncology
- Molecular Medicine

Technologies

Targeting SHIP-1 Through miR-155 for Enhanced Tumor Responses in Pancreatic Cancer

USF Tech ID# 21A103

Overview:

Pancreatic cancer (PC) is an aggressive inflammatory disease with a grim prognosis. Inflammatory tumor derived factors (TDF) contribute to the induction of immunosuppressive tumor microenvironment (TME) that impede the effectiveness of PC immunotherapy.

The inventors previously reported that apigenin (bioflavonoid) increased SHIP-1 expression which was correlated with the expansion of tumor associated macrophages type1 M1 TAM (tumoricidal) and improved anti-tumor immune responses. This method focuses on Pancreatic Ductal Adenocarcinoma (PDAC). It discovered that one of the molecular mechanisms by which anti-inflammatory bioflavonoid apigenin (API) transcriptionally regulates SHIP-1 expression is via the suppression of miRNA-155 impacting anti-tumor immune responses in bone marrow (BM) and immunosuppressive tumor microenvironment (TME). It was discovered that API reduced the PC-induced miRNA-155 and elevated SHIP-1 expression in bone marrow that promoted the restoration of myelopoiesis and reduced PC induced inflammation and increased anti-tumor immune responses in the TME. This research showed that targeting SHIP-1 through miR-155 might assist in the therapeutic intervention of Pancreatic Ductal Adenocarcinoma.

SHIP-1: Biomarker and Therapeutic Target to Reduce Health Disparities in African Americans with Pancreatic Cancer

USF Tech ID# 23T187

Overview:

Pancreatic ductal adenocarcinoma (PDAC) is one of the deadliest cancers. African Americans (AA) have higher mortality rates compared to European Americans (EA). Src-homology inositol phosphatase-1 (SHIP-1) is a master regulator of macrophage development whereby it impacts tumor immunity and thus can be a therapeutic target that may explain treatment failure, which contributes to health disparity associated with AA vs. EA with PDAC.

USF researchers reported that SHIP-1 expression is vital for the expansion of tumoricidal M1 macrophages, which in turn corresponds with an increase in anti-tumor responses in PDAC models. Preliminary clinical data show a significant increase in PDAC biomarker microRNA (miR-155) gene expression and a corresponding decrease in SHIP-1 gene and protein expression in the blood of healthy AA vs. EA individuals. This research project focuses on SHIP-1 as a biomarker and new molecular target to improve anti-tumor immunity and enhance immune checkpoint immunotherapy responses in PDAC patients. Results from this study will impact the understanding of SHIP-1 regulation of M1 tumoricidal Macrophages, thus leading to the development of a novel adjuvant therapy to enhance patient care, quality of life, and survival of all PDAC patients while reducing health disparity gap of African Americans with PDAC.

Targeting CREB-Heparan Sulfate Pathway for Cancer Treatment

USF Tech ID# 23T002

Overview:

Prostate cancer (PCa) is one of the most prevalent forms of malignancy and the second most common cause of cancer related death in men. A better understanding of PCa pathogenesis is essential to improve our effort to cure this life threatening disease. Heparan sulfate (HS), a linear, sulfated polysaccharide, expresses in the prostate and its expression is upregulated in PCa. Currently, what factors drive the aberrant HS expression and its functional consequence in PCa pathogenesis remain unclear.

Systematic bioinformatics studies at USF uncovered the loss-of-function mutation of Pten, a potent humor suppressor, correlates with upregulated heparan sulfate expression in human prostate cancer specimens. In mouse model and cell culture studies, the researchers uncovered that Pten-loss upregulates GREB-heparan sulfate Signc,1ling to promote prostate tumorigenesis, and pharmacological inhibition of GREB or heparan sulfate both efficiently blocked prostate cancer growth in vitro and in vivo, revealing the GREB-heparan sulfate axis as a novel target for cancer treatment.

Method and Apparatus for Generating Anti-Cancer Substances In Situ

USF Tech ID# 23T041

Overview:

Common treatment for colorectal liver metastases and liver cancer is hepatic artery infusion (HAI) chemotherapy which involves implanting a hockey puck sized pump in the abdomen to deliver chemotherapy directly to the liver. Implanting such a device can cause a great burden to patients due to invasive surgery and catheter-related complications.

USF researchers have invented a wireless powered implantable microdevice, called micro cisplatin synthesizer, and a therapy called Micro-Hepatic Arterial Infusion as a novel HAI modality that avoids the complications associated with current HAI chemotherapy. This device removes the need for a pump, reservoir, and any other external interaction so that it removes the risk of infection. The tumor is targeted by a robust cisplatin synthesis process from the microdevice which is externally powered by an ultrasonic powering system. This new HAI modality enables the delivery of power and light into deeper organs in the body and enables generating cisplatin from non-toxic components. Thus, this invention is expected to exert a long-term impact on cancer treatment and drug delivery.

Heme Overdrive Rewires Pan-Cancer Cell Metabolism

USF Tech ID# 22A086

Overview:

Iron is essential for cell growth and replication but aggressive or metastasized cancers often rely on large iron levels, named an “iron-addiction” status.

USF investigators have disclosed a method of identifying and targeting cancer iron-addiction as an attractive novel approach to exploit cancer metabolic vulnerabilities.

They found that iron-addiction is inextricably linked with heme overdrive in cancer and uncovered the critical metabolic pathways underlying cancer iron addiction, with a particular emphasis on the heme-related metabolic pathways. We have devised a strategy to target 'heme-overdrive' by chemo-modulators.

Dietary Choline Supplementation to Reduce Tumor Volume and Enhance Cognitive Response During Cancer Treatment

USF Tech ID# 19A047

Overview:

USF researchers have developed a method to reduce cancer growth using various choline supplements. Testing on mice showed that a choline diet reduced cancer growth by 23%, and improved the effectiveness of chemotherapy by reducing tumor volumes by 28% compared to a standard diet. Thus, this promising new treatment method can coincide with existing chemotherapy, such as doxorubicin and cyclophosphamide, for better results.

Advantages:

- Decreases cancer growth
- Improves chemotherapy effectiveness
- Uses existing supplements

Use of SiC Nanotechnology to Treat Deep-Tissue Cancer via X-Ray Excited NIR-PIT

USF Tech ID# 19A072

Overview:

Researchers at USF have developed a method to bring IR light, and thus NIR-PIT, to deeper layers of tissues. This method uses silicon carbide (SiC) nanostructures capable of converting x-ray photons from a traditional hospital source, such as a CT scanner, into NIR light to activate the complex in deeper tissue. This would allow for the targeted and safe treatment of cancer cells and growths in areas were normal NIR-PIT could not reach on its own.

Advantages:

- Safe and Effective
- Allows for targeting of deep tissue cancer cells
- Uses the already effective NIR-PIT

A Method of Treating Ovarian Cancer using Zeta-Stat

USF Tech ID# 18A122

Overview:

USF researchers have successfully treated multiple ovarian cell lines in murine models with the atypical PKC-zeta inhibitor zeta-stat. Assays were completed to determine the effects of this treatment option on proliferation and cellular invasion. These assays included protein quantification, cell proliferation, and wound healing. Xenograph experiments were also performed to determine the effects of zeta-stat on tumor growth in vitro. Results showed that zeta-stat successfully decreased both the proliferation of CCOC cells and wound healing while maintaining body weight in the subjects. This suggests that inhibition of this protein decreases the rate of proliferation, and that PKC-zeta is a novel target in ovarian cancer carcinogenesis.

Advantages:

- Novel ovarian cancer treatment target
- Decreased rate of proliferation
- Decreased wound healing rate
- Body weight is maintained with treatment

Aptamer Targeting of ADAM8 in the Tumor Microenvironment

USF Tech ID# 21B120

Overview:

Cancer growth and spread is dependent upon signaling between cancer cells and cells that mutate in the local environment to become cancer associated fibroblasts (CAF). CAF create the local "soil" which allows cancer to grow, flourish and spread. Previous efforts at blockade of CAF mutation fails because once initiated, CAF maintenance requires a distinct independent signaling pathway. This is an extremely unique and novel discovery.

In breast cancer models, USF scientists identified cancer cell-derived, extracellular A disintegrin and metalloprotease 8 (ADAM8), to be the second signal required for CAF maintenance. ADAM8 is highly expressed in human breast cancer, involved in breast cancer metastasis, and associated with poor survival. However, a specific inhibitor is lacking. RNA aptamers are an established technology that bind and inactivate extracellular targets with high affinity, high specificity, and low immunogenicity with the added benefit of relative ease of manufacturing. The group developed RNA aptamers to block cancer growth and isolated an aptamer family targeting ADAM8 that effectively bind and inhibit ADAM8 activity in cell culture. Initial mouse studies indicate the aptamer induces established human breast cancer regression. Delineation of this novel signaling pathway for CAF maintenance will generate additional targets.

Loss of CD73 Promotes the Growth of Uterine Leiomyomas via ADORA2B-regulated AKT Signaling Pathways

USF Tech ID# 23T166

Overview:

Uterine leiomyomas are benign monoclonal neoplasms that originate in the human myometrium. Clinically, leiomyomas are a frequent cause of infertility, pelvic pain and abnormal uterine bleeding. CD73 plays a key role in regulating extracellular levels of adenosine. Its overexpression is a common feature of many human cancers, where it suppresses tumoricidal immune responses. CD73 is also frequently used as a biomarker for mesenchymal stem cells.

USF researchers have found that dysregulated CD73 expression promotes the growth of uterine leiomyomas. The findings suggest that patterns of CD73 expression in leiomyomas are markedly restricted in uterine leiomyomas when compared to healthy myometrium. The modulation of adenosine receptor ADORA2B activity plays a critical role in promoting the growth of leiomyomas by modulating p-AKT/CyclinD1 signaling. These observations broadly implicate extracellular adenosine as a key mediator of leiomyoma growth and the differentiation of myometrial-specific stems cells destined to seed these tumors.

AI: Predictive Model for Pancreatic Cancer

USF Tech ID# 22A113

Overview:

One of the deadliest cancers with low survival rates is pancreatic cancer, which is difficult to identify in its early stages and has a very low chance of recovery after it has spread.

An AI model that can forecast a patient's survival time has been built by researchers at the University of South Florida. Based on the risk factors involved, which have been identified according to their proportional contribution to the model, the model forecasts this rate. The model's accuracy was determined through statistical testing, and it was found to be 96.42%. A stochastic model and survival monitoring indicator are incorporated into the model to further improve the predictions. The stochastic model tracks the patient's behavior at a given time, whereas the survival monitoring indicator tracks the patient's survival rate as a function of time. The efficacy of the various medical treatments can be evaluated using all these signs and forecasts. The unique feature of this paradigm is that it can include a variety of additional treatments in addition to chemotherapy, radiation, and other common therapies, and clinicians can choose which therapy to use next based on its efficacy. Additionally, the technology allows for the classification of prognosis and therapy based on age and race.

Advantages:

- The inventive model identifies the risk factors, and interaction and predicts the survival time of a pancreatic cancer patient.
- The analytic survival indicator can be used to evaluate the effectiveness of different treatments given to patients, by identifying if the survival time of the patients is increasing, remaining the same, or decreasing.
- The innovation includes additional findings concerning significant differences in gender, age, and race of pancreatic cancer patients and identifies appropriate methodologies for more powerful survival predictions of the disease.
- The findings and predictions about pancreatic cancer have been statistically verified to be 96.4% accurate.

A Method of Treating Cancer with combination Immunotherapy involving Mithramycin

USF Tech ID# 19B147

Overview:

USF researchers have formulated a method to target cancer stem cells (CSCs) using Mithramycin A in combination with immunotherapy (αPD-L1, programmed cell death ligand 1). Mithramycin A has been shown to be a potent inhibitor of CSCs. PD-L1 plays a role in tumor immune evasion and aggressiveness. Combination treatment of αPD-L1 plus Mit-A in animals significantly inhibited tumor growth. Moreover, the combination regimen induced expression of E-cadherin, which targets CSCs by promoting mesenchymal to epithelial transition while downregulating stemness marker Lgr5. This is a promising new approach for treatment of difficult-to-treat cancers.

Advantages:

- Reformulated combination therapeutic allows for shorter clinical pathway
- Targets cancer stem cells and their ability to escape the immune system
- More effective at inhibiting tumor growth than either treatment alone

Fluency Map Optimization in Intensity-Modulated Radiation Therapy

USF Tech ID# 20B206

Overview:

Cancerous tissues are fast proliferating cells that are more sensitive to radiation compared to healthy cells. This fact provides the basis to fight against cancers using radiotherapy. One of the radiotherapy methods is Intensity Modulated Radiation Therapy (IMRT) that uses computer-controlled accelerators to deliver radiation doses to a tumor or specific areas within the tumor. In IMRT, planning is a critical problem regarding concerns with the choice of the best setting of radiation. It has three phases of planning.

This invention focuses on the second phase i.e., fluency map optimization. The motivation is that, although the entire process of fluency map optimization is based on the trade-offs between killing cancerous cells and not harming healthy cells, there is no focus on modeling these trade-offs from the angle of cooperative game theory. Therefore, we use a game theoretical approach to create a cooperative game by solely focusing on modeling the trade-offs occurring in the fluency map optimization problem. This approach can be used for computing an emission plan in IMRT and assures the deliverance of tumoricidal radiation doses to planning target volume with minimal impact on healthy organs.

An Internet of Medical Things (IoMT) Approach for Remote Assessment of Head and Neck Cancer

USF Tech ID# 23T017

Overview:

Head and neck cancers (HNC) are treated with various treatment options which are associated with significant side effects, mainly shoulder dysfunction, and trismus (spasm of jaw muscles). However, measurement of patient's progress, and side effects while undergoing treatment, is limited to evaluation received based on scheduled appointments.

Internet-of-Medical-Things (IoMT) allows for a smart healthcare system to remotely monitor and assess a patient's progress at home. USF researchers developed an IoMT enabling application, namely, Automatic Measurement of Trismus and Shoulder Dysfunction (AMTSD), to remotely monitor the recovery. An HNC patient can use AMTSD as a web application frequently (twice/daily) to virtually measure the mouth extension and shoulder range of motion (ROM). The data collected is stored in a database and can be automatically analyzed to assess the progress. For five volunteers, AMSTD yielded the average measurement error for mouth extension is 1.77% and shoulder ROM is 2.89%. A clinical study with at least ten simulated patients and at least ten recovering HNC patients is underway.

Why Work With USF and the Technology Transfer Office?

USF Technology Transfer is committed to being the office of choice for our industry partners and envisions a future where every technology is given the opportunity to make a global impact.

- USF ranked 11th among American public universities and 23rd among all universities worldwide in generating new US Patents in CY 2021, according to the National Academy of Inventors (NAI) and Intellectual Property Owners Association (IPO). On a global scale, this is the 10th year USF has ranked in the top 25.
- USF facilitated the formation of 11 new startup companies in FY 2022 (ranking USF in the top 15 percent nationally for facilitating University startups).
- USF executed 99 options & licenses in FY 22 (ranking USF in the top 12 percent for executed agreements). These agreements represent companies that have contracted with USF to further develop research into commercial products and to help bring USF's innovation into the marketplace.
- USF Tampa was ranked #19 among the "Best Universities for Technology Transfer, 2017" by the prestigious Milken Institute.
- USF's innovation and economic development efforts generate more than $582 million in statewide impact.

USF TECHNOLOGY TRANSFER™

USF Technology Wheel

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USF Tech Transfer has over 250 technologies in the medical space. To learn more about how we can partner, please contact: ttoinfo@usf.edu

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