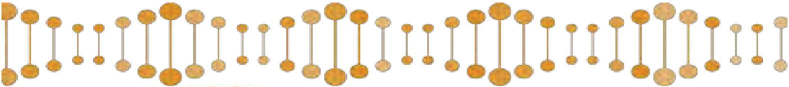

OKLAHOMA CENTER FOR RESPIRATORY
AND INFECTIOUS DISEASES

OCRID NEWS

October 2020

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A Message from the Director

Welcome to the new issue of OCRID Newsletter as we adapt to a new normalcy. OCRID awarded 3 grants to support COVID-19 research on animal model, vaccine development and drug discovery. OCRID investigators have also participated in COVID-19 response in their institutions from basic research and testing to clinic trials. OCRID investigators have been recognized for their achievements with various awards. In the past year, OCRID investigators received $26.9 million new grants with $11.6 million from project and pilot project leaders. I wish OCRID investigators all the best for respiratory and infectious diseases research in the coming year.

Lin Liu, Ph.D.
OCRID Director

OCRID Response to COVID-19

OCRID has awarded one 2-year research project and two pilot projects to help in the fight against the novel coronavirus. Each project looks to research a different facet of coronavirus infection, novel therapeutics, and vaccine options.

- **Dr. Craig Miller**, OSU-Stillwater, was awarded $423,000 for his proposal, "Validation of Naturally-Occurring Animal Model for SARS-CoV-2 Infection." His proposal seeks to gain greater understanding of SARS-CoV-2 pathogenesis in a natural infection in an animal model. Dr. Miller hopes his model will prove better for identifying possible treatment options and vaccine candidates. Using this model, Dr. Miller will generate and test novel vaccine candidates to assess their capacity to protect against SARS-CoV-2 infection. Dr. Clinton Jones, OSU and Dr. Jordan Metcalf, OUHSC will serve as mentors for Dr. Miller's project.

- **Dr. Christina Bourne**, OU-Norman, was awarded $25,000 for her proposal, "A Screening Platform for Pan-Coronavirus Assembly Modulators." She has identified the need for a novel anti-viral therapeutic option for those who cannot be protected by a vaccine for SARS-CoV-2. The objective of her proposal is to build a new platform to screen interactions that are essential for coronavirus assembly in order to identify a therapeutic approach that will treat multiple beta-coronaviruses.

- **Dr. Rakhi Rajan**, OU-Norman, was awarded $25,000 for her proposal, “A Comprehensive Approach to Analyze Corona Viral Protein Evolution Towards Novel Drug Discovery Strategies.” She wishes to compile a comprehensive study of SARS-CoV-2 using multiple research types. Her synergistic approach looks to fill critical knowledge gaps, build a better understanding of the spike protein and identify therapeutic options, and develop a recurrent neural network model, to help predict future SARS-CoV-2 viral evolution.

OCRID also awarded two additional pilot grants ($50,000 each) to **Dr. Joshua Butcher**, OSU-Stillwater, and **Dr. Daniel Lin**, OSU-Stillwater. Dr. Butcher’s proposal, “Augmented Muscle Mass as a Buffer Against Influenza” seeks to discover if myostatins (an exercise memetic) can protect against influenza severity in obese mice. Dr. Daniel Lin’s proposal, “Xanthophylls in RIG-I-MAVS modulated antiviral innate immunity,” seeks to better understand the significance of xanthophylls in host immune responses in respiratory infections, such as influenza.

A coronavirus researcher, **Dr. Rudragouda Channappanavar**, was recruited to fill a position that was committed to OCRID by the College of Veterinary Medicine, OSU. Our Search Committee undertook an extensive search for a new faculty member during the pandemic. Dr. Channappanavar will join OCRID as Center Investigator with an academic appointment in the Department of Veterinary Pathobiology, OSU as Assistant Professor next month. Dr. Channappanavar was trained by Dr. Stanley Perlman at the University of Iowa and has expertise in innate and adaptive immunity to investigate the pathogenesis of human coronavirus including SARS-CoV, MERS-CoV and now SARS-CoV2. He is going to make a wonderful addition to our research community, so please join us in welcoming him aboard!

OCRID investigators at OSU have contributed to the success of OSU COVID-19 testing lab, including **Dr. Sunil More** (OCRID investigator), **Dr. Teluguakula Narasaraju** (OCRID Phase I project leader), **Dr. Josh Ramsey** (OCRID investigator), **Dr. Jerry Ritchey** (IPC core director), **Samuel Jeyasingh** and **Girsh Patil** (PhD students mentored by OCRID faculty) and others. Read More Here, Here, and Here.

OCRID co-director, **Dr. Jordan Metcalf** from OUHSC participates in COVID-19 clinical trial. Read More Here

OCRID mentor, **Dr. Mark Coggeshall** at OMRF received $1.75 million supplement to his U19 grant from NIH to study the immune responses to SARS-CoV-2 in Oklahomans. Read More Here

OCRID pilot project leader, **Dr. Susan Kovats** from OMRF received a collaborative project grant from Presbyterian Health Foundation to study how COVID-19 affects patients with multiple sclerosis. Read More Here

OCRID investigator, **Dr. William Hildebrand** from OUHSC collaborates with Pure MHC to develop COVID-19 vaccine. Read More Here

OCRID pilot project leader, **Dr. Yu Feng** from Chemical Engineering, OSU examines social distancing models. Read More Here

OCRID pilot project leader, **Dr. Ford Versypt** from Chemical Engineering, OSU works with international coalition to understand SARS-CoV-2. Read More Here

COVID-19 Research Resources:

To facilitate research in fighting COVID-19, OCRID Molecular Biology Core (MBC) is making the following key reagents for COVID-19 research available to OCRID investigators. Please contact MBC director, Dr. Lin Liu (lin.liu@okstate.edu) for availability and collaborations.

Cell models: HEK293T-hACE2, A549-hACE2, and Vero E6
Human lung tissue model: Lung organoids
Viruses: SARS-CoV-2 pseudovirus, adenovirus expressing human ACE2 (for creating COVID-19 mouse model) and more.

COVID-19 Funding Opportunities

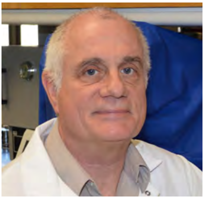
NIH funding opportunities specific to COVID-19: check here.

Awards OCRID Faculty Received

During the past year, OCRID members were recognized with many awards for outstanding achievements in research, mentorship, and more. We wish to extend our sincerest congratulation and we know to expect nothing less from our amazing investigators, project leaders, and mentors.

❧ Dr. Christina Bourne, OCRID Phase II Pilot Project Leader, from Chemistry and Biochemistry, OU-Norman, was awarded the **Nancy L. Mergler Faculty Mentor Award for Undergraduate Research**. The Nancy L. Mergler Faculty Mentor Award for Undergraduate Research was established in 2013 to recognize faculty excellence in supporting undergraduate research.

❧ Dr. Mark Coggeshall, OCRID Phase I and Phase II Mentor, from OMRF, was awarded **The Merrick Award for Outstanding Medical Research**. Dr. Coggeshall holds the Robert S. Kerr, Jr., Endowed Chair in Cancer Research and for the last decade has dedicated his research to understanding the immune response to anthrax. His discoveries also have the potential to help treat other forms of sepsis, the blood poisoning that results from exposure to anthrax.



❧ Dr. Tyrrell Conway, OCRID Phase II Mentor, from Microbiology and Molecular Genetics, OSU was awarded the **Career Champion Award**. This new award recognizes a faculty or staff member who has championed career development and readiness by encouraging, fostering, and promoting opportunities for students.

- Dr. Ashlee Ford Versypt, OCRID Phase I Pilot Project Leader, from Chemical Engineering, OSU, was awarded the **Women's Faculty Council Outstanding Achievement and Mentorship of Women Award for Outstanding Achievement.** This award is given to faculty who have made significant contributions to research, scholarship and/or creative works, and have demonstrated a record of encouragement, mentorship, and advancement of women toward professional success.

- Dr. Clinton Jones, OCRID Phase II Mentor, from Veterinary Pathobiology, OSU, has been **Newly Appointed as Regents Professor.** This honorary title is awarded to faculty judged by peers to have made outstanding contributions to their discipline through accomplishments in instruction research, scholarship, extension and/or outreach.

- Dr. Susan Kovats, OCRID Phase II Pilot Project Leader, from OMRF, was presented with the **J. Donald & Patricia H. Capra Award for Scientific Achievement**.

- Dr. Dingbo (Daniel) Lin, Phase I and II Pilot Project Leader, from Nutritional Sciences, OSU, was awarded the **Distinguished Early Career Faculty Award.** This award recognizes faculty who were awarded tenure within the past three years and have demonstrated a strong potential for continued contributions to the Universtiy and to his/her profession in the areas of instruction, research and creative activity, and/or extension/outreach.

- Dr. Lin Liu, OCRID director, from Physiological Sciences, OSU was awarded the **Regents Distinguished Research Award.** This award recognizes faculty who have shown unusually significant achievements in their field of research.

- Dr. Pamela Lovern, OCRID Phase I Mentor, from Physiological Sciences, OSU, was awarded the **Advising Excellence Award.** This award provides institutional recognition for outstanding academic advising by faculty and staff.

- Dr. Erika Lutter, Phase I Pilot Project Leader, from Microbiology and Molecular Genetics, OSU, was awarded the **Distinguished Early Career Faculty Award.** This award recognizes faculty who were awarded tenure within the past three years and have demonstrated a strong potential for continued contributions to the University and to his/her profession in the areas of instruction, research and creative activity, and/or extension/outreach.

Grants Received by OCRID Faculty

Grant Spotlight

Congratulations to Dr. Robert Welliver and Dr. Tom Oomens on their NIH Grant for Vaccine Development

Drs. Welliver and Oomens have been awarded a Phase I STTR grant totaling $267,672 for the "Development of an M Protein-Deficient Respiratory Syncytial Virus Vaccine for Aerosolized Vaccination of the Lung." According to the NIH website, a key objective of the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants is to translate promising technologies to the private sector and enable life-saving innovations to reach consumer markets. This grant will facilitate the efforts of OCRID investigators to move bench research to bedside and marketplace.

Dr. Welliver is a mentor of OCRID and Division Chief of Pediatric Infectious Diseases at the University of Oklahoma Health Sciences Center. Dr. Oomens is a Phase I project leader of OCRID and an Associate Professor in the Department of Veterinary Pathobiology, College of Veterinary Medicine at Oklahoma State University. OCRID brought Dr. Welliver, a clinician scientist and Dr. Oomens, a basic scientist together for a productive collaboration.

The project involves development of a vaccine against respiratory syncytial virus (RSV). RSV infection of the lung is the most frequent reason for an infant to be hospitalized in the US and most other countries. It causes approximately 150,000 deaths in children worldwide annually, and about 15,000 deaths in elderly individuals in the US each year. RSV infection in infancy is also a risk factor for the development of childhood asthma. Despite this, there is no approved vaccine against RSV, and no effective antiviral therapy.

Dr. Welliver and Oomens have developed a novel vaccine "Mnull RSV" (first produced by Dr. Oomens with the OCRID-CoBRE support) that protects animal models against RSV infection for at least 4-6 months, which is the length of an RSV season. The vaccine works best when it is delivered directly to the lung. The goal of the STTR grant is to demonstrate that the vaccine can be protective when administered via commercial nebulizers. They will test varying doses of the Mnull vaccine in animals using a nebulizer approved for use in human infants. When the optimal dose is established, they will vaccinate animals, and then challenge them with RSV to determine the degree of protection. The grant is awarded to Heartland Vaccines LLC, a small business that they started, which is based in Stillwater.

OCAST Awards Six OCRID Members Grants

The Oklahoma Center for the Advancement of Science and Technology (OCAST) board approved $1.25 million in funding for biomedical research projects across the state. OCRID investigators won six grants.

- **Dr. Matthew Cabeen**, OSU-Stillwater, was awarded a Health Research grant for his proposal, "Regulation of P. Aeruginosa Biofilm Formation by a DNA-Binding Protein."
- **Dr. Susan Kovats**, OMRF-Oklahoma City, was awarded a Postdoctoral Fellowship to train a postdoctoral researcher for the project "Targeting Guanylate Cyclase/cGMP/Phosphodiesterase-5 Signaling Pathway for Colorectal Cancer Prevention."
- **Dr. Veronique Lacombe**, OSU-Stillwater, was awarded a Health Research grant for her proposal, "The Sarcoplasmic Reticulum Calcium ATPase Pump as a Major Regulator Glucose Metabolism: A Novel Target for Diabetic Patients"
- **Dr. Erika Lutter,** OSU-Stillwater, was awarded a Health Research grant for her proposal, "Manipulation of Host Kinases by Chlamydia Trachomatis."
- **Dr. Lin Liu**, OSU-Stillwater, was awarded a Health Research grant for his proposal, "Role of Tankryasa 2 in Lung Innate Immunity."
- **Dr. Rakhi Rajan**, OU-Norman, was awarded a Health Research grant for her proposal, "Protein Engineering to Develop Stringent CRISPR-Cas Genome Tools."

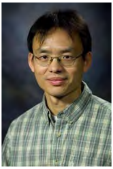
Grant Highlights

The following project/pilot project leaders received NIH grants to support their respiratory and infectious diseases research.

Drs. Matt Cabeen and Karen Wozniak receive CoBRE project Grants

Two OCRID phase II pilot project leaders, Drs. Matt Cabeen and Karen Wozniak at OSU Microbiology and Molecular Genetics become project leaders of a newly funded CoBRE award (PI, Jimmy Ballard), a joint effort between OUHSC and OSU. Dr. Cabeen was awarded $1,450,985. He will be leading a project for the next 5 years. His Project is entitled Characterization of Novel Biofilm Regulators in P. Aeruginosa." Dr. Wozniak was awarded $1,496,000. She will be heading up another project for the next 5 years. Her project is entitled: "Interaction of Human Pulmonary Macrophage and Dendritic Cell Subsets with Cryptococcus Neoformans." Read More Here

Dr. Junpeng Deng receives NIH R21 Grant



OCRID Phase I Pilot Project Leader, Dr. Junpeng Deng at OSU Biochemistry and Molecular Biology was awarded a R21 grant from the NIH for his project entitled: Structure Function Studies of a Molecular Complex for Generating Viral Membrane.

Dr. Ashlee N. Ford Versypt receives NIH MIRA Grant

OCRID Phase I Pilot Project Leader, Dr. Ashlee N. Ford-Versypt in OSU Chemical Engineering, was award a 1.8 million NIH MIRA grant for your research entitled: Quantitative Systems Biomedicine and Pharmacology for Multiscale Tissue Damage. Read More Here

Dr. Laura-Isobel McCall Receives NIH R21 Grant

OCRID Phase II Pilot Project Leader, Dr. Laura-Isobel McCall from Chemistry and Biochemistry, OU-Norman was award a NIH R21 grant for her project entitled: "Oral Carnitine Administration as a Novel Treatment for Chronic-Stage Chagas Disease."

Dr. Antonius Oomens Receives NIH R21 Grant

OCRID Phase I Project Leader, Dr. Antonius Oomens from Veterinary Pathobiology, OSU was awarded a NIH R21 grant for his project entitled "An authentic RSV virus-like particle vaccine to achieve broad and long-lasting protection".

Dr. Valentin Rybenkov Receives NIH R21 Grant

OCRID Phase I Pilot Project Leader, Dr. Valentin Rybenkov from Chemistry and Biochemistry, OU-Norman was awarded a NIH R21 for his research titled “Small Molecule Inhibitors of Bacterial Condensins”.

Dr. Erika Lutter Receives NIH R15 Grant

OCRID Phase I Pilot Project Leader, Dr. Erika Lutter from Microbiology and Molecular Genetics, OSU, was awarded a NIH R15 for her research titled “Role of Chlamydia Trachomatis Inc Proteins in Modulating the Immune Response”.

New Grants Received by OCRID Investigators (07/01/2019-06/30/2020)

Project/Pilot Project Leaders—$11,586,429

Cabeen, Mattew, NIH P20GM134973, Characterization of Novel Biofilm Regulations in P. Aeruginosa, 12/1/2019-11/30/2020, $1,450,985 (Subproject PI)

Deng, Junpeng, NIH R21AI149295, Structure Function Studies of a Molecular Complex for Generating Viral Membrane, 05/22/2020-04/30/2022, $411,400.

Duerfeldt, Adam Scott, NIH R01EY030472, Small Molecule PPAR-ALPHA Agonism as a Novel Approach to Treat Eye Vascular Diseases, 05/01/2020-04/30-2025, $2,290,005

Ford-Versypt, Ashlee, NIH R35GM133763, Quantitative Systems Biomedicine and Pharmacology for Multiscale Tissue Damage, 09/01/2019-06/30/2024, $1,834,680

Lutter, Erika, NIH R15 AI149439, Role of Chlamydia Trachomatis Inc Proteins in Modulating the Immune Response, 03/01/2020-02/28/2023, $441,392

McCall, Laura-Isobel, NIH, R21AI148886, Oral Carnitine Administration as a Novel Treatment for Chronic-Stage Chagas Disease, 2/1/2020-1/31/2022, $426,250

Oomens, Antonius, NIH, R21AI149022, An Authentic RSV Virus-Like Particle Vaccine to Achieve Broad and Long-Lasting Protection, 1/1/2020-12/31/2020, $399,482

Ranjan, Ashish, NIH/NCI 1R37CA239150, Novel Focused Ultrasound enhanced Calreticullin-Nanoparticle for Immune Primed Melanoma Immunotherapy, 6/4/2019-5/31/2024, $1,655,985

Ranjan, Ashish, OCAST, Minimally invasive Animal Sterilization w/Pinnacle Animal Health LLC, 2020-2021, $310,000

Rybenkov, Valentin, NIH R21AI141927, Small Molecule Inhibitors of Bacterial Condensins, 7/1/2019-6/30/2020, $426,250

Wozniak, Karen, NIH/NIAID R13AI150092, 2019 South Central Medical Mycology Conference, 11/19/2019-10/31/2020, $6,500

Wozniak, Karen, NIH, P20GM134973, Interaction of Human Pulmonary Macrophage and Dendritic Cell Subsets withy Cryptococcus Neoformans, 12/01/2019-11/30/2020, $1,496,000 (subproject PI)

Feng, Yu, OCAST, Understanding the Effects of Sphero-Cylinder Drug Particle Shape to Enhance Small-Airway Drug Delivery for Better Emphysema Treatment Outcomes, 07/01/2020-06/30/2023, $135,000

Lin, Daniel, NIH/USDA NIFA, Dietary Xanthophylls in Preventing Inflammation and Promoting Gut Health, 03/01/2020-02/28/2023, $500,000

Mentors—$15,112,320

Coggeshall, Mark, NIH U19AI062629, Molecular and Immunologic Analysis of the Pathobiology of Human Anthrax Infections, 09/30/2019-08/31/2024, $11,168,848

Coggeshall, Mark, NIH U19AI062629S, Supplement to study COVID-19 immune response, $1,750,000, 06/08/2020-08/31/2022.

Liu, Lin, Oklahoma Center for Adult Stem Cell Research, Modeling Influenza Virus Infection Using iPSC-derived Alveolar Organoids, 01/01/2020 – 12/31/2020, $168,000

Welliver, Robert, NIH R41AI147787, Development of an M Protein-Deficient Respiratory Syncytial Virus Vaccine for Aerosolized Vaccination of the Lung, 9/5/2019-8/31/2020, $267,672.

Jones, Clinton, NIH R01 NS111167, Stress-Mediated Regulation of HSV-1 Reactivation from Latency, 04/01/2020-03/30/2025, $1,757,800

Other Center Investigators—$185,000

Ramsey, Josh, OCAST, Targeted Delivery of a Reactive Oxygen Species Generator for Treatment Hormone Refractory Prostate Cancer, 07/01/2020-06/30/2023, $135,000

Walters, Matthew, Presbyterian Health Foundation New Investigator Seed Grant, COPD-Dependent

New Faces to the Center

Vibudutta Awasthi—Dr. Awasthi is a Professor of Pharmaceutical Sciences, Sandra K. & David L. Gilliland Chair and Associate Dean, College of Pharmacy, at the University of Oklahoma Health Science Center. Dr. Awasthi joined our Internal Advisory Committee. You can read more about Dr. Awasthi here.

Darren Hagen—Dr. Hagen is an Assistant Professor in the Department of Animal Science at the Ferguson College of Agriculture, OSU. Dr. Hagen works on bioinformatics and is interested in single cell RNA sequencing. You can find out more about Dr. Hagen here.

Christina Bourne—Dr. Bourne is an Assistant Professor at The University of Oklahoma –Norman in the College of Arts and Sciences Department of Chemistry and Biochemistry. She was awarded a Pilot Project Grant for this year. Dr. Bourne's lab works to understand the relation of protein function to macromolecular structure. You can read more information about

George Huang—Dr. Huang is an Assistant Professor at the Oklahoma State University Center for Health Sciences. He mainly focuses on the anaerobic pathogen Clostridium difficile and Fusobacterium nucleatum. You can read more about Dr. Huang here.

Dr. Bourne here.

- **Joshua Butcher**—Dr. Butcher recently joined Physiological Sciences, OSU from the Vascular Biology Center at the Medical College of Georgia at Augusta University. He was awarded a Pilot Project Grant for this year. Dr. Butcher's lab researches the dynamic interplay between obesity-derived cardiometabolic dysfunction and aging, with a focus on how exercise (or an exercise mimetic) can improve health/life span. You can read more information about Dr. Butcher here.

- **Dr. Rudragouda Channappanavar—**Dr. Channappanavar is joining Veterinary Pathobiology, OSU as a RID faculty from the University of Tennessee Health Science Center. He hopes to use his expertise in innate and adaptive immunity, host-pathogen interactions, and molecular virology to examine the mechanistic basis for protective and pathogenic immune responses to highly virulent respiratory virus infections in young and aged hosts.

- **Yong Cheng**—Dr. Cheng is an new Assistant Professor in the Department of Biochemistry and Molecular Biology at the Ferguson College of Agriculture, OSU. His lab is focused on understanding the molecular and cellular mechanisms of the host-pathogen interactions during mycobacterial infections. You can read more information about Dr. Cheng here.

- **Ratnakar Deole**—Dr. Deole is an Assistant Professor of Biochemistry and Microbiology at the Oklahoma State University Center for Health sciences. Dr. Dole works on halophilic (salt loving) microorganisms. You can read more about Dr. Deole here.

- **Craig Miller**—Dr. Miller joined OSU Veterinary Pathobiology as an Assistant Professor in 2018 and was just awarded a two year OCRID Project Grant. Dr. Miller's research primarily focuses on understanding the immunopathology of infection diseases, and includes translational lentivirus infection studies using feline immunodeficiency virus to study HIV pathogenesis. You can read more about Dr. Miller here.

- **Avi Mitra**—Dr. Mitra is a new Assistant Professor in the Department of Microbiology and Molecular Genetics. His lab will focus on two pathogens that are causative agents of human respiratory diseases, namely Mycobacterium tuberculosis and Pseudomonas aeruginosa.

- **Sunil More**—Dr. More has recently returned to OSU Veterinary Pathobiology as an Assistant Professor from the College of Veterinary Medicine at the University of Florida. Dr. More's lab is working to create a better model to study influenza in COPD patients. You can read more about Dr. More Here.

- **Rakhi Rajan**—Dr. Rajan is an Assistant Professor at The University of Oklahoma—Norman in the College of Arts and Sciences Department of Chemistry and Biochemistry. She was awarded a Pilot Project Grant this year. Dr. Rajan lab's primary focus is to characterize the protein-DNA-RNA interactions of the bacterial and archaeal immune system, CRISPR. You can read more about Dr. Rajan here.

Center Activities Announcement

As all of you are aware, we are still in the midst of a global pandemic. OCRID is dedicated to ensuring the safety of our faculty, staff, and invited guest. To that end we have decided to hold all OCRID activities this year via Zoom. This way we can ensure that we drastically limit contagion exposure, but still bring you the best quality seminars and activities. Thank you for you understanding during this time.