FCR 17

Office of the President
December 14, 2021

Members, Board of Trustees:

PATENT ASSIGNMENT REPORT

Recommendation: that the Board of Trustees accept the patent assignment report for the period April 1, 2021 to June 30, 2021.

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 July 1, 2021 TO September 30, 2021

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:** 17/420,659
UKRFID: 2209
Filed: July 2, 2021
Title: QUALITY ASSURANCE DEVICE FOR A MEDICAL ACCELERATOR
Inventors: Janelle Molloy (formerly College of Medicine), Dennis Cheek and Quan Chen (College of Medicine and Wild Dog Physics, LLC)
Description and Application: This is a quality assurance device adapted for calibrating and verifying the proper operation of a medical accelerator. The invention combines a novel phantom with a shell consisting of a scintillating material that converts X-ray radiation into visible light. This light is detected using 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: Option Agreement with Wild Dog Physics, LLC

2. **U.S. Patent Application Number:** 17/420,661
UKRFID: 2438
Filed: July 2, 2021
Title: QUALITY ASSURANCE DEVICE WITH PASSIVE OPTICAL COMPONENT AND REMOTE CAMERA
Inventors: Janelle Molloy (formerly College of Medicine), Dennis Cheek and Quan Chen (College of Medicine and Wild Dog Physics, LLC)
Description and Application: This is a quality assurance device adapted for calibrating and verifying the proper operation of a medical accelerator. The invention combines a novel phantom with a shell consisting of a scintillating material that converts X-ray radiation into visible light. This light is detected using 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: Option Agreement with Wild Dog Physics, LLC

3. **U.S. Patent Application Number:** 17/380,295
UKRFID: 2495
Filed: July 20, 2021
Title: APPARATUS AND METHOD FOR ENHANCED CAPACITIVE DEIONIZATION OF CONTAMINATED WATER
Inventors: Kunlei Liu, Xin Gao, Ayokunle Omosebi and James Landon (Center for Applied Energy)
Description and Application: This is an apparatus and method for enhancing the efficiency of the capacitive deionization of contaminated water. The novel apparatus includes a capacitive deionization reactor downstream from the contaminated water with a plurality of electrodes separated by a flow space for the contaminated water. A voltage source is connected to the plurality of electrodes and a flushing fluid source. The global market for water treatment is $145 billion with an expected compound annual growth rate (CAGR) of 2.3%.
License: N/A

4. **U.S. Patent Application Number:** 17/386,339
UKRFID: 2483
Filed: July 27, 2021
Title: METHODS OF INHIBITING PROCOLLAGEN-LYSINE, 2-OXOGLUTARATE 5-DIOXYGENASE 2
Inventors: Ren Xu and Shike Wang (College of Medicine)
Description and Application: This is a method of inhibiting the expression or activity of procollagen-lysine, 2-oxoglutarate 5-dioxygenases 2 (PLOD2) by administering a select compound to a subject. These select compounds include amiloride, azelastine, bazedoxifene acetate, gallic acid and gemcitabine. The overexpression of PLODs has been found to contribute to many collagen-related diseases, including a variety of cancers. Accordingly, PLOD2 appears to be a potential target for cancer therapy. The global oncology drug market is over $128 billion and is expected to reach $222 billion by 2027 at a 7.4% CAGR.
License: N/A

5. **U.S. Patent Application Number:** 17/393,210
UKRFID: 2516
Filed: August 3, 2021
Title: INHIBITION OF MICROSOMAL PROSTAGLANDIN E2 (PGE2) SYNTHASE-1 (MPGES-1)
Inventors: Chang-Guo Zhan, Fang Zheng (College of Pharmacy), Shuo Zhou (formerly College of Pharmacy) and Ziyuan Zhou (College of Pharmacy)
Description and Application: This is a method for inhibiting expression or activity of prostaglandin E2 (PGE_2) in a cell by introduction of a microsomal prostaglandin synthase 1 (mPGES1) inhibitor. The mPEG1 is selected from ceftriaxone, aztreonam, cefotetan, and pharmaceutically accepted salts thereof. These mPGES1 inhibitors are effective treatments for inflammation-related diseases including inflammatory pain, neuropathic pain, lupus and skin disorders. The mPGES1 inhibitors may also be an effective treatment for coronaviruses. mPGES1

inhibitors are more effective and safer treatments than non-steroidal anti-inflammatory drugs. The global market for inflammatory drugs is $191 billion with an expected CAGR over 6%.
License: N/A

6. **U.S. Patent Application Number:** 17/397,774
UKRFID: 2281
Filed: August 9, 2021
Title: APPARATUS AND METHOD FOR TRACE GAS DETECTION UTILIZING UNMANNED AERIAL VEHICLES
Inventors: Marcelo Guzman and Travis Schuyler (College of Arts and Sciences)
Description and Application: This is a novel gas detection system using multiple unmanned aerial vehicles (UAVs) each with an environmental sensor package. The sensor package is configured to detect the presence of methane, propane and butane. The UAVs can be used to detect leaks from gas pipes or in other embodiments to detect gas from natural features such as methane tundra bods. The global gas detection market is expected to reach $1.5 billion by 2024 at a CAGR of 5.7%.
License: N/A

7. **U.S. Patent Application Number:** 17/431,408
UKRFID: 2349
Filed: August 16, 2021
Title: N-ARYL BENZENESULFONAMIDES FOR USE IN TREATING CANCERS, BACTERIAL DISEASES, METABOLIC DISEASES, AND TRAUMATIC BRAIN INJURY
Inventors: David Watt (formerly College of Medicine), Roberto Gedaly, Brett Spear, Chunming Liu, Francesc Marti, Patrick Sullivan, Wen Zhang (College of Medicine) and Yang Yang-Hartwich (Yale University College of Medicine)
Description and Application: This is a cancer treatment using N-aryl benzenesulfonamides. The use of N-aryl benzenesulfonamides has been shown effective in mouse models of hepatocellular carcinoma and in vitro efficacy against traumatic brain injury, bacterial infections and metabolic syndrome. N-aryl benzenesulfonamides have lower toxicity and are cheaper to produce than other treatments. The market for this treatment is $290 billion globally and is expected to increase by low single digits until 2024.
License: N/A

8. **U.S. Patent Application Number:** 17/468,439
UKRFID: 2510
Filed: September 7, 2021
Title: CLINICAL ASSESSMENT OF CEREBRAL VASOSPASM RISK FOLLOWING ANEURYSMAL SUBARACHNOID HEMORRHAGE
Inventors: Wang-Xia Wang (College of Medicine)
Description and Application: This is a method for assessing the risk of cerebral vasospasm (CVS) following an aneurysmal subarachnoid hemorrhage (aSAH) by detecting micro ribonucleic acid (miRNA). CVS has long been considered the most devastating acute complication following aSAH and brain injury. Complications of CVS range from subtle to permanent neurological deficits and death. The method identifies patients with an elevated risk of CVS where there are elevated amounts of specific miRNAs relative to a control. The global market for neurological biomarkers is $5.5 billion with a projected CAGR of 14.5%.
License: N/A

9. **U.S. Patent Application Number:** 17/470,690
UKRFID: 2213
Filed: September 9, 2021
Title: A LOW-COST SELECTIVE PRECIPITATION CIRCUIT FOR RECOVERY OF RARE EARTH ELEMENTS FROM ACID LEACHATE OF COAL WASTE
Inventors: Rick Honaker (College of Engineering) and Wencai Zhang (formerly College of Engineering)
Description and Application: This is a method of separating rare earth elements from contaminants by manipulating the pH of an acidic liquid containing rare earth elements. The acidic liquid may be generated naturally from the acidification of coal and coal byproducts by the oxidation of contained pyrite and by contact with rain or groundwater. Natural sources include all sources of sufficient acidity as to contain rare earth elements from coal mining-derived sources. Thus, rare earth elements may be obtained from coarse coal refuse piles. The global market for rare earth elements is $5.3 billion and is expected to reach $9.6 billion by 2026.
License: N/A

10. **U.S. Patent Application Number:** 17/440,544
UKRFID: 2354
Filed: September 17, 2021
Title: MODIFIED PROSTATE APOPTOSIS RESPONSE-4 (PAR-4) POLYPEPTIDE, AND METHODS OF PRODUCTION AND USE
Inventors: Chan-Guo Zhan, Fang Zheng, Kyungbo Kim (College of Pharmacy) and Vivek Rangnekar (College of Medicine)
Description and Application: This is a modified form of the prostate apoptosis response-4 protein (Par-4), which promotes cell death in cancer cells, but not healthy cells. By modifying the original Par-4 peptide, the novel modification (Par-4EX) has a half-life that is approximately seven times longer than Par-4. This

allows for greater potency and in vivo efficiency in a mouse model of metastatic breast cancer. The total global oncology market is valued at $122 billion with an expected 10% growth annually. Breast and pancreatic cancer have global markets of $16.2 billion and $2 billion respectively.
License: N/A

11. **U.S. Patent Application Number:** 17/480,320
UKRFID: 2509
Filed: September 29, 2021
Title: FORMULATION AND METHOD FOR SPRAY-DRYING D-TAGATOSE
Inventors: Patrick Marsac and Heather Campbell (formerly College of Pharmacy)
Description and Application: This is a D-tagatose spray-drying feed formulation with a mixture of D-tagatose and a functional polymer excipient co-dissolved in a solvent to produce a composite with a glass transition temperature of greater than 30°C. The composite is then atomized in a drying chamber containing a hot inert processing gas and the droplets evaporate to produce solid particles of D-tagatose. D-tagatose has been shown to be a safe and efficacious treatment for type 2 diabetes. Specifically, D-tagatose has been shown to lower fasting food glucose levels and total cholesterol. D-tagatose may provide the desired sweet taste while avoiding the issues associated with more bioavailable sugars. The global food sweetener market was approximately $86 billion in 2020 and is expected to grow at a CAGR of 2.5% until 2026.
License: N/A

12. **U.S. Patent Application Number:** 17/481,799
UKRFID: 1311
Filed: September 22, 2021
Title: ALTERATION OF TOBACCO ALKALOID CONTENT THROUGH MODIFICATION OF SPECIFIC CYTOCHROME P450 GENES
Inventors: Ralph Dewey (Crop and Soil Sciences North Carolina State University), Balazs Siminszky (formerly College of Agriculture, Food and Environment), Steven Bowen (North Carolina State University) and Lily Gavilano (formerly College of Agriculture, Food and Environment)
Description and Application: This is a method for reducing the nornicotine content in plants that are members of the genus *Nicotiana* by suppressing the expression of a cytochrome P450. An expression cassette with an inhibitory sequence that targets the expression or function of a cytochrome P450 polypeptide is introduced into the plant. When harvested, the leaf or stem tissues of these plants can be used to produce tobacco products with reduced levels of nornicotine, thus reducing the carcinogenic potential. The global tobacco market was $932 billion in 2020 and will have a CAGR of 1.8% until 2028.
License: Exclusive License with Philip Morris Products S.A.

13. **International Application Number:** PCT/US2021/43147
UKRFID: 2493
Filed: July 26, 2021
Title: METHOD OF MULTI-STAGE FRACTURING OF SUBTERRANEAN FORMATION AND SLURRY FOR THAT METHOD
Inventors: Thomas Robl, Robert Jewell, Anne Oberlink and Tristana Duvallet (Center for Applied Energy Research)
Description and Application: This is a method of hydraulic fracturing a subterranean formation by injecting a first proppant made from coal combustion fly ash particles with a mean particle size of 6 to 8 microns. The method may also include injection of a second proppant made from coal combustion fly ash particles with a mean particle size of 25-35 µm. A third fly ash derived proppant, with a mean particle size of 70 to 80 µm, may also be used. The global proppant market is estimated to reach $7.8 billion by 2020 and is expected to reach $12.1 billion by 2025.
License: N/A

14. **International Application Number:** PCT/US2021/43774
UKRFID: 2488
Filed: July 29, 2021
Title: ACCELERATING REPAIR OF MUCOSAL INJURY USING GOLD(III) COMPOUNDS
Inventors: Samuel Awuah (College of Arts and Sciences) and Terrence Barrett (College of Medicine)
Description and Application: This is a method for treating inflammatory bowel syndrome disease (IBD) and coronavirus induced enteritis by increasing mitochondrial respiration in a cell. Mitochondrial respiration is increased by administering a novel gold(III) compound to a subject. IBD is a chronic illness that is estimated to affect more than 3.1 million patients in the United States. IBD requires costly lifelong medical therapy and frequently results in hospitalization, surgery and disability. The global market for IBD treatment was $13 billion in 2020 and is expected to reach $15 billion by 2027, with a CAGR of 2.3%.
License: N/A

15. **International Application Number:** PCT/US2021/43766
UKRFID: 2490
Filed: July 29, 2021
Title: GOLD(III) COMPOUNDS AND CANCER CELL-SELECTIVE MODULATION OF MITOCHONDRIAL RESPIRATION AND METABOLISM
Inventors: Samuel Awuah and Randall Mertens (College of Arts and Sciences)
Description and Application: These novel gold(III) compounds are used to treat cancer by perturbing mitochondrial metabolism. The novel compounds induce mitochondrial stress regardless of tumor type and are selective for cancer cells compared to normal cells. The oncology drug market was $128 billion in 2019 and is projected to reach $222 billion by 2027, registering a CAGR of 7.4%.
License: N/A

16. **International Application Number:** PCT/US2021/47599
UKRFID: 2514
Filed: August 25, 2021
Title: GENERATION OF HYDROGEN BY THERMAL HYDROLYSIS OF SODIUM BOROHYDRIDES
Inventors: Hyun-Tae Hwang and Geo-Jong Kim (College of Engineering)
Description and Application: This is a method of generating hydrogen by heating a mixture of sodium borohydride and a water storage agent (that is stable below 60°C) to a temperature range between 80°C and 300°C to release water from the water storage agent and generate hydrogen. This novel method of hydrogen generation by thermal hydrolysis of sodium borohydride uses solid-state reactants to obtain high hydrogen yield at temperatures below 150°C, as well as providing rapid kinetics without the use of a catalyst. The global market for hydrogen generation is $142 billion and is expected to grow with a CAGR of 8%.
License: N/A

17. **International Application Number:** PCT/US2021/52719
UKRFID: 2492
Filed: August 29, 2021
Title: MULTI-COORDINATE GOLD-PHOSPHINE COMPOUNDS
Inventors: Samuel Awuah and Jong Hyun Kim (College of Arts and Sciences)
Description and Application: These novel gold-phosphine compounds are used to treat cancer by specific inhibition or uncoupling of mitochondrial respiration. In addition, the novel compounds can target distinct mitochondrial dynamics, such as mitochondrial structure to exert profound antitumor effects. These compounds are stable toward biological thiols and demonstrate enhanced mitochondrial oxygen consumption rates and induce proton leaking in aggressive cancer cells. The oncology drug market was $128 billion in 2019 and is projected to reach $222 billion by 2027, registering a CAGR of 7.4%.
License: N/A

18. **Foreign Application Number:** CA 3,125,971
UKRFID: 2438
Filed: July 7, 2021
Title: QUALITY ASSURANCE DEVICE WITH PASSIVE OPTICAL COMPONENT AND REMOTE CAMERA
Inventors: Janelle Molloy (formerly College of Medicine), Dennis Cheek and Quan Chen (College of Medicine and Wild Dog Physics, LLC)
Description and Application: This is a quality assurance device adapted for calibrating and verifying the proper operation of a medical accelerator. The invention combines a novel phantom with 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: Option Agreement with Wild Dog Physics, LLC

19. **Foreign Application Number:** EU19909293.3
UKRFID: 2438
Filed: July 7, 2021
Title: QUALITY ASSURANCE DEVICE WITH PASSIVE OPTICAL COMPONENT AND REMOTE CAMERA
Inventors: Janelle Molloy (formerly College of Medicine), Dennis Cheek and Quan Chen (College of Medicine and Wild Dog Physics, LLC)
Description and Application: This is a quality assurance device adapted for calibrating and verifying the proper operation of a medical accelerator. The invention combines a novel phantom with 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: Option Agreement with Wild Dog Physics, LLC

20. **Foreign Application Number:** IN202117034245
UKRFID: 2438
Filed: July 29, 2021
Title: QUALITY ASSURANCE DEVICE WITH PASSIVE OPTICAL COMPONENT AND REMOTE CAMERA
Inventors: Janelle Molloy (formerly College of Medicine), Dennis Cheek and Quan Chen (College of Medicine and Wild Dog Physics, LLC)
Description and Application: This is a quality assurance device adapted for calibrating and verifying the proper operation of a medical accelerator. The invention combines a novel phantom with 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: Option Agreement with Wild Dog Physics, LLC

21. **Foreign Application Number:** EU20714405.6
UKRFID: 2241
Filed: August 11, 2021
Title: MULTIVALENT LIVE-ATTENUATED INFLUENZA VACCINE FOR PREVENTION AND CONTROL OF EQUINE INFLUENZA VIRUS (EIV) IN HORSES
Inventors: Thomas Chambers (College of Agriculture, Food and Environment), Luis Martinez-Sobrido (formerly University of Rochester) and Kendall King (Zoetis Inc.)
Description and Application: This is a novel multivalent immunological composition with at least two equine live-attenuated influenza viruses (LAIV). The first LAIV expresses one or more antigens of a clade 1 H3N8 equine influenza virus. The second LAIV expresses one or more antigens of a clade 2 H3N8 equine influenza virus. The second LAIV expresses hemagglutinin (HA), neurominidase (NA), or a combination of A/equine/Lancashire/1/2016 H3N8, A/equine/Ohio/1/2013 H3N8, or A/equine/Texas/6/2017 H3N8. It is currently estimated that H3N8 equine influenza outbreaks result in economic losses of hundreds of millions of dollars.
License: Option with Zoetis, Inc.

22. **Foreign Application Number:** AU2021232790
UKRFID: 1935
Filed: September 16, 2021
Title: COMPOSITIONS AND METHODS FOR TREATING RETINAL DEGRADATION
Inventors: Jayakrishna Ambati, Kameshwari Ambati and Benjamin Fowler (formerly College of Medicine)
Description and Application: These are methods to treat degradation of the retinal pigment epithelium (RPE) by administering compositions with a nucleoside and/or a nucleoside reverse transcriptase inhibitor (NRTI). Geographic atrophy, an advanced form of age-related macular degeneration, causes blindness in millions of people worldwide. There are no approved treatments, and it results from the death of RPE cells. The inventive treatment to reduce RPE cell death includes: 1) inhibiting inflammasome activation 2) reducing the permeability of a cell 3) reducing the amount of mitochondrial reactive oxygen species in the cell and/or 4) inhibiting activation of at least one inflammasome in a subject's eye. The global pharmaceutical market for age-related macular degeneration was $8.6 billion in 2018 and is expected to reach $18.7 billion in 2028.
License: Exclusive license with Inflammasome Therapeutics, Inc.

Patent Activities
Fiscal year to date as of September 30, 2021

Total FY2021-22					
	FY22Q1	FY22Q2	FY22Q3	FY22Q4	Total FY22
Invention Disclosures[i]	13	0	0	0	13
Full Patent Applications[ii]	22	0	0	0	22
Provisional Patent Applications[iii]	18	0	0	0	18
Patents Issued	9	0	0	0	9
License Income[iv]	$925,684.76	$0	$0	$0	$925,684.76
New Licenses & Options Executed	8	0	0	0	8
New UK Startups Formed	0	0	0	0	0

Patent Activities
FY2020-21 as of June 30, 2021

Total FY2020-21					
	FY21Q1	FY21Q2	FY21Q3	FY21Q4	Total FY21
Invention Disclosures[i]	26	28	25	30	99
Full Patent Applications[ii]	23	16	22	16	77
Provisional Patent Applications[iii]	26	17	19	18	80
Patents Issued	8	8	4	2	22
License Income[v]	$810,900.86	$209,591.78	$1,250,404.62	$81,934.69	$2,352,831.95
New Licenses & Options Executed	6	3	11	7	27
New UK Startups Formed	0	0	5	1	6

Patent Application Summary Table

Inventors	College(s)	Title	Brief description
Biomedical			
Janelle Molloy, Dennis Cheek and Quan Chen	College of Medicine	Quality assurance device for a medical accelerator	A quality assurance device for calibrating and verifying proper operation of a medical accelerator.
Janelle Molloy, Dennis Cheek and Quan Chen	College of Medicine	Quality Assurance Device with Passive Optical Component and Remote Camera	A quality assurance device for calibrating and verifying proper operation of a medical accelerator.
Ren Xu and Shike Wang	College of Medicine	Methods of inhibiting procollagen-lysine, 2-oxoglutarate 5-dioxygenase 2	A method of inhibiting the expression or activity of procollagen-lysine, 2-oxoglutarate 5-dioxygenases 2 (PLOD2) by administering a select compound into a subject.
Chang-Guo Zhan, Fang Zheng, Shuo Zhou and Ziyuan Zhou	College of Pharmacy	Inhibition of microsomal prostaglandin E2 (PGE2) synthase-1 (mPGES-1)	A method for inhibiting expression or activity of prostaglandin E2 (PGE_2) in a cell by introduction of a microsomal prostaglandin synthase 1 (mPGES1) inhibitor.

Inventors	College(s)	Title	Brief description
David Watt, Roberto Gedaly, Brett Spear, Chunming Liu, Francesc Marti, Patrick Sullivan, Wen Zhang and Yang Yang-Hartwich	College of Medicine	N-aryl benzenesulfonamides for use in treating cancers, bacterial diseases, metabolic diseases, and traumatic brain injury	A cancer treatment using N-aryl benzenesulfonamides; specifically, treatment of hepatocellular carcinoma.
Wang-Xia Wang	College of Medicine	Clinical assessment of cerebral vasospasm risk following aneurysmal subarachnoid hemorrhage	A method for assessing the risk of cerebral vasospasm (CVS) following an aneurysmal subarachnoid hemorrhage (aSAH) by detecting micro ribonucleic acid (miRNA).
Chan-Guo Zhan, Fang Zheng, Kyungbo Kim and Vivek Rangnekar	College of Pharmacy College of Medicine	Modified prostate apoptosis response-4 (PAR-4) polypeptide, and methods of production and use	A modified form of the prostate apoptosis response-4 protein (Par-4), which promotes cell death in cancer cells, but not healthy cells.

Inventors	College(s)	Title	Brief description
Patrick Marsac and Heather Campbell	College of Pharmacy	Formulation and method for spray-drying D-tagatose	A D-tagatose spray-drying feed formulation with a mixture of D-tagatose and a functional polymer excipient co-dissolved in a solvent to produce a composite with a glass transition temperature of greater than 30°C.
Samuel Awuah and Terrence Barrett	College of Medicine College of Arts and Sciences	Accelerating repair of mucosal injury using gold(III) compounds	A method for treating inflammatory bowel syndrome disease (IBD) and coronavirus induced enteritis by increasing mitochondrial respiration in a cell.
Janelle Molloy, Dennis Cheek and Quan Chen	College of Medicine	Quality Assurance Device with Passive Optical Component and Remote Camera	A quality assurance device for calibrating and verifying proper operation of a medical accelerator.
Janelle Molloy, Dennis Cheek and Quan Chen	College of Medicine	Quality Assurance Device with Passive Optical Component and Remote Camera	A quality assurance device for calibrating and verifying proper operation of a medical accelerator.
Janelle Molloy, Dennis Cheek and Quan Chen	College of Medicine	Quality Assurance Device with Passive Optical Component and Remote Camera	A quality assurance device for calibrating and verifying proper operation of a medical accelerator.

Inventors	College(s)	Title	Brief description
Jayakrishna Ambati, Kameshwari Ambati and Benjamin Fowler	College of Medicine	Composition and methods for treating retinal degradation	Methods for treating degradation of the retinal pigment epithelium (RPE) by administering compositions with a nucleoside and/or a nucleoside reverse transcriptase inhibitor (NRTI).
Engineering			
Kunlei Liu, Xin Gao, Ayokunle Omosebi and James Landon	CAER	Apparatus and method for enhanced capacitive deionization of contaminated water	An apparatus and method for enhancing the efficiency of the capacitive deionization of contaminated water.
Rick Honaker and Wencai Zhang	College of Engineering	A low-cost selective precipitation circuit for recovery of rare earth elements from acid leachate of coal waste	A method of separating rare earth elements from contaminants by manipulating the pH of an acidic liquid containing rare earth elements.
Thomas Robl, Robert Jewell, Anne Oberlink and Tristana Duvallet	CAER	Method of multi-stage fracturing of subterranean formation and slurry for the method	A method of hydraulic fracturing by injecting a first proppant made from coal combustion fly ash particles with a mean particle size of 6 to 8 microns.

Inventors	College(s)	Title	Brief description
Hyun-Tae Hwang and Geo-Jong Kim	College of Engineering	Generation of hydrogen by thermal hydrolysis of sodium borohydrides	A method of generating hydrogen by heating a mixture of sodium borohydride and a water storage agent that is stable below 60°C, to between 80°C and 300°C to release water from the water storage agent and generate hydrogen.
Agriculture, Food and Environment			
Ralph Dewey, Balazs Siminszky, Steven Bowen and Lily Gavilano	College of Agriculture, Food and Environment	Alteration of tobacco alkaloid content through modification of specific cytochrome P450 genes	A method for reducing the nornicotine content in plants that are members of the genus *Nicotiana* by suppressing expression of a cytochrome P450.
Thomas Chambers, Luis Martinez-Sobrido and Kendall King	College of Agriculture, Food and Environment	Multivalent live-attenuated influenza vaccine for prevention and control of equine influenza virus (EIV) in horses	A novel multivalent immunological composition with at least two equine live-attenuated influenza viruses (LAIV).
Arts and Sciences			
Marcelo Guzman and Travis Schuyler	College of Arts and Sciences	Apparatus and method for trace gas detection utilizing unmanned aerial vehicles	A novel gas detection system using multiple unmanned aerial vehicles (UAVs) each with an environmental sensor package.

Inventors	College(s)	Title	Brief description
Samuel Awuah and Randall Mertens	College of Arts and Sciences	Gold(III) Compounds and cancer cell-selective modulation of mitochondrial respiration and metabolism	Novel gold(III) compounds to treat cancer by perturbing mitochondrial metabolism.
Samuel Awuah and Jong Hyun Kim	College of Arts and Sciences	Multi-coordinate gold-phosphine compounds	Novel gold-phosphine compounds to treat cancer by specific inhibition or uncoupling activity of mitochondrial respiration.

[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 the 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.

[iv] In Q1 an additional $200,000.00 was received from a license to 22nd Century managed by the College of Agriculture, Food and Environment on behalf of the Office of Technology Commercialization.

[v] In Q2 an additional $300,000.00 was received from a license to 22nd Century managed by the College of Agriculture, Food and Environment on behalf of the Office of Technology Commercialization.