Antibiotic Resistance: Rawan Eleshy

Rawan Eleshy, a resident of Oklahoma since she was 13 years old, is conducting exciting research on an important topic, antibiotic resistance. Rawan became interested in studying microbiology and perusing her Ph.D after taking a molecular lab where her professor, Dr. Hoff, encouraged her to continue her education and pursue a PhD at Oklahoma State University. Her research consists of studying bacterial infections at mucosal sites, specifically those that are antibiotic resistant, and other side projects that are soon to be published.

Antibiotic resistance is when bacteria change in a way that drugs are no longer effective. This is extremely important because antibiotic resistance is on the rise. Eventually, if there is no solution, all bacteria will be impossible to kill by the use of drugs and will ultimately lead to death. Rawan states, “I felt like research is what I’m cut out to do.” And explains the medical importance of studying resistance.

Today, Rawan is currently researching the mechanisms that *Staphylococcus aureus* uses to acquire antibiotic resistance in mucosal sites, such as inside the lungs of cystic fibrosis patients. Cystic fibrosis is a chronic disorder that causes mucous in the lungs and digestive tract to become thick, inherently causing chronic coughing and lung infections. *S. aureus* is responsible for skin and wound infections, commonly acquired after surgical procedures. *S. aureus* is also responsible for food poisoning, pneumonia, and more serious infections, such as bacteremia, which is when bacteria spreads to the blood.

Rawan states they have found some interesting results about the acquisition of resistant genes in cystic fibrosis patients. She states that “*S. aureus* is adept at developing resistance and the mechanisms it uses to acquire resistance is either through mutation or horizontal gene transfer. I’ve been studying these mechanisms and we found some novel mutations that could be contributing to resistance. We have also started to study horizontal gene transfer between *S. aureus* and *P. aeruginosa* in the cystic fibrosis lung. This part is a little complicated, but so far our results suggest that genetic exchange between these two organisms is possible.”

Although antibiotic resistance in cystic fibrosis patients is Rawan’s main focus, she discussed two other side projects she is working on that are soon to be published. The first project involves testing newly synthesized antimicrobial compounds. Antimicrobial compounds are things like medicines, soaps, and sanitizers that kill microorganisms (bacteriostatic) or stop growth (bactericidal). For this project she states, “I receive the new chemical and determine if it is bacteriostatic or bactericidal. I also showed that this chemical is specifically designed to target Gram-positive bacteria such as methicillin resistant *S. aureus*.” She mentions that this work is to be published soon. The second side project she has just started and she is excited to start collecting data soon. In this project, she relates the effects of antibiotics on biofilm formation. A biofilm is formed by a cluster of organisms and are for the use of adhesion, such as to the lungs of cystic fibrosis patient, to assist in infecting the host.

Antibiotic resistance is an important topic that many researchers, like Rawan, are working hard to understand. If new antibiotics are not discovered to help assist in putting resistance to a halt, all infections will be nearly lethal, as there will be no drug able to rid infection.