BIOMEDICAL & VETERINARY SCIENCES

GRADUATE PROGRAM

ANNOUNCES

The Master of Science Seminar and Examination of

Hsin-Wen Liang

"Investigating FDA-approved drugs for treatment of multidrug-resistant Neisseria gonorrhoeae"

Thursday, May 4th, 2023
11:00AM
VMIA 220
Zoom: https://virginiatech.zoom.us/j/88323892950?pwd=ajhFR2hLT2VBWmdjY2tkdFFrRHRuUT09
Passcode: Cindy

Bio

Hsin-Wen has dedicated her academic and professional career to microbiology. Her journey began at Soochow University in Taiwan, where she earned a B.S. in Microbiology in 2015. Continuing her education, Hsin-Wen received an M.S. in Biological Sciences at Purdue University Northwest in 2017. After graduation, Hsin-Wen worked as a microbiology lecturer and laboratory manager at Purdue University and later joined DonLevy as a microbiologist. In 2020, Hsin-Wen joined Dr. Seleem's laboratory at Virginia Polytechnic Institute and State University. Her research in Dr. Seleem's laboratory focused on discovering novel therapeutics using a drug repurposing approach to combat multidrug-resistant Neisseria gonorrhoeae, the causative agent of the sexually transmitted disease gonorrhea. With a strong academic background and hands-on experience in the field of microbiology, Hsin-Wen is committed to making a significant impact in the battle against infectious diseases. As Hsin-Wen progresses in her research endeavors, she looks forward to tackling challenges in future research endeavors.

Funded by

VMCVM Office of Research and Graduate Studies

Awards and Academic Achievements

- Best Poster Presentation award, Virginia Tech 39th Annual GPSS Symposium, 2023, Blacksburg, VA.
- Outstanding Oral Presentation award, Virginia Tech 32nd Annual BMVS symposium, 2023, Blacksburg, VA.

Lay Language Abstract

Neisseria gonorrhoeae, the causative agent of gonorrhea, is the second most prevalent sexually transmitted infection that leads to substantial morbidity and economic burden worldwide. Improperly or untreated gonorrhea can lead to severe and life-threatening complications, including abortion, infertility, pelvic pain, and maternal death. Due to the increasing prevalence of resistance development against the formally and currently used antibiotics, the Centers for Disease Control and Prevention (CDC) have classified multi-drug resistant N. gonorrhoeae as an urgent-threat pathogen. The discovery of new anti-gonorrheal therapeutics is an urgent need.

Drug repurposing is the process of discovering new therapeutic uses for existing drugs that go beyond the original medical indication. To address the dire need to replenish the dry pipeline of anti-gonorrheal drugs, repurposing FDA-approved drugs is a promising approach as it significantly reduces the time and expense associated with traditional drug development. By screening an FDA-approved drug library, 14 drugs were found to display promising anti-gonococcal activity. Interestingly, three (itraconazole, isavuconazole, and ravuconazole) out of 14 identified drugs that share a similar chemical structure were azole antifungal drugs, and their activities were further investigated in vitro.

All three azole drugs showed bactericidal activity, meaning that they killed bacteria, had a low propensity to develop resistance, and completely cleared the burden of intracellular N. gonorrhoeae. Besides, our finding suggests that isavuconazole and ravuconazole possessed exceptional activity in the suppression of bacterial growth following brief antibiotic exposure. In conclusion, the three azole drugs exhibited potent anti-gonococcal activity and merited further investigation. This study provided unexplored avenues and promising opportunities that can be further evaluated to combat N. gonorrhoeae infection.

Publications

Naclerio GA, Abutaleb NS, Onyedibe KI, Karanja C, Eldesouky HE, **Liang HW**, Dieterly A, Aryal UK, Lyle T, Seleem MN, Sintim HO. Mechanistic Studies and In Vivo Efficacy of an Oxadiazole-Containing Antibiotic. J Med Chem. 2022 Apr 28. doi: 10.1021/acs.jmedchem.1c02034. PMID: 35482444.

Elsebaie MM, Nour El-Din HT, Abutaleb NS, Abuelkhir AA, **Liang HW**, Attia AS, Seleem MN, Mayhoub AS. Exploring the structure-activity relationships of diphenylurea as an antibacterial scaffold active against methicillin- and vancomycin-resistant Staphylococcus aureus. Eur J Med Chem. 2022 Apr 15. doi: 10.1016/j.ejmech.2022.114204. PMID: 35279608.

Presentations

Hsin-Wen Liang, Ahmed E.M. Elhassanny, Nader S. Abutaleb, and Mohamed N. Seleem, 2023. Repurposing the anti-inflammatory FDA-approved drug, auranofin, for combating Neisseria gonorrhoeae. VTCDD Drug Discovery Day 2023. Virginia Polytechnic Institute and State University, VA.

Hsin-Wen Liang, Ahmed E.M. Elhassanny, Nader S. Abutaleb, and Mohamed N. Seleem, 2023. FDA-approved drug library screening identifies the anti-inflammatory drug, auranofin, reveals antibacterial activity against Neisseria gonorrhoeae. 39th Annual GPSS Research Symposium. Virginia Polytechnic Institute and State University, VA. (Best Poster Presentation Award)

Hsin-Wen Liang, Ahmed E.M. Elhassanny, Nader S. Abutaleb, and Mohamed N. Seleem, 2023. Teaching an old drug a new trick: Repurposing the anti-inflammatory FDA-approved drug, auranofin, to treat Neisseria gonorrhoeae. 32nd Annual BMVS Graduate Research Symposium. Virginia Polytechnic Institute and State University, VA. (Outstanding Oral Presentation Award)

Presentations continued

Hsin-Wen Liang, Ahmed E.M. Elhassanny, Nader S. Abutaleb, and Mohamed N. Seleem, 2023. Anti-inflammatory FDA-approved drug, auranofin, exhibits antibacterial activity in vitro and in vivo against Neisseria gonorrhoeae. VCOM Research Recognition Day. Virginia Polytechnic Institute and State University, VA.

Hsin-Wen Liang, Ahmed E.M. Elhassanny, Nader S. Abutaleb, and Mohamed N. Seleem, 2022. Novel Antibiotics against Neisseria gonorrhoeae Accelerated by Drug Repurposing. CeZAP Infectious Diseases Symposium. Virginia Polytechnic Institute and State University, VA

Examination Graduate Committee

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