Advancing USF Innovation

Life Science Technologies
The Technology Transfer Office (TTO) was established in 1990 to facilitate the commercialization of university intellectual property, including patents and copyrights.

The TTO works with researchers and students in every college to ready new inventions for the patenting process and potential licensing opportunities. TTO's work allows for a sustained focus on transferring cutting-edge research and innovation to the commercial marketplace, generating revenue and diversifying the economy.

Our office has a knowledgeable and professional staff with specialized backgrounds, who work in collaborative teams in the areas of marketing, patent prosecution and licensing to direct the movement of new ideas, discoveries and innovation into the commercial and public sectors. TTO endeavors to educate and promote innovation, the result of which is products, jobs and technologies utilized in the public interest.

USF was recently ranked in the Top 20 of American Universities for technology transfer by the prestigious Milken Institute. With 114 new utility patents issued in 2016, USF ranks fifth among American public universities and 11th among universities worldwide in generating new U.S. patents, according to the National Academy of Inventors (NAI) and Intellectual Property Owners Association (IPO). This past year, the university had a record 133 license and option agreements, ranking 9th nationally among individually reporting schools (comparison to the most recent available published data – AUTM 2015 survey). USF also had 9 new startup companies in FY 2016, and has facilitated the formation of 50 startup companies in the last 5 years. TTO endeavors to educate and promote innovation, the result of which is products, jobs and technologies utilized in the public interest.

[http://www.usf.edu/research-innovation/pl/]
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Conditional FKBP51 Over-Expression Transgenic Mouse

- Human FKBP51 is overexpressed in mice to exhibit depressive behavior
- Provides a new screening tool for therapeutic agents
- Can be used to screen for additional psychiatric disorders, including post-traumatic stress disorder and bipolar disorder
- Live Specimens Available

USF Tech ID# 13A006
Patent Pending

Technology Description:
Researchers at USF have developed a transgenic mouse model that causes the mouse to express depressive behavior. This was accomplished by the addition of a nucleotide sequence encoding human FKBP51 integrated into the mouse genome. This model is capable of over-expressing human FKBP51 in the forebrain, which causes the transgenic animal to exhibit depressive behavior.

The mouse model provides a method for studying the effect of a possible therapeutic agent on one or more phenotypes of the depressive–like behavior through comparing the effect to an untreated control animal. This technique offers the potential to improve drug development efforts in the pharmaceutical industry for psychiatric disorders.

Ube3a Rat Model for Angelman Syndrome

- A rat model that lacks the entire Ube3a gene, which is known to cause Angelman Syndrome
- All isoforms and alternative promoters of the Ube3a gene are also removed
- The model may be used for research as well pre-clinical testing of potential therapeutics
- Live Specimens Available

USF Tech ID# 16A060
Patent Pending

Technology Description:
Nearly all cases of Angelman Syndrome result from the disruption of a single gene: UBE3A. USF scientists have developed a rat model of Angelman Syndrome that closely mimics the complete deletion of the UBE3A gene containing region of chromosome 15 found in approximately 70% of Angelman cases. The rat model is completely UBE3A deficient with a genome lacking the entire UBE3A gene (including all isoforms and alternative promoters). This rat model may be used for basic research in regards to the disease as well as applied research for pre-clinical testing of potential therapeutics.
Transgenic Foxc2-tdTomato Overexpressing Mice
- Mouse model to overexpress the Foxc2-td gene via Cre recombinase
- Potential application to resolve genetic defects in lymphatic valve development
- Live Specimens Available

USF Tech ID# 17A097
Patent Pending

Technology Description:
USF researchers have designed a mouse model which has a transgenic construct inserted into the genome to overexpress the gene Foxc2.

This novel approach allows the overexpression of Foxc2 in a Cre-dependent manner. Foxc2 is a necessary transcription factor for embryonic development of lymphatic valves. This mouse model may help researchers gain insight into genetic defects of the lymphatic valves.

Modeling Complex Human Disease in a Single Animal
- An all-in-one technique that is not dependent on isogenic strains
- Allows the generation of three cell populations in a single animal
- Could be used to generate larger animal models including non-human primates
- Product in Development

USF Tech ID# 14B132
Patent Pending

Sensitively Studying Gene-Gene Interactions over a Wide Genetic Background
- Uses the CRISPR method to generate novel mouse models
- Allows first-generation mice to be used, which greatly expedites modeling of gene-gene interaction over a wide genetic background
- Eliminates genetic, epigenetic and environmental variations
- Product in Development

USF Tech ID# 14B153
Patent Pending
Direct Conversion of Human Skin Fibroblast into Neurons Using a Faster and Cheaper Alternative
- A modified protocol to convert human skin fibroblasts into neurons using a readily available medium
- Neurons are directly converted without transition into iPSCs and without the use of neurotrophic factors
- Lower cost and faster conversion method

USF Tech ID# 15A014
US Patent# 9,481,864

Technology Description:
Researchers at the University of South Florida have developed a novel method to obtain neurons from human skin fibroblasts in half the time previously reported. This method uses readily available medium to convert the cells without the complicated and lengthy generation of induced pluripotent stem cells (iPSCs). This method lowers costs and increases time efficiency.

This newly discovered method will be a crucial component in the advancements of ex-vivo assays. It will also expedite personalized medicine approaches for the treatment of Alzheimer’s disease and other neurodegenerative diseases.

Methods and Systems of Detecting Exocytosis of a Target Molecule from a Population of Cells
- A method used to monitor insulin exocytosis at the whole islet level in response to an insulin secretagogue
- High throughput screening
- A less expensive, simple and more sensitive method

USF Tech ID# 15A096
US Patent# 9,739,734

Technology Description:
USF Researchers have developed a simple yet sensitive method for high throughput analysis of single pancreatic islet viability and potency using impedance analysis. Impedance analysis of electrical circuits enables separation of resistance and capacitances and characterization of the actual values in the circuit. This method has been successfully utilized to monitor insulin exocytosis at the whole islet level in response to an insulin secretagogue.

This approach could not only be used as an industry standard for assessing and sorting human islets prior to transplantation, but will also advance islet transplantation procedures and explorations for treatments of diabetes by monitoring functional release of insulin from single islets.
Molecule that Inhibits STAT3 Activation: Development of a Phospho STAT3 Cytoblot High Throughput Assay
- A method for the treatment of tumors and cancerous tissues
- Prevents tumorigenesis and malignant transformation through the modulation of STAT3 intracellular signaling
- Anti-tumor activity demonstrated in-vitro and in-vivo

USF Tech ID# 01A026
US Patent# 7,998,947 & 8,691,799

Novel Methods for the Staining of Fungi and Protozoa: Development of Staining Kit
- Methods are applicable to fungal and protozoan detection in both environmental and biological samples
- Techniques are rapid, specific and sensitive methods
- Applicable as a routine detection test

USF Tech ID# 02A034
US Patent# 7,745,168; 7,157,242 & 8,609,365

Detection of Florida Red Tide Organisms by Nucleic Acid Amplification
- Quick identification via real time PCR
- Reliable bloom prediction
- Potential adaptation to a mobile design

USF Tech ID# 02B088
US Patent# 7,700,278 & 8,003,778

A Method for the Detection of Polyketide Synthetase Gene Expression in Karenia brevis (Red Tide)
- A rapid and specific detection of the existing toxin-producing genes of the Florida Red Tide Organism
- Ability to predict fish kills
- Determination of relative virulence

USF Tech ID# 05B070
US Patent# 7,422,857 & 7,888,031
Method for Controlling Microbial Cells for Separation
- Can improve the performance of bioreactors by removing contaminants or enriching microbes
- Unlike antibody based separation, this technology has an unlimited shelf life and is reusable
- May be used with a variety of environmental samples

USF Tech ID# 06A014
US Patent# 8,795,498

Molecular Detection and Quantification of Enterococci
- A method for rapid detection and quantification of fecal bacteria responsible for human recreational water illnesses (RWIs)
- Uses acid sequence based amplification (NASBA) to amplify ribonucleic acid (RNA)
- Rapid detection with high sensitivity and precision
- Reduction in false negatives

USF Tech ID# 06A039
US Patent# 7,947,441

Barrier-Permeable Proxy Reporter Analysis
- Utilizes molecular tags that target a desired molecule, cell or particle and can then report the presence of the target without interferences from the environmental media
- Gives the detector the ability to remain in its preferred configuration
- Keeps the environmental media isolated

USF Tech ID# 06A054
US Patent# 7,879,622

Enantioselective Bronsted Acid-Catalyzed Ring-Opening of Aziridines
- Excellent enantioselectivity
- Can be completed in an environmentally benign set of conditions
- Potential application in preparation of pharmaceuticals

USF Tech ID# 07A029
US Patent# 7,799,934
**Enhanced Formation of Extracellular Matrix by Overlayering Cultured Cells with a Volume Exclusion Agent**
- Increases the formation of collagen fibrils and extracellular matrix
- Allows for higher tensile strength and better structural integrity of the cells in culture
- Yields a more normal cell topography in the bioengineered tissue

**USF Tech ID# 08A052**
**US Patent# 8,623,646**

**ATP Bioluminescence Immunoassay**
- Can determine viability of specific bacterial contaminants in food products, beverages, and public water sources
- A reliable procedure that can be completed in one hour
- Minimal or no sample pre-treatment involved
- Plate or dipstick formats

**USF Tech ID# 09A010**
**US Patent# 8,518,658 & 9,116,151**

**Harmful Algal Bloom Mitigation by Induction of Programmed Cell Death**
- A method for controlling algal blooms via induced apoptosis
- Suitable for any type of aquatic medium (marine, freshwater, brackish & artificial)
- May be used as a preventative measure for harmful algal blooms

**USF Tech ID# 09A050**
**US Patent# 8,476,196**

**Capture Antibody Targeted Fluorescent In-Situ Hybridization (CAT-FISH)**
- Accommodates various fluorescence requirements
- Allows multiple combinations of probes and antibodies
- Is an inexpensive kit that utilizes inexpensive and commercially available reagents

**USF Tech ID# 10B092**
**US Patent# 9,714,943**
QmiR, A Computer Program for Designing PCR Primers for UQmiR miRNA RT-qPCR Assay
- Primers can be designed for specific miRNAs and for miRNA amplification
- Can handle thousands of miRNA sequences at once
- Ensures specificity when using miRNAs in a research setting

Blue Collagenase Assay
- Measures both soluble and insoluble cell or tissue-associated collagenase activity
- Stains lyophilized collagen in its native state without solubilization by acid and/or gelling by heat
- Allows for qualitative observation of collagenase activity and quantitative activity via a spectrophotometer
- Can also be used to analyze metallo-proteinases in humans and other animals

Fragment Evolution via Kinetic Target-Guided Synthesis for the Identification of Potent Bcl-2 Modulators
- Rapid identification of modulators of protein-protein interactions
- Applicable to any undruggable targets such as protein-protein interaction targets or protein-DNA/RNA interactions
- Applicable to the pharmaceutical, biotechnology, and drug design industries

Universal qPCR Duplex Detection of mRNAs and miRNAs
- A multiplexed RNA Quantitative PCR Assay
- Simultaneous detection of one or more microRNA species and/or one or more messenger RNA species from one or more samples
- Four PCR reactions can be performed in one well
- Reduction in cost, time and experimental errors
CRISPR Cloning Technique
- A CRISPR/Cas9 technique combined with the homologous recombination technique
- Can be used to modify an existing construct into a large vector seamlessly
- Efficiently shortens cloning time

**USF Tech ID# 14B124**
Patent Pending

Efficient CRISPR Knock-in
- High knock-in efficiency of HDR without NHEJ inhibitors
- Ability to knock-in large fragments with the absence of undesirable bi-allelic knock-ins
- High survival rate of zygotes
- Low toxicity and cost

**USF Tech ID# 15B127**
Patent Pending

Site-Directed Mutagenesis without Polymerase Chain Reaction
- Small DNA fragments can be cloned seamlessly into a vector without using the PCR technique
- Allows for simple and seamless mutagenesis with high efficiency
- Could be combined with the CRISPR/Cas9 technique

**USF Tech ID# 16A036**
Patent Pending

A Novel Preclinical Model of Neonatal Necrotizing Enterocolitis (NEC)
- A murine model which investigates red blood cell transfusions and their impact on bowel injuries in mice with severe anemia
- An easily reproducible and clinically relevant model
- Could be used to study human NEC due to strong similarities

**USF Tech ID# 17A053**
Patent Pending
**Supramolecular Assemblies and Building Blocks**
- Simple and highly modifiable materials
- Greater potential for the prediction, design, and synthesis of the network topology of a framework based on a singular network topology
- Potential application in areas focused on carbon dioxide capture, methane storage, gas separations and drug delivery

**USF Tech ID# 07B130**
US Patent# 8,034,952

**Technology Description:**
Researchers at USF have invented a novel approach to unequivocally design functional porous materials based on hierarchical bottom-up assembly utilizing targeted Supermolecular Building Blocks (SBBs). These building blocks provide a greater potential for the prediction, design, and synthesis of the resultant network topology of the constructed metal-organic, or covalent-organic frameworks.

The invention also provides corresponding designed ligands that can be used as monomers in the preparation of SBBs and the triangular MBBs. The dual composition of these materials and their extra-large cavities offer great potential for their use in areas such as separation, controlled release and/or sequestration of gases, chemosensors and drug delivery.

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**Polypeptide Electrospun Nanofibrils of Defined Composition**
- Homogeneous nanofibers made of pure synthetic polypeptides
- Have increased stability through crosslinking
- Are biodegradable by enzymes over time
- Possible applications include surgical sutures, wound dressings, tissue engineering scaffolds, medical textile materials and drug delivery depots

**USF Tech ID# 09B135**
US Patent# 9,428,849

**Technology Description:**
University of South Florida researchers have developed homogeneous nanofibers made of pure synthetic polypeptides. These materials have physical, chemical and biological properties that make them advantageous for replacing traditional materials in medicine and tissue engineering. Biocompatible and bio-absorbable materials are needed to help minimize the foreign-body response that often occurs during surgical procedures. These biomaterials are also biodegradable by enzymes over time.
3-Trifluoromethyl-3-aryldiazirine Photolabels with Enhanced Ambient Light Stability

- A successfully synthesized ambient-light stable photolabel
- Enhanced ambient light stability and aqueous solubility
- Enhanced photo-affinity labeling could help to introduce chemical probes into drug discovery, identifying new drug targets and molecular interactions

**Technology Description:**
Researchers at USF have successfully synthesized an ambient-light stable photolabel without compromising the photoactivated insertion reactivity. The photolabels, synthesized with 3-trifluoromethyl-3-aryldiazirine, have allowed researchers to overcome the many obstacles of traditional photolabel techniques, including cumbersome synthesis, instability to ambient light conditions, and limited aqueous solubility.

This invention will enhance photoaffinity labeling thereby furthering its applications. Such applications may include drug discovery and the identification of new drug targets and molecular interactions.

**Nano-Scale Faceted Polyhedra**

- Chemical robustness and diversity allow the technology to be made from magnetically and catalytically active metals
- Contains internal and external cavities suitable for encapsulating organic or other chemical species
- Applications include areas of liquid crystal technology, magnetic devices or applications, and drug delivery as adjuvant or carriers

**Synthetic Elastic Polymer/Collagen Fibril Biocomposite for Artificial Tissue Design**

- Combines biotic and abiotic material for artificial tissue replacement surgeries
- Decreases the risk of an autoimmune response
- Decreases the risks of post-operative infection at the site of implant

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**Coomassie stained gel of photolabeled Con A and controls.**

**A visual depiction of the native ligand mannose bound to Con A.**

**The prototypical nanoscale faceted polyhedron that is based upon a small rhombihexahedron.**

**Control collagen fiber**

**Nanoparticle treated fiber**
Polyhedral Cage-Containing Mesoporous Metal-Organic Frameworks as Platform for Biocatalysis
- Enhanced activity and greater stability of the immobilized enzyme in comparison to current technologies
- High surface area, structural versatility and solvent adaptability
- Various biocatalysis applications in chemical, pharmaceutical and food industries

USF Tech ID# 11A083
US Patent# 9,404,105

- Simple and highly tunable
- Made-to-order Metal-Organic Frameworks with potential in carbon dioxide capture, methane storage, and gas separation
- Wide range of applications in catalysis, magnetic materials, semiconducting materials, chemosensors, and biosensors

USF Tech ID# 11B117
US Patent# 9,139,599

Peptide-Based Materials
- Novel bio-inspired polymeric materials made of random polypeptides of known amino acid composition
- Cost efficient and highly practical
- Potential application in the materials manufacturing niche
- Eliminates unnecessary consumption of non-renewable resources, therefore reducing non-biodegradable waste

USF Tech ID# 12B157
Patent Pending

Nano-Cages Based Local Heaters, Compound Materials: Magnetic Beads Covered with Nanocages, Light Activated Materials Combined with Thermally Sensitive Polymers
- May be used for localized heating of biological systems
- Are highly tunable and targetable
- Potential applications in the areas of thermal ablation of cancerous tissues and optofluidic systems

USF Tech ID# 13B204
Patent Pending
**Imparting Amphiphobicity on Single-Crystalline Porous Materials**
- The amphiphobic porous materials resist all kinds of liquids but allow the adsorption/permeation of gases
- Exhibits superhydrophobicity, oleophobicity, high crystallinity and intact porosity
- Applications in a variety of fields such as microelectronics, medicine and military

**Molded Polypeptide Polymers: Characterization of Bulk and Molecular Properties**
- Focuses on the design and production of innovative soft materials made of polypeptides
- Allows researchers to determine interactions between mechanical properties and sample processing, polymer design, blend ratio and crosslink density
- Potential applications in biotechnology, medicine, and food science

**Composition and Methods for Delivery of mRNA and Long Non-Coding RNA**
- The peptide delivers the RNA-based therapeutic agents \textit{in-vivo}
- Efficient delivery of mRNA and long non-coding RNA
- Does not induce any systemic toxicity
- Allows for adequate endosomal escape

**Tantala-based Sorbent for Online/Offline Extraction and Preconcentration of Catecholamine Neurotransmitters as well as other Chemical Species**
- Provides excellent pH stability (pH 0-14)
- Could be used to investigate a wide range of analytes including catecholamine neurotransmitters, nucleotides and nucleosides
- Allows for a desorption efficiency of > 95%
Sensor Apparatus for In Situ Analysis of Chemical and Biological Species
- A submersible, self propelled apparatus
- Provides an improved method to analyze a component contained in a liquid or fluid medium in situ or in an on-site situation
- Capable of measuring large volumes of fluids without a pumping system and utilizes a highly-sensitive contaminant assay system

USF Tech ID# 02B081
US Patent# 8,557,183 & 8,603,395

A Hand Held Thermal Regulating Fluorometer
- Portable and low cost thermal regulation
- Allows for real time analytic detections to be performed in the field
- Flexible and GUI based user friendly interface for control of the fluorometer
- Applications include nucleic acid amplification, enzymatic studies and analytical biochemical reactions

USF Tech ID# 04A033
US Patent# 7,186,989 B2

An Integrated Portable Hand Held Reactor for Real-Time Nucleic Acid Amplification and Detection
- The device is portable and is more cost efficient than the available analytical devices
- Allows for real time analysis
- Supports isothermal gene-amplification technologies (e.g NASBA, LAMP, SDA, etc.)

USF Tech ID# 05B134
US Patent# 7,705,339

Magnetic Metabolite Transfer Disks and Diagnostic Transfer Disks
- Used for the transfer and identification of microbial species and their metabolites
- Could be adapted as a bandage or wound dressing
- Has the potential to be automated for industrial use

USF Tech ID# 07B144
US Patent# 8,697,437
Two Stage Acoustic Microfluidic Microparticle and Cell Separation System
- Continuous microparticle and cell separation using surface acoustic waves
- Biological samples are handled gently with no physical contact between the ultrasonic transducer and the medium
- The use of the sheath flow for positioning is not required

**USF Tech ID# 10B132**
Patent Pending

Development and Testing of Hyperbaric Atomic Force Microscopy (AFM) and Fluorescence Microscopy for Biological Applications
- A custom-designed hyperbaric chamber tested with AFM and fluorescence microscopy allows researchers to study the effects of hyperbaric gases on biological preparations
- Enables remote operation of instrumentation under hyperbaric conditions
- Allows for vibrational isolation and temperature regulation

**USF Tech ID# 11A076**
Patent Pending

Membrane-Integrated Microfluidic Device for High-Resolution Live Cell Imaging Fabricated via a Novel Substrate Transfer Technique
- Allows for high resolution images on either side of the membrane in a tissue mimetic environment
- Continuous perfusion of necessary nutrients and gasses
- Can be adapted to any membrane-based cell culture which requires high resolution imaging screening methods, including drug discovery methods

**USF Tech ID# 12A045**
Patent Pending

Microfluidic Device for Generating Neural Cells to Simulate Post-Stroke Conditions
- Generates normoxic, anoxic, and hypoxic environments in vitro to replicate the in vivo conditions that occur during an ischemic stroke
- Allows for precise control over input parameters (drug candidates, cytokines, etc.)

**USF Tech ID# 12A047**
US Patent# 8,912,006 & 9,632,076
Auto-Regulation System for Intraocular Pressure

- A wireless device for continuous pressure monitoring
- Eliminates manual sampling of pressure
- Allows complete control of the specific input parameters
- Reduced time and increased sample rate

**USF Tech ID# 12A082**
**US Patent# 9,022,968 & 9,314,375**

High-throughput Platform for Bioprinting Tissue Modules

- Versatile platform for complex tissue formation
- Maintains cell morphology in tissue modules during assembly of 3D structures
- Integrates into existing 3D printing systems

**USF Tech ID# 14B171**
**Patent Pending**

Method And Apparatus for Hot Embossing Micro Feature with High Resolution Microscopy Access

- A micro-feature device that can be used to culture cells for high-throughput screening
- Extremely thin with an optically clear bottom
- Could be used to model how human organ systems respond to agents such as toxins or medications

**USF Tech ID# 15A049**
**Patent Pending**

Continuous Wireless Powering of Moving Biological Sensors

- Can deliver a constant power supply
- Eliminates power related drifts and their corresponding recalibration procedures
- Increased data resolution and decreased size

**USF Tech ID# 15A052**
**Patent Pending**
A Mouse Dissection Device Expediting Sample Collection

- The simplified multilayer structure accommodates a wide range of animal sizes
- Durable structure and easy clean-up design

USF Tech ID# 15B170
US Patent# 9,622,842

Polymer Gradient Creation System

- Allows the creation of complex gradients of multiple polymer or liquid components
- Components such as nanoparticles or cells can also be imbedded into the polymer matrix
- Allows for high accuracy and control

USF Tech ID# 17A019
Patent Pending

The Life Sciences Licensing Managers are relationship driven and dedicated, identifying industry partners and negotiating license agreements in areas such as therapeutics, medical devices, reagents, marine science, chemistry and diagnostics. The Life Sciences team facilitates and guides the entire license and patent process from start to finish.

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