# FCR 13

Office of the President
February 21, 2020

Members, Board of Trustees:

PATENT ASSIGNMENT REPORT

Recommendation: that the Board of Trustees accept the patent assignment report for the period October 1, 2019 to December 31, 2019.

Background: At its March 1997 meeting, the Board of Trustees authorized the University of Kentucky Research Foundation to conduct all future copyright and patent filings and prosecutions. Quarterly reports on patent and copyright applications are to be submitted to the Finance Committee of the Board.

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Action taken: ☑ Approved ❑ Disapproved ❑ Other_____

PATENT ASSIGNMENTS
FOR THE PERIOD October 1, 2019 TO December 31, 2019

Patents

The following assignments on behalf of the Board of Trustees of the University of Kentucky Research Foundation have been executed:

1. **International Application Number:** PCT/US19/61518
**UKRFID:** 2182
**Filed:** November 14, 2019
**Title:** DIAGNOSIS OF DIABETES BY DETECTING AGGREGATED AMYLIN IN ERYTHROCYTES
**Inventors:** Florin Despa (College of Medicine)
**Description and Application:** The invention relates to method for detecting the presence of amylin in a patient's erythrocytes, determining the risk for development of type 2 diabetes and related comorbidities, and determining effectiveness of treatments for patients at risk for developing type 2 diabetes and comorbidities. Treatment methods may include increasing circulating epoxyeicosatrienoic acid, lifestyle changes, biologicals, genetic, or pharmacological intervention depending on the amylin levels in healthy control erythrocytes.
**License:** N/A

2. **U.S. Patent Application Serial Number:** 16/684,439
**UKRFID:** 2182
**Filed:** November 14, 2019
**Title:** DIAGNOSIS OF DIABETES BY DETECTING AGGREGATED AMYLIN IN ERYTHROCYTES
**Inventors:** Florin Despa (College of Medicine)
**Description and Application:** The invention relates to method for detecting the presence of amylin in a patient's erythrocytes, determining the risk for development of type 2 diabetes and related comorbidities, and determining effectiveness of treatments for patients at risk for developing type 2 diabetes and comorbidities. Treatment methods may include increasing circulating epoxyeicosatrienoic acid, lifestyle changes, biologicals, genetic, or pharmacological intervention depending on the amylin levels in healthy control erythrocytes.
**License:** N/A

3. **International Application Number:** PCT/US19/56767
**UKRFID:** 2229
**Filed:** October 17, 2019
**Title:** PERCUTANEOUS PULMONARY ARTERY DRAINAGE DEVICE
**Inventors:** Dongfang Wang, Joseph Zwischenberger (College of Medicine)
**Description and Application:** The invention relates to a device for catheterization of the heart, specifically for percutaneous left ventricular unloading during venoarterial extracorporeal membrane oxygenation. The multiple lumen device includes an expandable cage and an outer catheter. The first lumen is in the outer catheter. The device also includes an inner catheter with a second and third lumen. The device is percutaneously inserted into a blood vessel that leads to the heart, allowing a desired amount of blood to flow in a retrograde manner from the pulmonary artery into the right atrium. This device can be used to assist with cardiogenic shock which has a mortality rate as high as 40-50%. The current market size for cardiac assist devices such as the invention is approximately $6 million a year and experiencing continued growth.
**License:** In negotiation with W-Z Biotech.

4. **International Application Number:** PCT/US19/67990
**UKRFID:** 2261
**Filed:** December 20, 2019
**Title:** CATHETER SYSTEMS AND RELATED METHODS
**Inventors:** Thomas Pittman, William Dillen (College of Medicine)
**Description and Application:** The invention relates to a catheter system that forms a closed reservoir that is useful as an intraventricular catheter for accessing cerebrospinal fluid of a subject. The catheter system has an innovative trocar and allows the catheter to be secured to a port and lock in place without external reinforcements. There are approximately 1.8 million new cases of diagnosed cancer in 2019, and that number continues to rise. In cancer treatment implantable ports are becoming more popular for the delivery of chemotherapeutic drugs because they allow for precise drug delivery.
**License:** Exclusive option in negotiation with Alycone.

5. **U.S. Patent Application Serial Number:** 16/724,126
**UKRFID:** 2276
**Filed:** December 20, 2019
**Title:** METHOD OF TREATING CANCER WITH AN ELEVATED GLYCOGEN CONTENT
**Inventors:** Matthew Gentry, Ramon Sun, Lyndsay Young (College of Medicine)
**Description and Application:** The inventors identified a unique profile of high glycogen levels in the cytoplasm and nucleus of cancer cells that is absent in the surrounding benign tissue. The inventors propose repurposing of drugs currently used in metabolic disease as a novel personalized therapeutic strategy for lung, renal, and breast cancer. Current cancer therapies do not target

glycogen metabolism and there are no therapies linking glycogen metabolism to epigenetic changes. There are approximately 1.8 million new cases of diagnosed cancer in 2019, and that number continues to rise. A subset of these cancers contains high levels of glycogen in the cytoplasm and nucleus. Evidence has shown that glycogen metabolism plays a role in energy production for rapidly replicating cancer cells and in epigenetic changes that drive cancer phenotypes.
**License:** N/A

6. **U.S. Patent Application Serial Number:** 16/719,843
**UKRFID:** 2292
**Filed**: December 18, 2019
**Title**: BIOSYNTHESIS OF CURCUMINOIDS IN MAMMALIAN CELLS
**Inventors:** Logan Warriner, Daniel Pack (College of Engineering)
**Description and Application:** The production of curcuminoids, molecules suitable for drug formulation, may reduce radiation risk for astronauts, be used for cancer therapy, and treat bacterial infections. The invention relates to a method of making a curcuminoid by expressing one or more enzymes in a mammalian cell. The starting enzymes can include tyrosine ammonia lyase, 4-coumaroyl-CoA ligase, curcuminoid synthase, diketide-CoA synthase, curcumin synthase, 4-coumaraate 3 hydroxylase, caffeoyl-CoA 3-O- methyltransferase, and acetyl-CoA carboxylase. The expressing of one or more of the above enzymes converts a starting material to curcuminoid. The method could encompass delivering genetic material corresponding to one or more enzymes to the cell *in vivo*; harvesting the cell from a subject, delivering the genetic material corresponding to one or more enzymes to the cell *in vitro*, and replanting the cell; or harvesting the cell from a subject, delivering the genetic material corresponding to one or more enzymes to the cell *in vitro*, encapsulating the cell, and administering the encapsulated cell to the subject in a tissue cage. The method in the patent eliminates problems associated with current technology such as rapid breakdown by kidneys and resolves issues with administration.
**License:** N/A

7. **U.S. Patent Application Serial Number:** 16/717,972
**UKRFID:** 2295
**Filed:** December 17, 2019
**Title:** INDUCING PRODUCTION OF FULL-LENGTH PROGRANULIN (GRN) FROM NUCLEOTIDES INCLUDING MUTATIONS CONTAINING A PREMATURE STOP CODON (PTC)
**Inventors:** Haining Zhu (College of Medicine)
**Description and Application:** The invention relates to a new therapy to treat and correct one of the causes of frontotemporal dementia (FTD). The therapy includes the use of a class of antibiotics known as aminoglycosides to force a readthrough of a mutated progranulin protein including a premature stop

codon so that the full-length protein is synthesized. Similar strategies have been attempted in other human diseases including cystic fibrosis, Duchenne Muscular Dystrophy, and Rett's syndrome. FTD is a clinically and pathologically heterogeneous group of non-Alzheimer's dementias characterized by progressive atrophy of the frontal or temporal lobes, or both. FTD is the most common form of dementia for people under age 60 and represents 10-20% of all dementia cases. Estimates place the number of people with FTD in the United States between 50,000 and 60,000 and there is currently no treatment to prevent or reverse FTD.
**License:** N/A

8. **U.S. Patent Application Serial Number:** 16/675,980
**UKRFID:** 2304
**Filed:** November 6, 2019
**Title:** METHODS OF TREATING PAIN AND/OR INFLAMMATORY DISORDERS USING LAPATINIB
**Inventors:** Chang-Guo Zhan, Fang Zheng, Shuo Zhou, Ziyuan Zhou (College of Pharmacy)
**Description and Application:** The patent relates to a method of treating pain by administering an effective amount of Lapatinib or a pharmaceutically acceptable salt to a subject in need of treatment for pain. Approximately 25.5 million adults suffer from chronic pain, and opioids are often prescribed potentially leading to misuse and use disorders. One of the most devastating consequences of opioid misuse is respiratory depression and death. Drug overdose is the leading cause of accidental death in the United States. The invention offers a possible alternative to prescription opioids.
**License:** N/A

9. **U.S. Patent Application Serial Number:** 16/670,707
**UKRFID:** 2319
**Filed**: October 31, 2019
**Title**: MITHRAMYCIN OXIME AND HYDRAZINE DERIVATIVES HAVING INCREASED SELECTIVITY AND ANTI-CANCER ACTIVITY
**Inventors:** Jon Thorson, Jurgen Rohr, Markos Leggas, Joseph Eckenrode, Liu Yinan, Jianjun Zhang, Khaled Attia Shaaban Mahmoud (College of Pharmacy)
**Description and Application:** The patent relates to a treatment for cancer using derivates of mithramycin (MTM). Specifically, the relevant compounds are MTM Oxime (MTM-OX) and MTM hydrazine (MTM-HY). The use of these derivatives allows for selectively modulating the activity of a target erythroblast transformation-specific transcription factor in a patient by administering a therapeutically effective amount of the derivative or a related pharmaceutically acceptable salt. This treatment may be effective for prostate, colon, and lung cancers, as well as the treatment of leukemia, lymphoma, and Ewing sarcoma.
**License:** N/A

10. **U.S. Patent Application Serial Number:** 16/599,166
**UKRFID:** 2208
**Filed:** October 11, 2019
**Title:** PLASMA GENERATOR INCLUDING ANODE AND CATHODE HELD WITHIN A CONTAINMENT HOUSING
**Inventors:** Michael Winter, Helmut Koch (Center for Manufacturing)
**Description and Application:** The invention relates to an encapsulated plasma generation system for use as a propulsion system for small satellites for deep space missions. The novel plasma generator is a non-fusion, low-power cylindrical inertial electrostatic confinement with a glass tube and internal gas-feeding. The plasma generator has a novel cylindrical helix electrode rather than the conventional spherical design and provides a solid confinement of the outer electrode.
**License:** N/A

11. **U.S. Patent Application Serial Number:** 16/601,678
**UKRFID:** 2370
**Filed:** October 15, 2019
**Title:** ANTEGRADE RETROGRADE RECON FEMORAL INTRAMEDULLARY NAIL SYSTEM
**Inventors:** Arun Aneja, Lorenzo Deveza, Shea Comadoll, Boshen Liu (College of Medicine)
**Description and Application:** This invention is an improved intramedullary nail configured for antegrade or retrograde insertion into a femur in order to stabilize the neck of the femur. Unlike traditional intermedullary nails, this invention may be inserted in a retrograde manner and still stabilize/protect the femoral neck. The invention may also be used with a variety of femoral fractures. The global orthopedic device market is in excess of $36 billion and will continue to grow as population increases.
**License:** N/A

12. **U.S. Patent Application Serial Number:** 16/657,543
**UKRFID:** 2279
**Filed:** October 18, 2019
**Title:** CONCRETE REPAIR COATING
**Inventors:** Thomas Robl, Robert Jewell, Anne Oberlink, Tristana Duvallet (Center for Applied Energy Research)
**Description and Application:** The invention relates to an innovative concrete repair coating with unique and beneficial qualities. The coating has both a calcium sulfoaluminate cement and a Portland cement, wherein the aggregate component includes coarse aggregates between 62.5 microns and 500 microns in diameter and fine aggregates between 62.5 microns to less than 5 microns in diameter.
**License:** N/A

13. **U.S. Patent Application Serial Number:** 16/690,397
**UKRFID:** 2358
**Filed:** November 21, 2019
**Title:** CONTINUOUS WET-SPINNING PROCESS FOR THE FABRICATION OF PEDOT:PSS FIBERS WITH HIGH ELECTRICAL CONDUCTIVITY, THERMAL CONDUCTIVITY AND YOUNG'S MODULUS
**Inventors:** Ruben Sarabia-Riquelme (Center for Applied Energy Research)
**Description and Application:** The invention relates to a novel process for wet-spinning to produce fibers having unique electrical conductivity, thermal conductivity, and Young's modulus properties. The invention uses poly(3,4-ethylenedioxythiopene): poly(styrenesulfonate) (PEDOT:PSS). The resulting fibers have electrical conductivity between 100 and 2500 S/cm, a thermal conductivity between 1 and 15 W/mk and a Young's modulus between 4 and 16 GPa. This invention also allows for scalable, continuous manufacturing as opposed to batch processing. These inventive fibers and method are useful in the emerging fields of smart textiles and wearable electronics.
**License:** N/A

14. **International Application Number:** PCT/US19/066007
**UKRFID:** 2209 and 2311
**Filed:** December 12, 2019
**Title:** QUALITY ASSURANCE DEVICE FOR A MEDICAL ACCELERATOR
**Inventors:** Janelle Molloy, Dennis Cheek, Quan Chen (College of Medicine)
**Description and Application:** The invention relates to a quality assurance device adapted for calibrating and verifying proper operation of a medical accelerator. The invention combines a novel phantom that possesses a shell consisting of a scintillating material that converts X-ray radiation into visible light. This light is detected using some form of optical imaging that can acquire a near 360-degree panoramic field. The images can be transmitted to a digital imaging system. The inventive device allows for the performance of several tasks with a single device.
**License:** License option to Wild Dog Physics, LLC

15. **U.S. Patent Application Serial Number:** 16/711,633
**UKRFID:** 2255
**Filed:** December 12, 2019
**Title:** HEAT-INTEGRATED TRANSFORMATIVE CARBON DIOXIDE CAPTURE PROCESS
**Inventors:** Kunlei Liu, Heather Nikolic, Fan Zhen, Jesse Thompson, Amanda Warriner (Center for Applied Energy Research)
**Description and Application:** The invention relates to a novel apparatus and method for capturing carbon dioxide from an acid gas stream. The apparatus has at least three packing segments, including specific surface area packing, wherein the surface area of the packing in a first packing segment is less than the surface area of the packing in a second packing segment and the surface

area of the packing in the second packing segment is less than the surface area of the packing in a third packing segment. The invention includes at least one in-situ liquid/gas distributor.
**License:** N/A

16. **International Application Number:** PCT/US19/066043
**UKRFID:** 2438
**Filed:** December 12, 2019
**Title:** QUALITY ASSURANCE DEVICE WITH PASSIVE OPTICAL COMPONENT AND REMOTE CAMERA
**Inventors:** Janelle Molloy, Dennis Cheek, Quan Chen (College of Medicine)
**Description and Application:** The invention relates to a quality assurance device adapted for calibrating and verifying proper operation of a medical accelerator. The invention combines a novel phantom that possesses a shell consisting of a scintillating material that converts X-ray radiation into visible light. This light is detected using some form of optical imaging that can acquire a near 360-degree panoramic field. The images can be transmitted to a digital imaging system. The invention includes a camera located outside the housing and a passive optical component inside the housing. The inventive device allows for the performance of several tasks with a single device.
**License:** N/A

Patent Activities
Fiscal year to date as of December 31, 2019

| FY 2019-20 | | | | | |
|---|---|---|---|---|---|
| | First Quarter | Second Quarter | Third Quarter | Fourth Quarter | Total |
| Full Patent Applications | 11 | 16 | - | - | 27 |
| Provisional Patent Applications | 28 | 14 | - | - | 42 |
| Patents Issued | 7 | 11 | - | - | 18 |
| License Income | $1,365,221.64 | $66,754.90 | - | - | $ 1,431,976.54 |

| FY 2018-19 | | | | | |
|---|---|---|---|---|---|
| | First Quarter | Second Quarter | Third Quarter | Fourth Quarter | Total |
| Full Patent Applications | 7 | 7 | 7 | 7 | 28 |
| Provisional Patent Applications | 10 | 16 | 10 | 30 | 66 |
| Patents Issued | 2 | 6 | 7 | 11 | 26 |
| License Income | $1,176,827.69 | $75,162.99 | $1,149,705.55 | -$74,643,.49 | $2,327,052.74 |

Patent Application Summary Table

| **Inventors** | **Departments/ College(s)** | **Title** | **Brief description** |
|---|---|---|---|
| **Biomedical** | | | |
| Florin Despa | Molecular and Cellular Biochemistry, Medicine | Diagnosis of diabetes by detecting aggregated amylin in erythrocytes | Method of detecting of amylin in a subject's erythrocytes and related treatments. |
| Florin Despa | Molecular and Cellular Biochemistry, Medicine | Diagnosis of diabetes by detecting aggregated amylin in erythrocytes | Method of detecting of amylin in a subject's erythrocytes and related treatments. |
| Dongfang Wang, Joseph Zwischenberger | Surgery, Medicine | Percutaneous pulmonary artery drainage device | A device for heart catheterization, specifically for percutaneous left ventricular unloading during venoarterial extracorporeal membrane oxygenation. |
| Thomas Pittman, William Dillen | Neurosurgery, Medicine | Catheter systems and related methods | A catheter system that forms a closed reservoir useful for |

| Inventors | Departments/ College(s) | Title | Brief description |
|---|---|---|---|
| | | | accessing cerebrospinal fluid of a subject. |
| Matthew Gentry, Ramon Sun, Lyndsay Young | Molecular and Cellular Biochemistry, Medicine | Method of treating cancer with an elevated glycogen content | Cancer treatment targeting glycogen metabolism of cancer cells. |
| Haining Zhu | Molecular and Cellular Biochemistry, Medicine | Inducing production of full-length progranulin (GRN) from nucleotides including mutations containing a premature stop codon | A new therapy to treat and correct one of the causes of frontotemporal dementia (FTD). |
| Chang-Guo Zhan, Fang Zheng, Shuo Zhou, Ziyuan Zhou | Pharmaceutical Sciences, Pharmacy | Method of treating pain and/or inflammatory disorders using lapatinib | An opioid alternative pain treatment method involving administering an effective amount of Lapatinib or a pharmaceutically acceptable salt. |
| Jon Thorson, Jurgen Rohr, Markos Leggas, Joseph Eckenrode, Liu Yinan, Jianjun Zhang, Khaled Attia Shaaban Mahmoud | Pharmaceutical Sciences, Pharmacy | Mithramycin oxime and hydrazine derivatives having increased selectivity and anti-cancer activity | A treatment for cancer using derivates of mithramycin (MTM). |
| Arun Aneja, Lorenzo Deveza, Shea Comadoll, Boshen Liu | Orthopedic Surgery and Sports Medicine, Medicine | Antegrade retrograde recon femoral intramedullary nail system | An improved intramedullary nail configured for antegrade or retrograde |

| Inventors | Departments/ College(s) | Title | Brief description |
|---|---|---|---|
| | | | insertion into a femur in order to stabilize the femoral neck. |
| Janelle Molloy, Dennis Cheek, Quan Chen | Radiation Medicine, Medicine | Quality assurance for a medical accelerator | A quality assurance device adapted for calibrating and verifying proper operation of a medical accelerator. |
| Janelle Molloy, Dennis Cheek, Quan Chen | Radiation Medicine, Medicine | Quality assurance device with passive optical component and remote camera | A quality assurance device adapted for calibrating and verifying proper operation of a medical accelerator with remote camera. |
| **Engineering** | | | |
| Michael Winter, Helmut Koch | Mechanical Engineering, Engineering | Plasma generator including anode and cathode held within a containment housing | An encapsulated plasma generation system for use as a propulsion system for small satellites for deep space missions. |
| Thomas Robl, Robert Jewell, Anne Oberlink, Tristana Duvallet | CAER | Concrete repair coating | An innovative concrete repair coating with unique and beneficial qualities. |
| Ruben Sarabia-Riquelme | CAER | Continuous wet-spinning process for the fabrication of PEDOT:PSS fibers with high electrical conductivity, thermal | A novel process for wet-spinning of fibers for wearable electronics with unique properties and electrical and |

| Inventors | Departments/ College(s) | Title | Brief description |
|---|---|---|---|
| | | conductivity and Young's modulus | thermal conductivity. |
| Kunlei Liu, Heather Nikolic, Fan Zhen, Jesse Thompson, Amanda Warriner | CAER | Heat-integrated transformative carbon dioxide capture process | A novel apparatus and method for capturing carbon dioxide from an acid gas stream. |
| Logan Warriner, Daniel Pack | Chemical and Materials Engineering, Engineering | Biosynthesis of curcuminoids in mammalian cells | A method of making a curcuminoid in a mammalian cell by expressing one or more enzymes in a mammalian cell. |