FCR 18

Office of the President
September 15, 2023

Members, Board of Trustees:

PATENT ASSIGNMENT REPORT

Recommendation: that the Board of Trustees accept the patent assignment report for the period April 1, 2023 to June 30, 2023.

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.

Action taken: ☑ Approved ❑ Disapproved ❑ Other_____

PATENT ASSIGNMENTS
FOR THE PERIOD April 1, 2023 TO June 30, 2023

Patents

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

1. **U.S. Patent Application Number:** 18/296,616
UKRFID: 2667
Filed: April 6, 2023
Title: FUNCTIONALIZED MESOPOROUS SILICA NANOPARTICLES FOR TREATMENT OF PERIODONTAL DISEASE
Inventors: John Littleton (College of Arts and Sciences), Barbara Knutson, Stephen Rankin (College of Engineering), Luciana Shaddox (College of Dentistry) and Octavio Gonzalez (College of Medicine)
Description and Application: The invention consists of mesoporous silicon dioxide nanoparticles (MSNPs) functionalized to deliver chemotherapeutic compounds to treat periodontal disease, and potentially other inflammatory conditions. The particles have a high surface area and controlled pore diameter to enable delivery of a high payload of small molecule drugs. Periodontal disease is a common disease affecting nearly half of Americans at some point in their lives, and a greater fraction of the global population. The global market for therapeutics is expected to reach $1.1 billion by 2027. This invention provides a highly effective therapy reducing the likelihood of more invasive future treatments.
License: N/A

2. **U.S. Patent Application Number:** 18/133,385
UKRFID: 2350
Filed: April 11, 2023
Title: DEVICE FOR CHARACTERIZATION OF MATERIAL PROPERTIES UNDER REALISTIC PROCESS CONDITIONS
Inventors: Julius Schoop (College of Engineering)
Description and Application: This is a state-of-the-art, ultra-high-speed testbed to enable truly predictive modeling of the machining process, particularly under finish machining conditions where surface integrity becomes paramount. Thus, for the first time, it is now possible to fully characterize dynamic material behavior (stress/strain/temperature relationship) during the machining process.
License: N/A

3. **U.S. Patent Application Number:** 18/136,298
UKRFID: 2355
Filed: April 18, 2023
Title: LIPOSOMAL AZITHROMYCIN FOR IMMUNO-SUPPRESSION THERAPY
Inventors: David Feola, Vincent Venditto (College of Pharmacy), John Gensel (College of Medicine), Ahmed Abdel-Latif (formerly College of Medicine) and Ahmed Al-Darraji (formerly College of Pharmacy)
Description and Application: The invention is a drug formulation of liposomal azithromycin with anti-inflammatory properties capable of decreasing death associated with traumatic inflammatory conditions such as heart attacks, spinal cord injury and lung infection. Compared to other drugs in this class, liposomal azithromycin can inhibit inflammation that is the cause of secondary injury to the heart during heart attack and other conditions. Other drugs open arteries or thin blood to prevent future clots, but do not stop the inflammation that can cause pathology in the heart and other organs. The global cardiovascular drugs market size was $47 billion in 2018 and is projected to reach $64 billion by 2026, exhibiting a compound annual growth rate (CAGR) of 3.8%.
License: Negotiations in process with Cyrus Scientific, LLC.

4. **U.S. Patent Application Number:** 18/308,642
UKRFID: 2655
Filed: April 27, 2023
Title: CARBON FIBER DERIVED FROM PEDOT:PSS FIBER
Inventors: Matthew Weisenberger and Ruben Riquelme (Center for Applied Energy Research)
Description and Application: The invention consists of a novel method to convert PEDOT fiber to a carbon fiber using a direct carbonization method. The global carbon fiber market stood at $2 billion in 2021 and is projected to reach $4 billion by 2028.
License: N/A

5. **U.S. Patent Application Number:** 18/266,542
UKRFID: 2806
Filed: June 9, 2023
Title: COMPOSITIONS AND METHODS FOR PREVENTING, ATTENUATING, AND TREATING MEDICAL CONDITIONS WITH SHDL NANOPARTICLES
Inventors: Xiangan Li (College of Medicine), Anna Schwendeman, Hongliang He and Sang Yeop Kim (University of Michigan)
Description and Application: The invention relates to compositions of synthetic high density lipoprotein (sHDL) nanoparticles, methods for synthesizing such sHDL nanoparticles, as well as systems and methods utilizing such sHDL nanoparticles (e.g., in diagnostic and/or therapeutic settings). The invention provides compositions of sHDL nanoparticles to prevent, attenuate, and/or treat sepsis and sepsis-related disorders, conditions and symptoms caused by a viral infection (e.g., COVID-19), and conditions and symptoms caused by thrombosis.

The global nanomedicine market was valued at $174.13 billion in 2022 and is expected to grow at a CAGR of 11.6% from 2023 to 2030.
License: N/A

6. **U.S. Patent Application Number:** 18/268,575
UKRFID: 2517
Filed: June 20, 2023
Title: STRUCTURE-BASED DESIGN AND DISCOVERY OF A LONG-ACTING COCAINE HYDROLASE MUTANT WITH IMPROVED BINDING AFFINITY TO NEONATAL FC RECEPTOR FOR TREATMENT OF SUBSTANCE USE DISORDERS
Inventors: Chang-Guo Zhan and Fang Zheng (College of Pharmacy)
Description and Application: This invention is a set of novel administered pharmacotherapeutic enzyme candidates to treat cocaine abuse. The current invention modeled the Fc-fusion CocH binding with neonatal Fc receptor (FcRn) in order to prolong the biological half-life (to 9 days) and thus, decrease the required frequency of the enzyme administration to treat cocaine abuse. The global substance abuse treatment market was $10.2 billion in 2021 and is expected to grow at a CAGR of 8.5% from 2022 to 2031.
License: Licensed to Enzyme Therapy Inc. Option in negotiations with Clear Scientific Inc.

7. **U.S. Patent Application Number:** 18/213,054
UKRFID: 2677
Filed: June 22, 2023
Title: AN ELECTROCHEMICAL LITHIUM-ION SEPARATOR FOR END-OF-LIFE LITHIUM-ION BATTERY RECYCLING
Inventors: Kunlei Liu, Ayokunle Omosebi (Center for Applied Energy Research), Xin Gao (College of Engineering) and Aron Patrick (PPL Corporation)
Description and Application: This invention aims to purify Li^+ from H_2O leachate. This process uses an electrochemical Li^+-ion separator (ELIS), a flow electrolyzer equipped with a pair of electrochemically stable electrodes, separated by a cation exchange membrane. Due to the use of the cation-selective membrane, only Li^+ in the anolyte loop can pass through the membrane under the electrical field to balance the OH^- in the catholyte loop. Thus, the ELIS produces an LiOH salt. A pilot-scale design is also disclosed. The global lithium-ion battery recycling market was valued at $6.5 billion in 2022, projected to reach $35.1 billion by 2031, growing at a CAGR of 20.6% from 2022 to 2031.
License: N/A

8. **U.S. Patent Application Number:** 18/345,803
UKRFID: 2566
Filed: June 30, 2023
Title: A DEVICE FOR MEASURING PLATELET-FIBRIN CLOT CONTRACTION KINETICS
Inventors: Qingjun Wang, Sidney “Wally” Whiteheart (College of Medicine), Kanakanagavalli Prakhya (formerly College of Arts and Science) Ya Luo (Gliasoft)

Description and Application: This invention is a novel device (including the hardware, software and suggested assay conditions) that simultaneously assesses clot contraction kinetics in multiple samples using time-lapse photography and automated image processing. Clot contraction kinetics in multiple samples can then be analyzed. The global hemostasis market was valued at $535.7 million in 2021 with a CAGR of 12% from 2021 to 2028.
License: N/A

9. **International Application Number:** PCT/US2023/25340
UKRFID: 2686
Filed: June 14, 2023
Title: METHODS AND COMPOSITIONS OF INHIBITING DCN1-UBC12 INTERACTION
Inventors: Leah Kovalic, Tucker Moseley, R. Kip Guy and Kristen Begely (College of Pharmacy)
Description and Application: This invention works to develop a small molecule inhibitory agent to interact with defective in cullin neddylation protein (DCN-1) which has amplification effects leading to proliferation of squamous cells in carcinoma. Ideally, the developed small molecules would be formulated and applied to a variety of dysfunctions such as excessive squamous cell proliferation in carcinoma. The global cancer treatment market is valued at $166.5 billion in 2022 with a CAGR of 9.1% from 2022 to 2030.
License: N/A

10. **International Application Number:** PCT/US2023/68564
UKRFID: 2115
Filed: June 16, 2023
Title: VESICULAR MONOAMINE TRANSPORTER-2 LIGANDS AND THEIR USE IN THE TREATMENT OF PSYCHOSTIMULANT ABUSE
Inventors: Linda Dwoskin, R. Kip Guy, Jon Thorson, Jared Hammill, Stefan Kwiatkowski (College of Pharmacy), David Watt (College of Medicine), Markos Leggas, Peter Crooks, Guangrong Zheng, Justin Nickell, Na-Ra Lee, Derong Ding (formerly College of Pharmacy) and Zheng Cao (formerly College of Medicine)
Description and Application: The invention is a treatment for substance abuse disorder, drug dependence or abuse and withdrawal that includes administering N-phenylalkyl amphetamine and pharmaceutical compositions containing these compounds. The inventive small molecules are adept in the treatment of methamphetamine (meth) addiction. There are an estimated 15 million to 16 million meth users worldwide. With no current FDA-approved therapeutics, the current treatment of meth use disorder is behavioral therapy.
License: Option in negotiation with MUDRx Inc.

11. **Foreign Application Number:** EP21904459.1
UKRFID: 2806
Filed: June 28, 2023
Title: COMPOSITIONS AND METHODS FOR PREVENTING, ATTENUATING, AND TREATING MEDICAL CONDITIONS WITH SHDL NANOPARTICLES
Inventors: Xiangan Li (College of Medicine), Anna Schwendeman, Hongliang He and Sang Yeop Kim (University of Michigan)
Description and Application: The invention relates to compositions of synthetic high density lipoprotein (sHDL) nanoparticles, methods for synthesizing such sHDL nanoparticles, as well as systems and methods utilizing such sHDL nanoparticles (e.g., in diagnostic and/or therapeutic settings). The invention provides compositions of sHDL nanoparticles to prevent, attenuate, and/or treat sepsis and sepsis-related disorders, conditions and symptoms caused by a viral infection (e.g., COVID-19), and conditions and symptoms caused by thrombosis. The global nanomedicine market was valued at $174.13 billion in 2022 and is expected to grow at a CAGR of 11.6% from 2023 to 2030.
License: N/A

Patent Activities
Fiscal Year to Date as of June 30, 2023

Total FY2022-23					
	FY23Q1	FY23Q2	FY23Q3	FY23Q4	Total FY23
Invention Disclosures[i]	24	34	31[1]	25	114
Full Patent Applications[ii]	25[2]	15[3]	16	11	67
Provisional Patent Applications[iii]	24[4]	20	23	27	94
Patents Issued	8	6	12[5]	6	32
License Income	$317,370.67	$172,263.56	$103,698.50	$214,573.50	$807,906.23
New Licenses and Options Executed	7	5	14[6]	11	37
New UK Startups Formed	3	0	1	1	5

[1] Additional Disclosure added to Q3 to capture to capture filed provisional application.
[2] Captured additional patent filings from collaborative partner.
[3] Captured additional patent filings from collaborative partner.
[4] Added additional provisional filed by collaborative partner.
[5] Captured foreign patent issuance.
[6] Captured executed license agreement from our inter-institutional agreement partner.

Patent Activities
FY2021-22 as of June 30, 2022

Total FY2021-22					
	FY22Q1	FY22Q2	FY22Q3	FY22Q4	Total FY22
Invention Disclosures	13	20	25	33	91
Full Patent Applications	24	20	19	12	75
Provisional Patent Applications	18	21	13	16	68
Patents Issued	9	12	5	6	32
License Income	$925,684.76	$73,397.91	$204,789.15	$91,141.99	$1,295,013.81
New Licenses and Options Executed	8	2	10	10	30
New UK Startups Formed	0	1	2	1	4

Patent Application Summary Table

Inventors	College(s)	Title	Brief description
Biomedical			
David Feola, Vincent Venditto, John Gensel, Ahmed Abdel-Latif and Ahmed Al-Darraji	College of Pharmacy	Liposomal azithromycin for immuno-suppression therapy	A novel drug formulation with anti-inflammatory properties.
Xiangan Li, Anna Schwendeman, Hongliang He and Sang Yeop Kim	College of Medicine	Compositions and methods for preventing, attenuating, and treating medical conditions with sHDL nanoparticles	Novel compositions of synthetic HDL nanoparticle and methods utilizing sHDL nanoparticles to prevent, attenuate, and/or treat sepsis and sepsis-related disorders
Chang-Guo Zhan and Fang Zheng	College of Pharmacy	Structure-based design and discovery of a long-acting cocaine hydrolase mutant with improved binding affinity to neonatal Fc receptor for treatment of substance use disorders	Novel pharmacotherapeutic enzyme candidates for cocaine abuse treatment.

Inventors	College(s)	Title	Brief description
Xiangan Li, Anna Schwendeman, Hongliang He and Sang Yeop Kim	College of Medicine	Compositions and methods for preventing, attenuating, and treating medical conditions with sHDL nanoparticles	Novel compositions of synthetic HDL nanoparticle and methods utilizing sHDL nanoparticles to prevent, attenuate, and/or treat sepsis and sepsis-related disorders
Linda Dwoskin, R. Kip Guy, Jon Thorson, Jared Hammill, Stefan Kwiatkowski, David Watt, Markos Leggas, Peter Crooks, Guangrong Zheng, Justin Nickell, Na-Ra Lee, Derong Ding and Zheng Cao	College of Pharmacy, College of Medicine	Vesicular monoamine transporter-2 ligands and their use in the treatment of psychostimulant abuse	N-phenylalkyl amphetamine and pharmaceutical compositions containing these compounds to treat pschostimulant addiction.
Qingjun Wang, Sidney “Wally” Whiteheart, Kanakanagavalli Prakhya and Ya Luo	College of Medicine	A device for measuring platelet-fibrin clot contraction kinetics	A novel device to analyze clot contraction kinetics in multiple samples at one time.

Inventors	College(s)	Title	Brief description
Leah Kovalic, Tucker Moseley, R. Kip Guy and Kristen Begely	College of Pharmacy	Methods and compositions of inhibiting DCN1-UBC12 interaction	A novel composition and derivatives to inhibit DCN1-UBC12 interaction to stop proliferation of squamous cell carcinoma.
Engineering			
John Littleton, Barbara Knutson, Stephen Rankin, Luciana Shaddox and Octavio Gonzalez	College of Engineering	Functionalized mesoporous silica nanoparticles for treatment of periodontal disease	A method of using mesoporous silicon dioxide nanoparticles (MSNPs) to treat periodontal disease.
Julius Schoop	College of Engineering	Device for characterization of material properties under realistic process conditions	A novel testbed and predictive modeling process to characterize dynamic material behavior during the machining process.
Inventors	**College(s)**	**Title**	**Brief description**
Center of Applied Energy Research			
Matthew Weisenberger and Ruben Riquelme	Center for Applied Energy Research	Carbon fiber derived from PEDOT:PSS fiber	A novel method to convert PEDOT fiber to a carbon fiber using direct carbonization.

Inventors	College(s)	Title	Brief description
Kunlei Liu, Ayokunle Omosebi, Xin Gao and Aron Patrick	Center for Applied Energy Research	An electrochemical lithium-ion separator for end-of-life lithium-ion battery recycling	A novel method to purify Li+ from H2O leachate.

[i] Invention disclosures include new technologies and intellectual property disclosed to the Office of Technology Commercialization (OTC) that do not fall under an existing technology number. This number captures the potential new intellectual property disclosed to OTC.

[ii] Full patent applications, as used by OTC, include nonprovisional patent application filings at the United States Patent and Trademark Office (USPTO), Patent Cooperation Treaty filings, and foreign patent application filings. These are technologies that are assigned to the University of Kentucky that OTC has identified to invest further into in an effort to obtain patent protection and are described in more detail in the patent assignment section above.

[iii] Provisional patent applications are legal documents filed at the USPTO that establish a filing date and protect the owner from anticipated publication of the technology, but do not mature into an issued patent unless the applicant files a full patent application within one year. Although owned by the University of Kentucky, the provisional patent applications are not included in the patent assignment descriptions as they will not mature into full patent applications without further action and investment.