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A Message from the Director

In the past year, we all faced many challenges and opportunities. Although moving to a virtual meeting, our two-day annual research symposium was successful with two keynote speakers and 8 project, 3 core and 28 abstract presentations. Several new faculty members were recruited to participating colleges and institutions. We continue to strengthen our COVID-19 research by awarding new research grants and recruiting additional faculty with expertise in coronavirus. Our center members received new grants totaling over \$24 million and published 149 papers. I congratulate all OCRID members for their achievements in this challenging time.

Lin Liu, Ph.D., FAPS
OCRID Director

New OCRID Projects

After receiving 13 highly competitive applications for OCRID projects from this years Call for Proposals, they were submitted to both the External Advisory Committee and Internal Review Committee for review. From these, two continuing projects and two new projects were selected for 2-year full research project support. Along with an ongoing project, OCRID is now supporting five full research projects. Additionally, three projects were selected for 1-year pilot project grants. **Congratulations!**

Research Projects

- **Inflammatory monocyte-macrophages in age-related susceptibility to SARS-CoV-2 infection**—**Rudragouda Channappanavar**, DVM, Ph.D, Assistant Professor, The Department of Veterinary Pathobiology, College of Veterinary Medicine, Oklahoma State University. (New). Mentors: Drs. Susan Kovats and Lin Liu.
- **Understanding the Mechanism of Immune Dysfunction in a Cystic Fibrosis Murine Model During Non-tuberculous Mycobacterial Infection**—**Yong Cheng**, Ph.D, Assistant Professor, The Department of Biochemistry and Molecular Biology, The Ferguson College of Agriculture, Oklahoma State University. (New). Mentors: Drs. Mark Coggeshall and Lin Liu.
- **The Role of Glucose Homeostasis During Influenza Infection**—**Veronique Lacombe**, DVM, Ph.D, Professor, The Department of Physiological Sciences, The College of Veterinary Medicine, Oklahoma State University. (Continuing). Mentors: Drs. Gillian Air, Clint Jones and Bob Welliver.
- **Two pathways for calcium signaling & virulence regulation in P. aeruginosa**—**Marianna Patrauchan**, Ph.D, Professor, The Department of Microbiology and Molecular Genetics, College of Arts and Sciences, Oklahoma State University. (Continuing). Mentors: Drs. Tyrrell Conway, Michael Franklin and Jordan Metcalf.
- **Validation of a naturally-occurring animal model for SARS-CoV-2 infection**—**Craig Miller**, DVM, PhD, Assistant Professor, The Department of Veterinary Pathobiology, The College of Veterinary Medicine, Oklahoma State University. (Ongoing). Mentors: Drs. Clint Jones and Jordan Metcalf.

Pilot Projects

- **Molecular Components of the two heme uptake pathways of mycobacterium tuberculosis**—**Avishek Mitra**, Ph.D., Assistant Professor, The Department of Microbiology and Molecular Genetics, College of Arts and Sciences, Oklahoma State University (Relinquished due to receiving funding from another source)
- **Drug Targeting of Oxysterol-Binding Protein (OSBP) for Respiratory Viral Infections**—**Anthony W.G. Burgett**, Ph.D., Associate Professor, The Department of Pharmaceutical Sciences, The College of Pharmacy, The University of Oklahoma Health Science Center
- **Pathogenesis of SARS-CoV-2 and Klebsiella Pneumoniae coinfection**—**Sunil More**, DVM, Ph.D, Assistant Professor, The Department of Veterinary Pathobiology, The College of Veterinary Medicine, Oklahoma State University

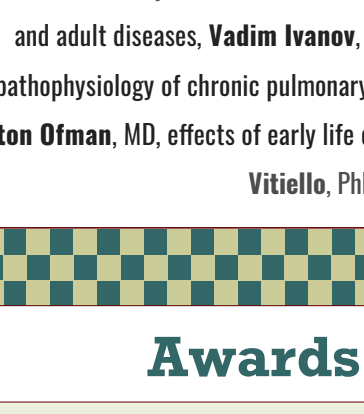
New OCRID Website Live Now!

The OCRID website has been moved over to the OMNI server. It has been updated and revamped. Click above to check out the new site.

*If you reach the old website by mistake please clear your internet browsing history and try again.

New OCRID Faculty

Over the past years, OCRID gained some talent in the form of new faculty member recruitments at participating colleges and institutions. In this issue, we highlighted two of them, Dr. Rudra Channappanavar, DVM, Ph.D., and Dr. Xufang Deng, Ph.D. who were hired into the College of Veterinary Medicine at Oklahoma State University in the past year. We hope you will join us in welcoming them on-board and to Oklahoma. Below is a brief introduction to both of our new members.



Xufang Deng—Dr. Deng grew up in a small village in the southwestern part of China and then lived in Chicago for nearly ten years. He received his Ph.D. in Veterinary Virology in 2011 from the Chinese Academy of Agricultural Sciences in Beijing, China and his master's in Bioinformatics in 2021 from Loyola University Chicago in Chicago, Illinois.

It was the facilities, resources, collaborative environment, and especially the support to junior faculty provided by OCRID, CVM, and the greater OSU family that led to Dr. Deng's decision to move here. As he arrived in the summer he was hit by heat! However, he feels Oklahoma is a beautiful state and that Stillwater is an ideal place to work and live. In his spare time, he enjoys playing with his kids, reading, music, soccer and taking road trips.

Dr. Deng's research interests mainly focus on understanding how coronaviruses infect hosts and cause diseases, specifically investigating what and how viral and host components dictate coronaviral infections and pathogenesis in different organs. We are looking forward to seeing his work in the future.

Rudragouda Channappanavar—Dr. Channappanavar grew up in the Indian state of Karnataka in a large farming family. He is a veterinarian with a master's degree in Veterinary Pathology and obtained his Ph.D. in Biological Sciences (viral immunology) from Oakland University in Michigan.



It was the excellent research environment at OCRID, College of Veterinary Medicine, and Oklahoma State University in general that drew him to Oklahoma. Being a veterinarian and having grown up in a farming family made it an easy decision to move to Oklahoma when there was an opportunity. He was struck by the peaceful rural community of Stillwater and it reminded him of his rural upbringing. He enjoys spending time with his 2-year-old daughter Gauri, occasionally going on a drive, and watching American football and cricket.

He is an Iowa Hawkeye fan, and slowly we are winning him over to the OSU Cowboys as well.

He is a passionate researcher, and his work is dedicated to improving the health of people and animals by understanding the basis for severe respiratory infections and developing agents to improve the health and well-being. He is currently focusing on the basis for severe disease caused by human coronavirus infections in young and aged hosts. Additionally, he is looking into identifying and evaluating effective antivirals and vaccines to coronavirus infections.

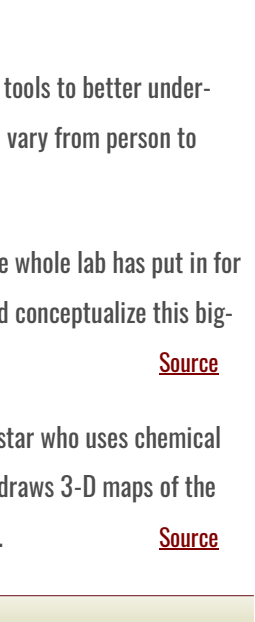
Additional new faculty with research interests in respiratory and infectious diseases were hired by participating colleges and institutions and joined OCRID recently. Drs. **Yong Cheng, PhD** and **Avi Mitra, PhD** were recruited as assistant professor to Department of Biochemistry and Molecular Biology at the Ferguson College of Agriculture, OSU and Department of Microbiology and Molecular Genetics, College of Arts and Sciences, OSU. Dr. Cheng's research focuses on understanding the molecular and cellular mechanisms of the host-pathogen interactions during mycobacterial infections and Dr. Mitra's research focus on two pathogens that are causative agents of human respiratory diseases, namely Mycobacterium tuberculosis and Pseudomonas aeruginosa. Dr. **Trent Triplett, MD** with research expertise on lung development and lung injury/repair was recruited to OU-HSC to serve as Section Chief of Neonatal-Perinatal Medicine in the Department of Pediatrics. He reached out to OCRID for collaborative opportunities to bridge lung infections with pregnancy and newborn research. As a result, 5 clinicians/scientists from his division joined OCRID. These faculty and their research interests are: **Ahrajit Ganguly, MD**, fetal origins of juvenile and adult diseases, **Vadim Ivanov, MD**, meconium aspiration and neonatal-perinatal medicine, **Marjorie Makoni, MD**, pathophysiology of chronic pulmonary hypertension in infants and racial and health disparities in premature babies, **Gaston Ofman, MD**, effects of early life environmental, nutritional and clinical exposures to long term human diseases, **Peter Vitello, PhD**, bronchopulmonary dysplasia (BPD) and Friedrich's Ataxia.

Awards and Special Recognition

During the past year, OCRID members were distinguished with awards for outstanding achievements, obtained grants to further their research, and received special recognition for being exceptional examples in their fields.

OCRID Project Leader, Dr. Marianna Patrauchan in collaboration with OCRID Project Leader (2014-2015), Dr. Erika Lutter has received an R15 grant from the NIGMS. Drs. Patrauchan and Lutter both are in the Department of Microbiology and Molecular Genetics, College of Arts and Sciences at OSU.

The grant is entitled: *Calcium signaling controls Pseudomonas aeruginosa invasion and adaptation to the host intracellular environment.*

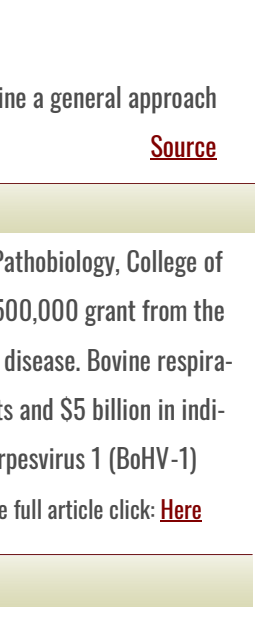


Dr. Patrauchan is seeking to understand the mechanisms of biofilm formation, and to also learn the regulatory circuits coordinating Pseudomonas aeruginosa's internalization and replication within host cells by studying the primary intracellular messenger in eukaryotic cells, Calcium (Ca²⁺).

Dr. Patrauchan believes identifying the molecular mechanisms of P. aeruginosa internalization is imperative for the development of efficient strategies to control the pathogen's devastating infections.

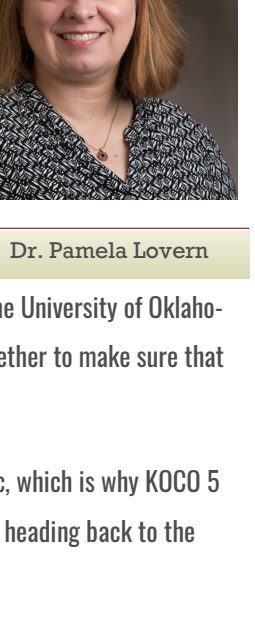
Dr. Marianna Patrauchan

Congratulations to Dr. Craig Miller, OCRID Project Leader from the Department of Veterinary Pathobiology, College of the Veterinary Medicine, Oklahoma State University, and his team to publish the COVID-19 animal model. The paper entitled "Clinical and Histopathologic Features of a Feline SARS-CoV-2 Infection Model Are Analogous to Acute COVID-19 in Humans" can be accessed [here](#). This animal model provides an unique tool for therapeutic and vaccine development in fighting the pandemic as the model mimics human acute COVID-19. His research on COVID-19 is supported by the OCRID full research project program.



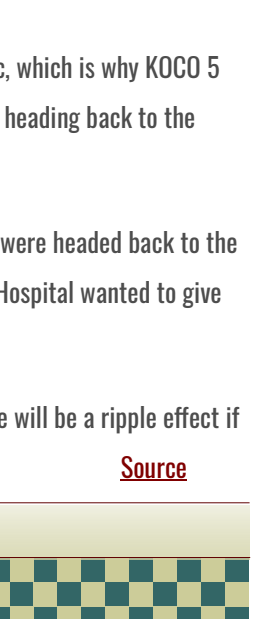
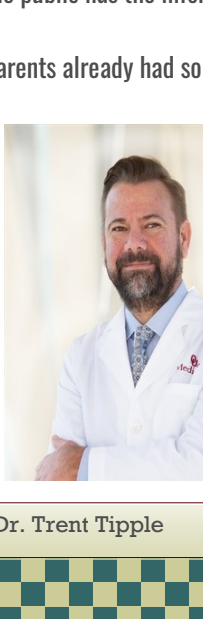
Dr. Craig Miller

Congratulations to Dr. Yong Cheng, OCRID Project Leader from the Department of Biochemistry and Molecular Biology, The Ferguson College of Agriculture, Oklahoma State University. Dr. Cheng's OCAST proposal: *WNK4-mediated Exosome Biogenesis Inhibits Cystic Fibrosis Macrophage Death during Nontuberculous Mycobacterial Infection*, was approved and funded. It was also ranked 2nd out of 147 proposals.

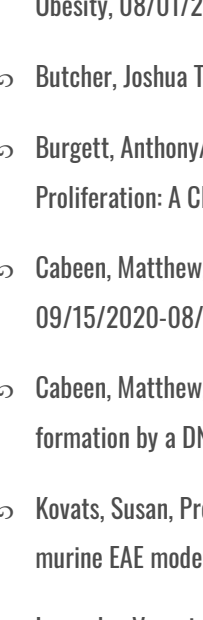


Dr. Yong Cheng

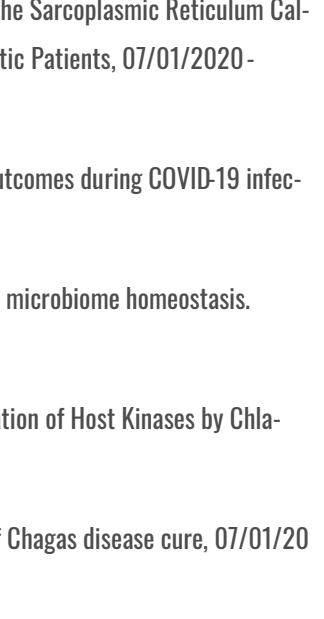
Congratulations to Drs. Veronique Lacombe, OCRID Project Leader from the Department of Physiological Sciences, College of Veterinary Medicine, Oklahoma State University, and Timothy Snider, OCRID Center Investigator from the Department of Veterinary Pathobiology, College of Veterinary Medicine, Oklahoma State University, who were both recognized by the American Veterinary Medical Association. Dr. Lacombe was awarded the Zoetis Award for Veterinary Research Excellence. Dr. Snider, a pathologist in the Immunopathology Core was awarded the Zoetis Distinguished Veterinary Teacher Award.



Dr. Anthony Burgett, OCRID Pilot Project Leader 2019-2020 and 2021-2022, from the Department of Pharmaceutical Sciences, College of Pharmacy, the University of Oklahoma Health Sciences Center, and Dr. Earl Blewett, OCRID Pilot Project Leader 2019-2020 from the Department of Biochemistry and Microbiology, Oklahoma State University Center for Health Sciences, have obtained an R01 entitled: Cellular Mechanism of Oxysterol-Binding Protein (OSBP) in Viral Proliferation: A Chemical Biology Approach. The NIH NIAID R01 funded project is to determine the role of oxysterol-binding protein (OSBP) in RNA viral proliferation, including through the use of OSBP-targeting compounds.



Drs. Burgett and Blewett's published results show that targeting OSBP with their compounds inhibits the proliferation of many different types of RNA pathogenic viruses in cells. This grant will allow for them to understand why RNA viruses need the human OSBP protein to proliferate and how targeting OSBP with small molecule compounds limits the viral proliferation. This is a basic science project that will form the basis for developing new, broad-spectrum antiviral drugs through targeting OSBP.

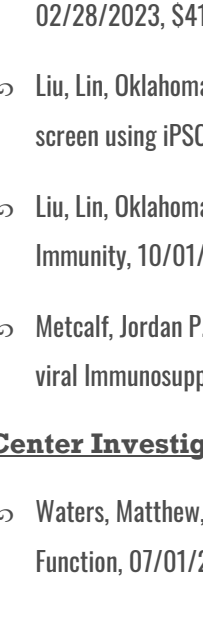


This funded R01 project, which is a collaborative project between the Burgett research group (OUHSC) and the Blewett research group (OSU-CHS), was built upon an award amount in research supported by a 2019-2020 OCRID Pilot research grant. The total R01 award amount is over 2 million.

Dr. Earl Blewett

Dr. Anthony Burgett

Congratulations to Dr. Matthew Cabeen, OCRID Pilot Project Leader 2019-2020 from the Department of Microbiology and Molecular Genetics, College of Arts and Sciences, Oklahoma State University, for obtaining a R35 Outstanding Investigator Award, or MIRA (Maximizing Investigators' Research Award). The 5 year award is for \$1.7 mil and is entitled: *Stress sensing and processing by bacterial cytoplasmic megacomplexes*.

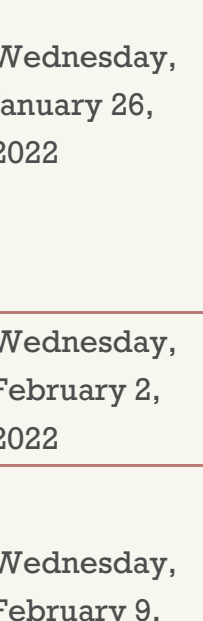


MIRA provides support to an investigator's laboratory that falls within the missions of NIGMS. The goal of MIRA is to increase the efficiency of NIGMS funding by providing investigators with greater stability and flexibility, thereby enhancing scientific productivity and the chances for important breakthroughs.

A key feature of the MIRA award is that it funds the laboratory not just a singular project, so it allows greater flexibility in the exact questions the lab studies.

Dr. Matthew Cabeen

OCRID Pilot Project Leader 2019-2020, Dr. Laura-Isobel McCall, from the Department of Chemistry and Biochemistry, College of Arts and Sciences, University of Oklahoma, was selected as one of the 2021 Burroughs Welcome Fund **Investigators in the Pathogenesis of Infectious Disease**. This highly competitive award provides \$500,000 over a period of five years facilitate multidisciplinary approaches to the study of human infectious diseases.



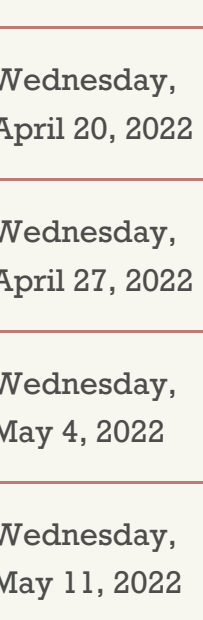
McCall's lab uses liquid chromatography mass spectrometry, 3-D metabolomics and data science tools to better understand why pathogens affect different parts of the body differently and why those differences also vary from person to person.

"It's a monumental honor," she added. "It's a testament to the hard work the whole lab has put in for us to get the point to develop the idea and the preliminary data that helped conceptualize this bigger project." [Source](#)

Dr. McCall was named to [www.cen.org](#) "Talented Twelve" as a rising star who uses chemical know-how to change the world. Dr. McCall is a molecular mapmaker. She draws 3-D maps of the interactions between disease-causing pathogens and the hosts they infect. [Source](#)

Dr. Laura-Isobel McCall

OCRID Pilot Project Leader 2013-2014, Dr. Valentin Rybenkov, from the Department of Chemistry and Biochemistry, College of Arts and Sciences, University of Oklahoma, published an opinion article in the journal Nature Chemical Biology that addresses the gap in the discovery of new antibiotics.



"The continuing emergence of antibiotic-resistant bacteria, and our inability to develop new antibiotics to combat them, represent two of the most wicked healthcare problems we face," said OU vice president for research and partnerships Tomás Diaz de la Rubia. "OU's team is working hard to develop solutions to these major challenges, and their opinion article helps bring visibility and attention to these issues at a time when it's needed most."

The increasing frequency of antibiotic resistance has created a significant health care challenge and will progressively worsen with innovative solutions.

In the article, the research team provides an overview of emerging insights into this problem and outline a general approach for researchers and scientists to address it. [Source](#)

Dr. Valentin Rybenkov

OCRID Mentor Dr. Clinton Jones, from the Department of Veterinary Pathobiology, College of Veterinary Medicine, Oklahoma State University, obtained a nearly \$500,000 grant from the National Institute of Food and Agriculture to study bovine respiratory disease and Bovine herpesvirus 1 (BHVV-1) infects the upper respiratory tract in cattle. [To read the full article click: Here](#)

Dr. Clinton Jones

OCRID Phase I Mentor, Dr. Pamela Lovren, from the Department of Physiological Sciences, College of Veterinary Medicine, Oklahoma State University, was granted \$1.75 million training grant from the National Institutes of Health (NIH), funding a program to attract more historically underrepresented doctoral students to careers in biomedical research.

Dr. Pamela Lovren

The five-year Graduate Research Training Initiative for Student Enhancement (G-RISE) grant is administered by the National Institute of General Medical Sciences, one of the 27 institutes and centers within NIH. Currently, OSU is one of only eight institutions in the nation to have been awarded a G-RISE grant.

OCRID Center Investigator, Dr. Trent Tipple, from the Department of Pediatrics, College of Medicine, the University of Oklahoma Health Sciences Center, along with his colleagues at the Oklahoma Children's Hospital worked together to make sure that the public has the information it needs to send children back to school.

Parents already had so many questions as children went back to the school during the COVID-19 pandemic, which is why KOCO 5 spoke to local doctors about the things you could do to keep them safe heading back to the classroom.

Tipple was like many parents in the Oklahoma City metro. His children were headed back to the classroom, which is why he and his colleagues at Oklahoma Children's Hospital wanted to give parents clear advice and information.

With pediatric hospitalizations rising due to COVID-19, he worried there will be a ripple effect if the alarm wasn't sounded. [Source](#)

Dr. Trent Tipple

New Grants Awarded to OCRID Faculty (07/01/2020—06/30/2021)

Project/Pilot Project Leaders—\$5,338,990

- Butcher, Joshua Thomas, NIH/NIA, K01AG064121, Skeletal Muscle as a Target for Cardio-Metabolic Disease in Sarcopenic Obesity, 08/01/2020 – 05/31/2025, \$643,860.
- Butcher, Joshua Thomas, OSU CVM, Effect of an exercise mimetic on brain function, 10/01/2020 – 09/30/2021, \$10,000.
- Burgett, Anthony/Earl Blewett, NIH/NIAID, R01AI154274, Cellular Mechanism of Oxysterol-Binding Protein (OSBP) in Viral Proliferation: A Chemical Biology Approach" 04/08/2021 – 03/31/26, \$2,002,666.
- Cabeen, Matthew, NIH, R35GM138018, Stress sensing and processing by bacterial cytoplasmic megacomplexes, 09/15/2020-08/31/2025, \$1,712,063.
- Cabeen, Matthew, Oklahoma Center for the Advancement of Science and Technology, Regulation of P. aeruginosa biofilm formation by a DNA-binding protein, 10/01/20-9/30/23, \$95,000.
- Kovats, Susan, Presbyterian Health Foundation, Impact of immune-modulating therapy on respiratory virus infection in the murine EAE model of multiple sclerosis, 07/01/20 – 06/30/21, \$140,000
- Lacombe, Veronique, Oklahoma Center for the Advancement of Science and Technology, The Sarcoplasmic Reticulum Calcium ATPase Pump as a Major Regulator of Glucose Metabolism: A Novel Target for Diabetic Patients, 07/01/2020-06/30/2023, \$134,601.
- Lacombe, Veronique, OSU CVM, Novel therapeutic targets to improve cardiorespiratory outcomes during COVID-19 infection and diabetes, 10/15/2020 - 10/14/2021, \$20,000.
- Lin, Dingbo (Daniel), USDA/NIFA, 2021-67018-34023, Watermelon juice promotes the gut microbiome homeostasis, 01/01/2021-12/31/2022, \$200,000.
- Lutter, Erika, Oklahoma Center for the Advancement of Science and Technology, Manipulation of Host Kinases by Chlamydia Trachomatis, 07/01/2020 - 06/30/2023, \$135,000.
- McCall, Laura-Isobel, PhRMA foundation, Meeting the translational need for biomarkers of Chagas disease cure, 07/01/20 – 06/30/21 \$100,000.
- Miller, Craig, Mioris Animal Foundation, D21FE-809, An innovative approach to replicate the Cytouzoon felis lifecycle in vitro, 10/01/2020 – 09/30/2021, \$10,800.
- Rajan, Rakhi, Oklahoma Center for the Advancement of Science and Technology, Protein Engineering to Develop Stringent CRISPR-Cas Genome Tools, 07/01/2020 - 06/30/2023, \$135,000.

Mentors/Core Directors—\$2,637,210

- Coggeshall, Kenneth, Mark, NIH, 3U19AI062629-1T51, Molecular and Immunologic Analysis of the Pathobiology of Human Anthrax, 09/01/2020-08/31/2022, \$476,466
- Jones, Clinton, USDA/NIFA, 2020-06435, Maintenance of bovine herpesvirus 1 latency by viral and cellular factors, 7/1/2021-6/30/2025, \$497,000.
- Liu, Lin, NIH/NIAID, R21AI152004, Lnc-PINK regulation of innate immunity in lung epithelial cells, 03/05/2021 – 02/28/2023, \$411,400.
- Liu, Lin, Oklahoma Center for Adult Stem Cell Research, Development of a COVID-19 human lung tissue model for drug screen using iPSCs, 01/01/2021 – 12/31/2021, \$168,000.
- Liu, Lin, Oklahoma Center for the Advancement of Science and Technology HR20-050, Role of Tankyrase 2 in Lung Innate Immunity, 10/01/2020 – 09/30/2023, \$135,000.
- Metcalf, Jordan P., Veterans Administration Merit Review Grant, I01BX005023, Reversing Cigarette Smoke-Induced Antiviral Immunosuppression, 10/01/2020-09/30/2024, \$948,344.

Center Investigators—\$16,691,000.00

- Waters, Matthew, Presbyterian Health Foundation, COPD-dependent Changes in Human Airway Stem/Progenitor Cell Function, 07/01/20-06/30/21, \$50,000.
- Waters, Matthew, Presbyterian Health Foundation, SARS-CoV-2 Host-Virus Interactions in Old vs. Young Human Airway Epithelium, 07/01/20-08/30/21, \$35,000.
- Xia, Lijun, NIH, P20GM139763, Center for Cellular Metabolism Research in Oklahoma, 02/05/2021-01/31/2026, \$13,110,000.
- Xia, Lijun, NIH, R01HL149860, Platelet CLEC-2 in Arterial Thrombosis, 07/01/2020-06/30/2024, \$1,748,000
- Xia, Lijun, NIH, 1R01HL153728, Site-1 protease-mediated lipid metabolism in lymphatic vascular development, 08/01/2020-05/31/2024, \$1,748,000.

Upcoming OCRID Activities

Wednesday, December 8, 2021	Work in Progress: Dr. Yong Cheng, Ph.D.	Link Meeting ID: 924 8060 4451
Wednesday, December 15, 2021	Work in Progress: Dr. Anthony Burgett, Ph.D.	Link Meeting ID: 924 8060 4451
Wednesday, January 26, 2022	Seminar: Dr. Jennifer Phillips, MD, Ph.D., Associate Professor of Medicine and Molecular Microbiology at Washington University School of Medicine in St. Louis Title: Exploiting host-pathogen interactions for TB treatment and diagnostics Hosted by: Dr. Yong Cheng	Link Meeting ID: 936 7697 4601
Wednesday, February 2, 2022	Journal Club: Sunil More, Ph.D Article: TBA	Link Meeting ID: 976 3468 0825
Wednesday, February 9, 2022	Seminar: Dr. Rachel Fearns, Ph.D., Professor of Microbiology at Boston University School of Medicine Title: TBA Hosted by: Dr. Lin Liu	Link Meeting ID: 936 7697 4601
Wednesday, February 16, 2022	Journal Club: Dr. Rudragouda Channappanavar, Ph.D Article: TBA	Link Meeting ID: 976 3468 0825
Wednesday, February 23, 2022	Seminar: TBA	Link Meeting ID: 936 7697 4601
Wednesday, March 2, 2022	Seminar: Dr. Hal Chapman, M.D., Professor of Medicine at the University of California, San Francisco Title: 13th Lundberg-Kienlen Lecture in Biomedical Research Hosted by: Dr. Lin Liu	Link Meeting ID: 936 7697 4601
Wednesday, March 9, 2022	Seminar: TBA	Link Meeting ID: 936 7697 4601
Wednesday, March 23, 2022	Work in Progress: Dr. Sunil More, Ph.D.	Link Meeting ID: 924 8060 4451
Wednesday, March 30, 2022	Journal Club: Dr. Yong Cheng, Ph.D Article: TBA	Link Meeting ID: 976 3468 0825
Wednesday, April 4-6, 2022	OCRID 9th Annual Symposium	
Wednesday, April 13, 2022	Journal Club: Dr. Veronique Lacombe, Ph.D Article: TBA	Link Meeting ID: 976 3468 0825
Wednesday, April 20, 2022	Seminar: TBA	Link Meeting ID: 936 7697 4601
Wednesday, April 27, 2022	Seminar: TBA	Link Meeting ID: 936 7697 4601
Wednesday, May 4, 2022	Journal Club: Dr. Craig Miller, Ph.D Article: TBA	Link Meeting ID: 976 3468 0825
Wednesday, May 11, 2022	Journal Club: Dr. Marianna Patrauchan, Ph.D Article: TBA	Link Meeting ID: 976 3468 0825