UTMB COVID Research Resources

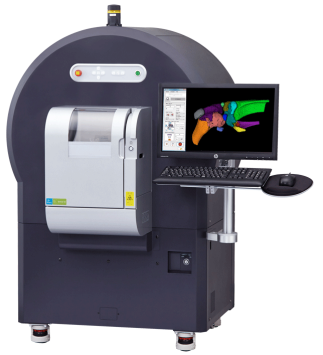
Three Faculty PIs who focus almost exclusively on Coronavirus research (Makino, Tseng, Menachery)

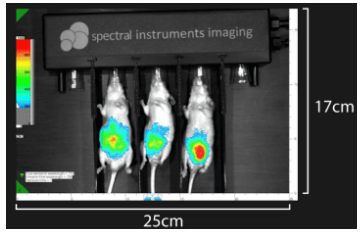
State-of-the-art BSL3, BSL3E and ABSL3 laboratories in the Galveston National Lab, Keiller and Mary Moody Northen buildings

Keck Center for Virus Imaging (MRB): BSL3 cryoElectron microscope capable of high-resolution tomography

Recently added GNL ABSL3 capabilities:

1. Small animal Quantum GS2 CT scanner
2. New hematology (VetScan HMS) and chemistry (VetScan VS2) instrumentation
3. Two portable X-ray instruments
4. DSI Small Animal Whole Body Plethysmography
5. In Vivo Imaging System (IVIS)





World Reference Center for Emerging Viruses and Arboviruses:

- Among the first 5 laboratories in the U.S. to receive the first SARS-CoV-2 isolate from the CDC in early February, first repository to distribute virus and viral RNA
- Currently ≈15 additional isolates available, including from a fatal case at UTMB
- Currently developing SARS-CoV-2 viral antigens and mouse antisera for research
- 8,000 other strains of emerging viruses and arboviruses available

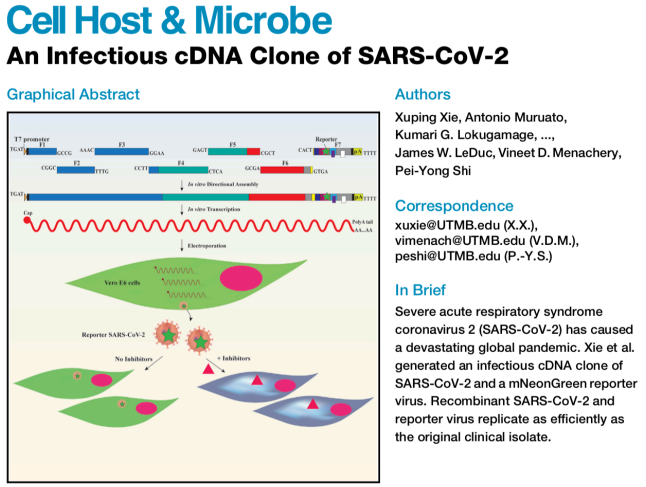
Severe Acute Respiratory Syndrome Coronavirus 2 from Patient with Coronavirus Disease, United States

Jennifer Harcourt,[1] Azaibi Tamin,[1] Xiaoyan Lu, Shifaq Kamili, Senthil K. Sakthivel, Janna Murray, Krista Queen, Ying Tao, Clinton R. Paden, Jing Zhang, Yan Li, Anna Uehara, Haibin Wang, Cynthia Goldsmith, Hannah A. Bullock, Lijuan Wang, Brett Whitaker, Brian Lynch, Rashi Gautam, Craig Schindewolf, Kumari G. Lokugamage, Dionna Scharton, Jessica A. Plante, Divya Mirchandani, Steven G. Widen, Krishna Narayanan, Shinji Makino, Thomas G. Ksiazek, Kenneth S. Plante, Scott C. Weaver, Stephen Lindstrom, Suxiang Tong, Vineet D. Menachery,[2] Natalie J. Thornburg[2]

Associate Director and Curator:
Dr. Ken Plante, Keiller 3.150

Reverse Genetics: cDNA clones for genetic manipulation of SARS-CoV-2 (available through WRCEVA)

- Mutagenesis for live-attenuated vaccine development, mouse adaptation, virulence determinants, etc.
- Reporter versions for high throughput neutralization assays and drug screening
- IVIS imaging for pathogenesis



Cell Host & Microbe

An Infectious cDNA Clone of SARS-CoV-2

Graphical Abstract

Authors

Xuping Xie, Antonio Muruato, Kumari G. Lokugamage, ..., James W. LeDuc, Vineet D. Menachery, Pei-Yong Shi

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In Brief

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has caused a devastating global pandemic. Xie et al. generated an infectious cDNA clone of SARS-CoV-2 and a mNeonGreen reporter virus. Recombinant SARS-CoV-2 and reporter virus replicate as efficiently as the original clinical isolate.

Transgenic Mouse Models

- Currently breeding at commercial supplier, expected availability late June or July

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0022-538X/07/$08.00+0 doi:10.1128/JVI.01702-06

Severe Acute Respiratory Syndrome Coronavirus Infection of Mice Transgenic for the Human Angiotensin-Converting Enzyme 2 Virus Receptor[▽]

Chien-Te K. Tseng,[1,3]* Cheng Huang,[1] Patrick Newman,[2] Nan Wang,[1] Krishna Narayanan,[1] Douglas M. Watts,[2,3] Shinji Makino,[1,3] Michelle M. Packard,[4] Sherif R. Zaki,[4] Teh-sheng Chan,[1] and Clarence J. Peters[1,2,3]

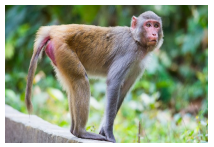
Departments of Microbiology and Immunology[1] and Pathology[2] and the Center of Biodefense and Emerging Infectious Disease,[3] University of Texas Medical Branch, Galveston, Texas, and Centers for Disease Control and Prevention, Atlanta, Georgia[4]

Animal Models

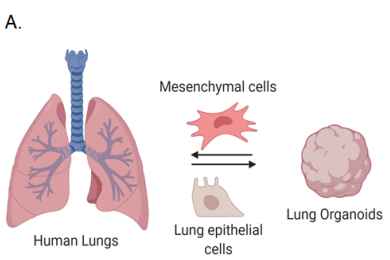
- Mice: ACE2 transgenic mice (Tseng)
- Mouse-adapted SARS-CoV-2 (Menachery, Shi, Rajsbaum)
- Hamsters (Bukreyev, Freiberg)

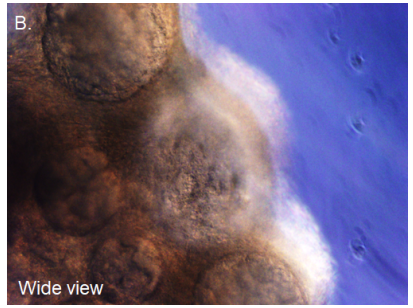
- Ferrets (Brasel)

- Nonhuman Primates
  - Rhesus and cynomolgus macaques (Comer)
  - African green monkeys (Geisbert, Cross)



- SARS-CoV-2 infection in 3D human lung organoids





Vaccine Development and Evaluation

- Live-attenuated vaccines (also surrogates for BSL2 research)
- Replicon-based (single cycle) vaccines,
- Inactivated vaccines,
- Viral vectored vaccines: Adenovirus, Modified Vaccina Ankara, VSV, Measles
- Lipid nanoparticles
- Protein-based subunit vaccines
- Structure-based design of coronavirus vaccines with broad efficacy and design peptide inhibitors of replication

Therapeutic Development and Evaluation

- Small molecule screening using reporter virus or replicon
- In silico screening of small molecules
- Development of host factor targets
- Immune plasma and monoclonal antibody therapeutic testing
- Evaluation of >20 FDA-approved drugs for repurposing
- Novel anti-coronavirus Therapeutics Derived from African Medicinal plants
- Test pharmacologic agents that produce hydrogen sulfide